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"Unethical use of research results" avoidance mechanisms and their nature (whistleblowing, ethical guidelines…) and limits of the existing processes—existing responses to rebuild trust at the institutional level.

Executive Summary

Trust in science, trust in the scientist or trust in the use of science?

Trust is regarded as a critical problem within the scientific context. When most people both in Europe and the US are seen to trust science to contribute to positive consequences, there is a definite variance in the confidence levels from region to region (Funk & Kennedy 2017) and according to the types of actors (scientists, researchers but also research users, such as politicians). Among those reasons highlighted documenting why there is some level of mistrust towards science, lies a paradox:

- on the one hand, the world of research, in its ecosystem, strives to publish only positive results complying with the expectations of the said environment, including funders - without revealing contradictions and doubts (Mlinarić, A., Horvat, M., & Šupak Smolčić, V. 2017) including towards the use of these results, which may itself be biased, as has recently been seen in the context of cholesterol-related issues (Ravnskov et al. 2018)
- while on the other hand, the general public is informed only of some very great successes, and inundated with conflicting information, controversies and harmful effects of research in often exaggerated terms (Haber et al. 2018) that are bound to raise doubts.

In short, adverse outcomes are reported over favourable ones, which leads to a negative perception of scientific effects, consequently, resulting in reduced levels of confidence.

This is all the more difficult for the non-specialist to understand, since it is not necessarily the practice of researchers that can be controversial, nor the result of the research that can be problematic, but rather the interpretation made of it by end-users, as shown by the recent controversy over the Milankovitch cycles and climate change.

This leads to the conclusion that mistrust in science could be more an issue of communication rather than the validity and reliability of the results.

Still another school of thought holds that phenomenon such as the financial crisis, climate change controversies, and obesity research malfunction, that can be in one way or another linked to biased research projects, and biased use of the research results, lead to low confidence levels among people, thus causing mistrust towards science.

Appreciation is given to the fact that the investigation does not question science; instead, it challenges the integrity of the people tasked with the responsibility of analysing scientific data, presenting it to the general population and in the end extracting political guidance out of it (Carucci, 2016), acknowledging the fact that there is nonetheless, too often, a tendency to hold researchers responsible for ethical failure when it is a more global and systemic issue.

As an instance, it is emphasized that in situations where research findings do not support the expectations of their promoters, researchers might find themselves entrapped within an ethical dilemma : either deliver the results of their observations as is, with all the risks that this might

entails - as in its time John Yudkin made the bitter experience - . or being made to adjust them to prevent project termination: an adverse effect of "academic capitalism"? (Welsh et al. 2008).

This sets the foundation for identifying processes that might exist as a way of preventing practices which are in contravention of ethical criteria in the context of research and research use, a solution that could include extending the safeguards that are currently only focusing on research and its practices, to the scope of research, i.e. its use.

Data Collection Methods

Two methods are applied to identify both the paradigms on which trust in research is build and the existing mechanisms to avoid unethical use of research results.

The first approach is an extensive literature review in which Boolean search is used to identify data in four different categories. Namely, evidence of unethical use of research results in-house and outside, evidence of lack of trust/mistrust in relation to the unethical use of research results, existing and non-existing mechanisms to identify risks of unethical use within and outside research organizations, and mechanisms to avoid/manage cases of misuse. In specifically targeting each of these contexts, the relevant keywords were used in the search on engines such as Qwant and Google Scholar.

The second method applied involved a case study on education in the French context. In bolstering the case study results, data sets provided by open data website and public walls were accessed. Following data identification, it was collected through a scraping phase, which was done using BeautifulSoup and then saved to a CSV file awaiting analysis. The homogeneity was then observed, and dissonance of these likes with the educational choices of the related individuals to predict potential dropout risk.
This approach was, however, restricted since data could only be collected from anonymous public discussion walls which could not make possible social engineering avoidance. One outcome of these restrictions is that they introduced a likelihood of bias in our data resulting from a lack of objectivity on the part of the chosen individuals from whom the data was to be collected.

Overview of the Literature

In the analysis of the existing literature, one of the most significant observations was that there is an overall absence of processes at the institutional level to prevent the misuse or biased use of research findings.

This observation resulted in the question of how a dynamic trust could be built and applied to the use of research outcomes. The question is responded to by looking at the distribution and causes of mistrust in various contexts. Concerning vaccines, for example, issues regarding security of adjuvants generally arise, and it appears that researchers typically find it hard to respond to them, tending to propose an answer that does not fully address the raised question : a known drive to frustration (Bateson, 1941).

Besides justifying their findings to the public, the literature reveals that another strategy scientist built upon to improve the acceptance of the reliability of their results is through peer reviews. This is a scenario where other people of comparable qualifications constructively

criticize a fellow researcher's work. This approach, while generally targeted towards ensuring a high level of trust for the presented results, is argued to, in some cases, fuel mistrust, especially in cases where the individuals reviewing the research work do not agree on certain essential elements.

Finally, the frequent use of science as justification and support for political action, which is now the least believed, tends to overuse the scientific voice (Langer,Tripney and Gough 2016)

In that regard, the evaluated literature ultimately shows that despite numerous efforts aimed at enhancing trust for research results, current practices appear to be rather counterproductive. By *institutionalizing content validation processes* (through cherry-picked publication, peer review…), by *not responding directly and explicitly to questions* asked by non-insiders, and by referring too often to science as the pillar of their action, the actors who seek to build trust in science and its achievements generate the opposite effect : suspicion and mistrust are significantly high, thus leading to low levels of confidence towards institutions (Lewicki, McAllister & Bies 1998).

Trust and Distrust in Different Contexts

It is argued that to understand the different elements of trust targeted, it is essential to come up with a clear definition of the concept. Generally, trust is pointed out to be a belief in the reliability of an individual or any other thing. In the context of the research, therefore, trust is the belief people have in scientists, the research findings they present and the use that is made of these. It is, however, revealed that trust could be treated as an action and a belief depending on the specific language used. In the French context, for example, there is no distinction between the act and feeling of trust. German and English, on the other hand, distinguish between trust as action and trust as the level of belief (Lewicki, McAllister & Bies 1998).

Beyond the different definitions of the trust concept, numerous researchers have alluded to a link between trust and economic development. This argument is found plausible based on the fact that it is people who trust each other that are likely to cooperate in different forms of economic activities, thus leading to the growth of profitable companies. In addition, high levels of trust lead to a reduction in costs of monitoring, controlling, litigation in economic relations. Researchers investigating the connection between trust and economic outcomes are, however, not in agreement as to the actual nature of the concept since each group applies the term under their specialization. For example, while psychologists look at trust as a personal trait, sociologists treat it as a social structure, while economists view it as one of the mechanisms of economic choice.

In an attempt to reconcile the social and economic arguments for trust, the convention theory was formulated in France in the 1980s. In this theory, the link between social and economic aspects of trust is established on the basis that economic actors within the institutional framework act as social actors by coming into agreements on the conventions that are supposed to govern them (Simon, 1986). Therefore, it is these social contracts, which insist on common good over individual interest, that form the basis of trust in economic interactions among different parties. In that regard, conventions are seen to make the behaviour of people much more predictable hence providing a supportive environment for trust in economic activities.

Trust and its Components

From a purely theoretical standpoint, the evaluated literature presents a categorization of trust into three classes, which are: characteristic-based trust, process-based trust, and institutional-based trust.
While characteristic-based trust is trait-dependent, process-based trust relates to the level of confidence one party has with the actions of others. Finally, institution-based trust is dependent on the level of trust an organization can elicit from people. Institutional trust is based on the trustworthiness of the different people working in particular organizations, meaning that avoidance of mistrust is achieved by having highly reputable people in organizations and putting in place standards that ensure a high level of organizational integrity (Hardy, Phillips, & Lawrence, 1998).

For trust and mistrust to be understood, it is necessary to identify their modes of production. At the personal level, the level of trust or mistrust manifested by an individual is dependent on the intensity of social ties between individuals. In that regard, personal proximity, learning, and experience are significant predictors of the level of trust or mistrust between two individuals. In this regard, confidence between individuals is built based on their ability to keep promises. Generalized trust, on the other hand, results from the social structure, which requires the presence of contracts between parties as a means of entering agreements. In the generalized trust context, therefore, contracts, legal systems, and institutional policies are required to build trust between different parties in the broader social and economic backgrounds. In the contractual trust context, the likelihood of unethical behaviour that leads to mistrust is mediated by a third party, which is, in most cases, the judicial system (Brinkmann & Lentz, 2006).

The judicial system, therefore, acts as one of the mechanisms of avoiding mistrust by promising to enforce predetermined legal provisions in the event the contract is breached. Unfortunately, in the present research context, there are few readable sanctions in the event of a breach of the social contract, which explains the lack of trust placed in research institutions as economic actors rather than in the conceptual figure that is science (according to Ben-Yehuda & Oliver-Lumerman, 2017 less than 7.5% of identified cases go to court).

In contrast, to trust at the institutional level, the evaluated literature shows that trust between individuals is exclusively based on the personal traits of the persons involved in any transaction. This kind of trust is dependent on a person's belief in another's loyalty rather than the rational calculation of risk. Lack of trust in such interaction usually results from either of the parties not honouring their obligations. Since there are no contracts, in this case, breach of trust in the personal context is much more complicated than in the institutional context as there are no predetermined guidelines on what should be done in any eventuality. The avoidance of breach of trust in the personal context is thus dependent on the level of socialization between the individuals involved in personal agreements (Glover, 2018). In the specific context of trust in research findings, legal contracts between researchers and the public might not exist. It is, therefore, the role of the science community, the media, and politicians to ensure the necessary measures are put in place to establish an atmosphere of trust between researchers and the public.

Findings

The findings indicate that there has been a significant increase in the number of researches results- based fraud identified over the last few years, this from both a research design and a research use point of view.

The two plausible causes for this increase are pointed out to be either an actual increase in the number of unethical practices (including Post-Truth) or improvement of the vigilance measures put in place to identify misconduct towards research at all level (Fensham, 2014), including fact checkers (d'Ancona, 2017). The results show that while it is appreciated that development in vigilance has resulted in the detection of many cases of unethical treatment of research data, the increase of wrongful behaviour cases is the main reason why misconduct cases have increased. The scientific community agrees that despite the application of advanced detection measures, the number of misconduct cases is still growing.

Lack of trust in scientific results, a question of neglect?
One of the leading causes of a lack of trust in scientific results is neglect, specifically as per data (Veldkamp et al. 2017), is concerned. While there are many forms of neglect, only a few are highlighted as the most common in research. The lack of critical thinking about results and insufficient cross-checking leads to erroneous conclusions and recommendations. Secondly, there have been cases of lax data management at various stages of the data handling process. This poor data management leads to a loss in the integrity of the data, meaning that any analyses will have inherent inaccuracies. Thirdly, some researchers choose inappropriate methods and analytical tools; thus, the collected data might be inaccurate or highly likely to be wrongly interpreted. Likewise, there are cases of non-disclosure of information that is important in the overall success of the research. All these factors bring to question the validity of any research findings presented hence put into question the trustworthiness of scientific research. Finally, it is also important not to neglect the truncated inclusion of scientific results (selection bias) in order to claim to have scientific support for a given action (Geddes, 1990).

Lack of trust in scientific results, a question of conflict of Interest?
In addition to the causes mentioned above of mistrust in research outputs, the findings reveal that conflict of interest is another significant factor as far as their trustworthiness is concerned (Bekelman, Li & Gross 2003). In many cases, the researcher, or the organization funding the research, might have interest in a particular outcome. Such a situation has been found to skew the analysis of results towards the preferred outcomes. It is, however, noted that conflict of interest is not necessarily a misconduct *per se* unless their interests explicitly bias the researcher at any stage of the research process (McTighe, 2019). One avoidance mechanism, in that regard, is to be vigilant of one's interests at all stages of the research process and making sure that these interests do not interfere with the data collection and analysis.

Lack of trust in scientific results, a question of societal demands?
One of the most profound findings highlighted is the fact that countries compete in terms of the number of publications made each year. In the current age, professional activity is usually subjected to quantitative evaluation, which has led to “Bibliometrics" as one of the most critical measures of the success of the researchers of a particular country. In this case, “Bibliomentrics”

refers to the number of times the scientific publications from a given country are referenced in new publications. While this does not directly mean that there are cases of untrustworthiness, the consideration of the mere numbers of published works leads to an increased likelihood of the publication of research studies that do not meet international standards. The implication, in this case, is that most of the research studies in popular journals might not be appropriately validated thus making their trustworthiness questionable. An actual example of the shortcomings brought about by bibliometric indicators was seen in 2014 when *Nature* revealed that some leading publishers were removing over 100 fake articles from their databases (Van Noorden, 2014). This, therefore, points to the possibility of there being numerous fake articles in less prestigious journals that will never be identified because nobody will take time to scrutinize them.
Finally, it is important not to neglect the appetite for support by third parties. The less trustworthy stakeholders are considered to be (as shown by the Endelman 2019 barometer), the more likely they are to seek third-party validation of their programme (Bradley, 2011), including in an adversarial way.

Limited and Unreliable Sanctions against Unethical Research or unethical use of research
While research misconduct is seen to be the result of individual researchers as unique perpetrators, the research ecosystem is found to be fostering a culture of untrustworthiness (Brown, 2013) as inappropriate use of research outcomes by third party is seldom considered (Frericks & Höppner, 2019).
One of the available measures put in place to combat unethical behaviour in research and its use is the law. The legal context allows avoidance mechanisms such as whistleblowing in the case of ethical failures, which then pave the way for investigations.
However, research evidence indicates that very few instances of research related ill behaviours have been reported. Besides, out of all the cases that have been reported, a few ever end up in court, and most go unpunished. In addition, many institutions have their internal ethical guidelines that give direction in cases of research misconduct. However, the implementation of these rules is weak since the persons conducting researchers are usually involved in their deployment, and these tools - in an astonishing realization of powerlessness - pay relatively little attention to the use made of research results (Bird, 2014). Also, there are hardly any situations where cases of research misconduct or research results misuse are translated into the legal system. For that reason, no significant actions are taken against perpetrators. This means that research related wrongful acts are not taken seriously as other kinds of fraud, thus increasing the chances of the different actors involved in the research ecosystem in taking part in unethical behaviour.
In addition, whistleblowing is jeopardized by the fact that denouncing the practices of peers, specifically when they are seniors usually has severe implications for careers.

Trust Indicators

Several tools have been developed over the past few years to measure the level of trust people have in scientific research. The first tool presented is surveying, which is usually designed in binary (yes/no) format or in trinary (yes/no/no opinion) format concerning the perceptions of people towards scientific research. The Endelman Trust Barometer, which is one such tool, makes it possible to measure a lack of confidence with research in institutions such as governments, companies, NGOs, and the media. In a survey in 2003, the tool was able to find that confidence with authorities was diminishing in favour of confidence to peers. In recent years, this trend has been made even more significant as a result of the advent of social

networking sites, which have led to more connections between people of similar ideologies (Sturgis & Smith, 2010).

Investigations of how the issue of lack of trust can be corrected indicate that the communication will be essential going forward. In a research study seeking to establish what should be done to build trust in the organizational context, findings indicate that 82% of the respondents held the opinion that fostering a culture of clear and transparent communication was essential. However, 81% of the respondents also hinted that for trust to be established, the communication must be accurate regardless of whether or not it is unpopular (Brion, Mo & Lount Jr, 2019). Regular engagement between employees and managers and the presence of managers in the event of serious problems were identified as the other factors that would foster trust.

Responses to the Confidence Crisis

There are three legal approaches employed by different countries in dealing with the lack of trust in scientific outputs. The first approach is where there are explicitly stated statutory provisions that define the procedures of addressing issues relating to research misuses. The second approach is where there are no explicit legal frameworks at the national level but specific ethical codes at the institutional level that address issues relating to scientific integrity (in which we include impacts and adequate use of results). The final approach is where there are no codified laws or rules relating to these issues, and all matters touching on research ethics are dealt with on a case-by-case basis.
At the institutional level, governance is found to play a profound role in the overall trust during innovations. In any research project at the organizational level, there are numerous stakeholders, including public, private, governmental or not, national, and international. The findings indicate that in research, each of these groups aims to protect their respective institutions hence maintain a biased view, which makes it impossible for research findings to be objective. The DEFORM project finds that the different stakeholders usually set divergent objectives depending on the specific bias of each group. This focus on outcomes that are favourable to each respective group, thus leads to untrustworthy outputs that might be invalid to some extent.

Limitations of Current Governance Structures

It is found that the governance structures employed in the management of trust in scientific research have several profound failures. The first shortcoming is that while there are clearly defined policies governing research aspects such as ethics and accountability, there is poor implementation specifically as per research results (mis)usage (Stoett, 2016). Secondly, it is observed that the governance bodies in institutions such as universities put too much emphasis on visible outcomes at the expense of policies meant to ensure the trustworthiness of research in the scientific, political, and economic contexts. Besides, these governance bodies have not established spaces where controversies involving scientific research can be addressed with all due serenity. In that regard, there usually is confusion whenever cases of misconduct arise since the frameworks necessary for implementing corrective measures are inexistent.

Finally, there are no tools to measure the bias in the interpretation of results in their use outside the scientific sphere. Thus, political insights and the risk inherent in a discovery (impact studies) are only rarely analysed ex ante, which means that they only become significant when they

arrive in the public sphere (Nelkin, 1994), as is the case, for example, with the questioning around CrispCas9 and biohacking.

Testing the "misplaced response to the question asked" hypothesis: case study on academic orientation choices & trust impacts.

It is established that academic work involves both dissemination and acquisition of knowledge both in the university and organizational context. However, most of the research studies focusing on academic work mostly pay attention to the collection of knowledge and in the process, ignoring dissemination. The assertion of lack of trust in the knowledge sector is therefore based on erroneous data since any available information collected does not consider the academic industry in its entirety (Cavestro, Durieux & Monchatre 2007).
An assertion is presented that the lack of trust towards the academic world results from the fact that the education provided in higher learning institutions does not necessarily give students the knowledge and skills required to meet their objectives, in other words, do not answer the question/expectation asked by all individuals about education: what path should I take to succeed. Higher education makes a promise by integrating young people (and increasingly older people as part of continuing education) into the system in different curricula on the basis of answers it would be able to provide to their questions of social positioning (Brown, 2003). *This promise is the basis of the contract of trust as defined above, between the future students and the educational institution*. We assume that as soon as the choice of orientation is made, the ability to succeed or fail in a given curriculum is established, that the roots of trust or lack of trust in the institution are established.

The data presented indicate a strong correlation between trust and the perception of students towards the curriculum. From the equation investigating adhesion to curriculum showed, it is found that factors such as social ecosystems and learner choices have a profound impact on how students are attached to their specific fields of study. More specifically, it is found that students are more likely to have positive attitudes towards their courses if their own persona most drives them in selecting them. Higher chances of failure are observed in cases where the learner has to choose specific areas of specialization as a result of pressures from their social ecosystem. The intersection between the forced choices and mistrust is argued to emerge from the amplification of negative experiences at any stage of their studies. Negative feelings lead the learner to perceive their academic choices even more negatively, ultimately resulting in frustration and mistrust : 50% of people interviewed in the trust barometer indicate that the "system" does not work for them, and the percentage of trust in the institution especially has consistently remained at the same level for 20 years; at 65-70%, according to the indicators: Endelman, 2019.

More importantly, we hypothesise that a poor response to the expectations of future learners (whatever their age) leads to misdirection and therefore failure, which would explain why the population of graduates with a university degree or equivalent remains at a relatively low level in Europe (37%: Eurostat)

The learner then enters a vicious circle that will amplify their bad experiences (bad orientation => bad social choices => bad careers => nonfulfillment: Cook-Sather, 2002). We know that it is the accumulation of these negative experiences that leads to a lack of trust. The chain then seems to be completed. If the sense of lack of trust does not seem to be statistically verified

when it comes to research activities, perhaps it is knowledge transfer activities that should be addressed; as, indeed, initial analyses seem to verify this.

Conclusion

Overall, the levels of trust towards scientific research has been said to be declining since cases of scientific inadequate practices or biased interpretation of research results are reported more than examples of prudent approaches, but this assertion is hardly verified statistically.
Indeed, in many cases, unethical practices in the treatment of research findings result from the expectations of various players. In cases where the results contradict the expectations of stakeholders, primarily if they fund the project, then researchers, in many cases, might be tempted altering the findings and align them with the interests of their promoters. Such bias generally leads to inaccurate conclusions and recommendations by the researchers to interested third parties. Exposure of those cases to the public such as during the 2007/8 financial crisis (Campbell, 2019), leads to the spread of mistrust towards all scientific researchers regardless of whether the findings are true or not.

Most of the issues with ethics in research are seen to emerge at the institutional level. A number of sentiments indicate the lack of clear procedures to fully address ethical issues at the institutional level, i.e. by including issues related to the potential impact of research outputs and their use by third parties. In addition, even when there are clear procedures, the transition of fraudulent or misconduct cases, including in the use of research results, to the legal system are very few. Convictions for such "malpractices" are thus virtually inexistent, meaning that researchers and/or research end-users generally have no consequences to fear even if they present untrue findings, and it is even more the case for the end users of such results who built their decision on them, such as often seen in policy making : no policy makers advocating for fake scientific results have ever been brought to court.

This shows that there are weaknesses in the enforcement of research policies both in institutions and in the general legal context.

The issue of trust also arises as a result of societal demands.
Countries compete to obtain positions in international rankings as this is paramount to their attractiveness and competitiveness. To do this, it is necessary to mass publish. With the objective being the mere number of publications, researchers find themselves engaging in numerous research studies that are usually of limited quality. These are published in second-rate journals that are typically not adequately scrutinized to reveal deficiencies. Evidence of this situation is seen in the case of *Nature*, exposing the withdrawal of several articles from some well-respected journals. The exposure of such events in the public domain further increases the level of distrust towards scientific outputs.

Some of the plausible interventions suggested as a response to ethical failures in the treatment of research results include whistleblowing, the establishment of ethical guidelines, and the creation of robust governance structures.

Whistleblowing by individuals involved in the research framework brings attention to problems before findings are put to any application, thus reducing the likelihood of mistrust in the general public. However, the method has a weakness, especially when a junior individuals is supposed

to expose the malpractices of a supervisor. There is the risk that such actions might adversely affect the juniors' career, and for that reason, some choose not to speak out.

Another intervention that has been found to be effective in different contexts in the past is peer-reviewing research work. The problem arises, such as on climate changes issue, when the different individuals disagree on the methodologies and the validity of the findings.

In the context of the establishment of ethical guidelines, clearly defined policies are essential in giving instructions to all actors of the research chain in terms of how findings should be treated. However, the principal limit of guidelines is that:

- most of them do not cover the issue of research outside the institution (impact of research use) or even establish sanctions in the event of fraudulent communication. In the recent case of a deliberately misleading interpretation of climate change by a radio host, NASA did not even ask for a right of reply, allowing fanciful interpretations to flourish on the subject.
- most institutions poorly implement them leading to malpractices, which lead to distrust.

Furthermore, there are no properly defined governance structures to regulate at supra-national level research policies and most importantly research outputs usages. In addition, different countries apply different approaches to governance in research. For that reason, there is no simple readability of the trust that can be placed in a particular research result or use.

Notwithstanding all these situations, which actually harm the world of research more than science itself, it is perhaps also in the fact that the knowledge industry is not statistically approached in its entirety that the problems of trust in the scientific ecosystem are nested. Our case study thus shows that the problem of trust also arises with regard to the transmission of knowledge, which constitutes another important aspect of academic activity.

As such, it might be within the limits of the current situation that may already rest the first steps towards a solution. Three recommendations could thus be made:

- consider the "knowledge industry" as a whole when analysing situations and attempting to provide solutions,
- extend to the use - in particular for policy-making purposes - of research results, the operating rules already applied to make such investigative processes transparent, by providing for systematic procedures in the event of misuse of research outputs (in particular for post-truth cases), which would be all the simpler as the rules already exist (public corrigendum, etc.),
- set up a recommendation tool rating the trust that can be placed in a given research governance and results use process, based on objective criteria, such as the ethical ratings set up by VigeoEiris©.

But for this to be effectively implemented, it still needs to be taken over by the research ecosystem. In this context, its appetite (and in particular the one of end-users) to adopt this type of tool needs be explored.

References

Bateson, G. (1941). IV. The frustration-aggression hypothesis and culture. *Psychological Review*, *48*(4), 350.

Bekelman, J. E., Li, Y., & Gross, C. P. (2003). Scope and impact of financial conflicts of interest in biomedical research: A systematic review. *JAMA*, *289*(4), 454-65.

Ben-Yehuda, N., & Oliver-Lumerman, A. (2017). *Fraud and misconduct in research: Detection, investigation, and organizational response*. University of Michigan Press.

Bird S. J. (2014). Socially responsible science is more than "good science". *Journal of microbiology & biology education*, *15*(2), 169–172. doi:10.1128/jmbe.v15i2.870

Bradley, R. S. (2011). *Global warming and political intimidation: How politicians cracked down on scientists as the earth heated up*. Univ of Massachusetts Press.

Brinkmann, J., & Lentz, P. (2006). Understanding insurance customer dishonesty: Outline of a moral-sociological approach. *Journal of Business Ethics, 66*(2-3), 177-195.

Brion, S., Mo, R., & Lount Jr, R. B. (2019). Dynamic influences of power on trust: Changes in power affect trust in others. *Journal of Trust Research, 9*(1), 6-27.

Brown, A. (2013). Understanding pharmaceutical research manipulation in the context of accounting manipulation. *The Journal of Law, Medicine & Ethics, 41*(3), 611-619.

Campbell, J. L. (2019). Self-Responsibility Gone Bad: Institutions and the 2008 Financial Crisis. *American Behavioral Scientist*, *63*(1), 10-26.

Carucci, R. (2016). Why ethical people make unethical choices. *Harvard Business Review*, *12*.

Cavestro, W., Durieux, C., & Monchatre, S. (2007). Travail et reconnaissance des compétences (No. halshs-00146526).

d'Ancona, M. (2017). *Post-truth: The new war on truth and how to fight back*. Random House.

Fensham, P. J. (2014). Scepticism and trust: Two counterpoint essentials in science education for complex socio-scientific issues. Cultural Studies of Science Education, 9(3), 649-661.

Frericks, P., & Höppner, J. (2019). The Turn Toward Self-Responsibility in Current Societies: Differences, Challenges, and Perspectives.

Funk, C., & Kennedy, B. (2017). Public confidence in scientists has remained stable for decades. Pew Research Center (April 6).

Gallup Wellcome Global Monitor 2018. Published 19 June 2019. Accessed 1st July 2019 : https://wellcome.ac.uk/reports/wellcome-global-monitor/2018

Geddes, B. (1990). How the cases you choose affect the answers you get: Selection bias in comparative politics. *Political analysis*, *2*, 131-150.

Glover, S. (2018). Who do they think we are?: Politicians imagine the nation. *Griffith Review,* (61), 172.

Haber, N., Smith, E. R., Moscoe, E., Andrews, K., Audy, R., Bell, W., ... & McClure, E. S. (2018). Causal language and strength of inference in academic and media articles shared in social media (CLAIMS): A systematic review. *PloS one*, *13*(5), e0196346.

Hardy, C., Phillips, N., & Lawrence, T. (1998). Distinguishing trust and power in interorganizational relations: Forms and facades of trust. *Trust within and between Organizations*, 64-87.

Hopf, H., Krief, A., Mehta, G., & Matlin, S. A. (2019). Fake science and the knowledge crisis: ignorance can be fatal. *Royal Society open science*, *6*(5), 190161.

Langer, L. Tripney, J. Gough, D. (2016) The Science of Using Science : Researching the Use of Research Evidence in Decision-Making EPPI-Centre Social Science Research Unit UCL Institute of Education University College London Final report http://www.alliance4usefulevidence.org/assets/Science-of-Using-Science-Final-Report-2016.pdf (accessed 17 August 2019)

Lewicki, R. J., McAllister, D. J., & Bies, R. J. (1998). Trust and distrust: New relationships and realities. *Academy of Management Review*, *23*(3), 438-458.

McTighe, T. (2019). What is considered a conflict of interest or what to disclose in lectures and publications?. *Reconstructive Review, 9*(1).

Mlinarić, A., Horvat, M., & Šupak Smolčić, V. (2017). Dealing with the positive publication bias: Why you should really publish your negative results. *Biochemia medica*, *27*(3), 030201. doi:10.11613/BM.2017.030201

Nelkin, D. (1994). Forbidden research: limits to inquiry in the social sciences. *Ethical issues in scientific research: An anthology*, 355-370.

Peter Stoett (2016) Citizen participation in the un sustainable development goals consultation process: Toward global democratic governance?. *Global Governance*, *22*(4), 555-574.

Ravnskov, U., & Western Vascular Institute. (n.d.). LDL-C does not cause cardiovascular disease: a comprehensive review of the current literature. Retrieved from https://www.tandfonline.com/doi/full/10.1080/17512433.2018.1519391.

Simon, H. A. (1986). Rationality in psychology and economics. *Journal of Business,* S209-S224.

Sturgis, P., & Smith, P. (2010). Assessing the validity of generalized trust questions: What kind of trust are we measuring?. *International Journal of Public Opinion Research, 22*(1), 74-92.

Van Noorden, R. (2014). Online collaboration: Scientists and the social network. *Nature 512*, *7513* (2014), 126–9.

Veldkamp, C. L., Hartgerink, C. H., van Assen, M. A., & Wicherts, J. M. (2017). Who believes in the storybook image of the scientist?. *Accountability in research*, *24*(3), 127-151.

Welsh, R., Glenna, L., Lacy, W., & Biscotti, D. (2008). Close enough but not too far: Assessing the effects of university–industry research relationships and the rise of academic capitalism. *Research policy*, *37*(10), 1854-1864.

Yudkin, J. (1957). Diet and coronary thrombosis: hypothesis and fact. *The Lancet*, *270*(6987), 155-162.

Ziegler, R (2017) Trusting science in an age of distrust. Euroscientist. Accessed 4th December 2018.https://www.euroscientist.com/trusting-science-age-distrust/

European Commission

UNETHICAL USE OF RESEARCH RESULTS

PRO-RES

AN ISSUE OF TRUST IN SCIENCE, TRUST IN THE SCIENTIST OR TRUST IN THE USE OF SCIENCE?

Trust is regarded as a critical problem within the scientific context. In two recent surveys :

60% of respondents completely trust Science (Ziegler, 2017)

24% of respondents completely trust Scientists in Western Europe (Wellcome Global Monitor)

Why?

The scientist paradox :

The research ecosystem strives to make public positive results complying with the expectations of the said environment, including funders, without revealing contradictions and doubts (Mlinarić, Horvat & Šupak Smolčić, 2017) inclusive towards the use of these results, which may itself be biased, as recently been seen in the context of cholesterol-related issues (Ravnskov et al. 2018)

The general public is informed only of some very great successes & inundated with conflicting information, controversies and harmful effects of research in often exaggerated terms (Haber et al. 2018) that are bound to raise doubts. This can be difficult to understand, since ***it is not necessarily the practice of researchers that can be controversial, nor the research result problematic, but the interpretation made of it by end-users.***

Conflicting noise around scientific outputs & research activities

Could mistrust in science be more an issue of communication rather than the validity and reliability of the results?

Another school of thought holds that recent phenomenon such as the financial crisis, climate change controversies, have led to extensive questioning on the research process and emphasize on the fact whether the well used conventional research methodologies still produces any fruitful result. An issue in itself, but the most important thing to understand is the overall mechanism of research so as to differentiate between genuine error and misconduct on the part of the researcher.
This differentiation is important as without the going through process, one cannot identify the roots of the lack of trust that has developed overtime on the research process and scientific education. Indeed, without trust in the research mechanism and the proposed outcomes, there would not be widespread acceptability of the results and concomitantly lead to low confidence levels among people, thus causing mistrust towards science.

Challenging the integrity of the people tasked with the responsibility of analysing scientific data, presenting it to the general population and in the end extracting political guidance out of it (Carucci, 2016) ?

OF NOTE

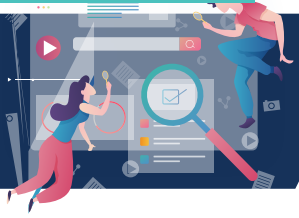
There is too often, a tendency to hold researchers responsible for ethical failure when it is a more global and systemic issue.

In situations where research findings do not support the expectations of their promoters, researchers might find themselves entrapped within an ethical dilemma :

Deliver the results of their observations as is, with all the risks that this might entails (Yudkin case in the 50s).

Being made to "adjust" them to prevent project termination: an adverse effect of "academic capitalism"? (Welsh et al. 2008).

A comprehensive need : how to build a dynamic of trust not only in research design but also in the use of research results.
A solution : extending the safeguards that are currently only focusing on research and its practices, to the scope of research, i.e. its use.



DATA COLLECTION METHODS

Two methods are applied to identify both the paradigms on which trust in research is build and the existing mechanisms to avoid unethical use of research results.

An extensive literature review in which Boolean search is used to identify data in four different categories.

- unethical use of research results in-house and outside,
- evidence of lack of trust/mistrust in relation to the unethical use of research results,
- existing and non-existing mechanisms to identify risks of unethical use within and outside research organizations,
- mechanisms to avoid/manage cases of misuse.

In specifically targeting each of these contexts, the relevant keywords were used in the search on engines such as Qwant and Google.

The second method intending to verify the hypothesis of a link between trust building mechanisms and discrepancies that may arise when societal issues are not answered in their true sense, **involved a case study** on curriculum choices processes and their impact in the French context.

In bolstering the case study results, data sets provided by open data website and public walls were accessed. Following data identification, it was collected through a scraping phase, which was done using BeautifulSoup and then saved to CSV files awaiting analysis. The homogeneity was then observed, and dissonance of these likes with the educational choices of the related individuals to predict potential dropout risk. This approach was, however, restricted since data could only be collected from anonymous public discussion walls which could not make

OVERVIEW OF THE LITERATURE

An overall absence of processes at the institutional level to prevent the misuse or biased use of research findings.

How a dynamic trust could be built and applied to the use of research outcomes?
The question is responded to by looking at the symptoms, distribution and causes of mistrust in various contexts.

Questionning Peer Review?

To improve the acceptance of the reliability of their results, Scientist built upon peer reviews*. This approach, while generally targeted towards ensuring a high level of trust for the presented results, is argued to, in some cases, fuel mistrust, especially in cases where the individuals reviewing the research work do not agree on certain essential elements.

The scientific voice squandered by its use as a political lever?

The frequent use of scientific outputs as justification and support for political action appear to be rather counter-productive for researchers, as they then become assimilated to politicians whose words are now the least believed (Langer,Tripney and Gough 2016).

T***he discrepancy that may arise when societal issues are not answered in their true sense*** by scientists, leaving behind a feeling of skepticism - a known drive to frustration (Bateson, 1941) - on the entire foundation of the answers and ultimately leads to trust deficiency.
In short, societal actors give the impression not to fully comprehend issues at stake. As a result, their solution also deviates from what was actually required of them. This could be termed as the main reason behind the lack of trust shown on the expert opinion. Another factor of considerable importance, is the miscommunication of the solution to the society.

By institutionalizing content validation processes (through cherry-picked publication, peer review…), by not responding directly and explicitly to questions asked by non-insiders, and by referring too often to science as the pillar of their action, the actors who seek to build trust in science and its achievements generate the opposite effect : suspicion and mistrust are significantly high, thus leading to low levels of confidence towards institutions (Lewicki, McAllister & Bies 1998).

TRUST AND DISTRUST IN DIFFERENT CONTEXTS

Some argue there is a link between trust and economic development. This argument appears plausible based on the fact that it is people who trust each other that are likely to cooperate in different forms of economic activities, thus leading to the growth of profitable companies where trust prevails. This is the founding principle of corporate social responsibility.

Trust : a polymorphic concept

Trust is pointed out to be a belief in the reliability of an individual or any other thing

Trust could be treated as an action and a belief depending on the specific language used. In the french context, for example, there is no distinction between the act and feeling of trust. German and English, on the other hand, distinguish between trust as action and trust as the level of belief.

Some disagreement exist on the definition of truts, as each group applies the term under their specialization. For example, while psychologists look at trust as a personal trait, sociologistic treat it as a social structure, while economists view it as one of the mechanism of economic choice.

In the context of the research, trust is the belief people have in scientists, the research findings they present and the use that is made of these

An attempt to reconcile the social and economic arguments for trust : the convention theory.

A link between social and economic aspects of trust is established on the basis that economic actors within an institutional framework act as social actors by coming into agreements on the convention that are supposed to govern them : social contracts. These supposedly consider common good vs individual interest. social adherence to common concepts of value would be the ferment of trust.

TRUST AND ITS COMPONENTS

From a purely theoretical standpoint, the evaluated literature presents a categorization of trust into three classes, which are

Characteristic-based trust which is is trait-dependent, as such the sum of a particular characteristics that produce unique and specific behavioural responses.

Process-based trust which relates to the level of confidence one party has with the actions of others

Institutional-based trust which is dependent on the level of trust an organization can elicit from people. Institutional trust is based on the trustworthiness of the different people working in particular organizations, meaning that avoidance of mistrust is achieved by having highly reputable people in organizations and putting in place standards that ensure a high level of organizational integrity.

The modes of production of trust

AT THE PERSONAL LEVEL

the level of trust or mistrust manifested by an individual is dependent on the intensity of social ties between individuals. In that regard, personal proximity, learning, and experience are significant predictors of the level of trust or mistrust between two individuals. The **avoidance of breach of trust in personal context is thus dependent on the level of socialization between the individuals involved in personal agreements** (Glover, 2018). In the specific context of trust in research findings, legal contracts between researchers and the public might not exist. It is, therefore, the role of the science community, the media, and politicians to ensure the necessary measures are put in place to establish an atmosphere of trust between researchers and the public.

GENERALIZED TRUST

on the other hand, results from the social structure, which requires the presence of contracts between parties as a means of entering agreements. In the generalized trust context, therefore, contracts, legal systems, and institutional policies are required to build trust between different parties in the broader social and economic backgrounds. In the contractual trust context, **the likelihood of unethical behaviour that leads to mistrust is mediated by a third party, which is, in most cases, the judicial system** (Brinkmann & Lentz, 2006).

The judicial system, therefore, acts as one of the mechanisms of avoiding mistrust by promising to enforce predetermined legal provisions in the event the contract is breached. Unfortunately, in the present research context, **there are few readable sanctions in the event of a breach of the social contract, which explains the lack of trust placed in research institutions as economic actors rather than in the conceptual figure that is science**

according to Ben-Yehuda & Oliver-Lumerman (2017) less than

7.5% of identified cases go to court

FINDINGS

The findings indicate that there has been a significant increase in the number of researches results- based fraud identified over the last few years, this from both a research design and a research use point of view.

The two plausible causes for this increase are pointed out to be either :

- An actual increase in the number of unethical practices (including Post-Truth),
- And/Or the improvement of the vigilance measures put in place to identify misconduct towards research at all level (Fensham, 2014), including fact checkers (d'Ancona, 2017).

LACK OF TRUST IN SCIENTIFIC RESULTS : A QUESTION OF NEGLECT?

One of the leading causes of a lack of trust in scientific results is neglect, specifically as per data (Veldkamp et al. 2017), is concerned. There are many forms of neglect, only a few are highlighted as the most common in research. Insufficient cross-checking leads to erroneous conclusions and recommendations., lax data management at various stages of the data handling process. Poor data management leads to a loss in the integrity of the data, meaning that any analyses will have inherent inaccuracies. Inappropriate methods and analytical tools; thus, the collected data might be inaccurate or highly likely to be wrongly interpreted. There are also cases of non-disclosure of information that is important in the overall success of the research. All these factors bring to question the validity of any research findings presented hence put into question the trustworthiness of scientific research. Finally, it is also important not to neglect the truncated inclusion of scientific results (selection bias) in order to claim to have scientific support for a given action (Geddes, 1990).

LACK OF TRUST IN SCIENTIFIC RESULTS : A QUESTION OF CONFLICT OF INTEREST?

The findings reveal that conflict of interest is another significant factor as far as their trustworthiness is concerned (Bekelman, Li & Gross 2003). In many cases, the researcher, or the organization funding the research, might have interest in a particular outcome. Such a situation has been found to skew the analysis of results towards the preferred outcomes. It is, however, noted that conflict of interest is not necessarily a misconduct per se unless their interests explicitly bias the researcher at any stage of the research process (McTighe, 2019). One avoidance mechanism, in that regard, is to be vigilant of one's interests at all stages of the research process and making sure that these interests do not interfere with the data collection and analysis.

LACK OF TRUST IN SCIENTIFIC RESULTS : A QUESTION OF SOCIETAL SEMANDS?

One of the most profound findings highlighted is the fact that countries compete in terms of the number of publications made each year. Professional activity is usually subjected to quantitative evaluation, which has led to “Bibliometrics"* as one of the most critical measures of the success of the researchers of a particular country. This does not directly mean that there are systematic cases of untrustworthiness, but the mere numbers of published works leads to an increased likelihood of the publication of research studies that do not meet international standards. An actual example of the shortcomings brought about by bibliometric indicators was seen in 2014 when Nature revealed that some leading publishers were removing over 100 fake articles from their databases (Van Noorden, 2014).

Finally, it is important not to neglect the appetite for support by third parties. The less trustworthy stakeholders are considered to be (as shown by the Endelman 2019 barometer), the more likely they are to seek third-party validation of their programme (Bradley, 2011), including in an adversarial way.

LIMITED AND UNRELIABLE SANCTIONS AGAINST UNETHICAL RESEARCH OR UNETHICAL USE OF RESEARCH

Research misconduct is seen to be the result of individual researchers as unique perpetrators, the research ecosystem is found to be fostering a culture of untrustworthiness (Brown, 2013) as inappropriate use of research outcomes by third party is seldom considered (Frericks & Höppner , 2019).

Very few instances of research related ill behaviours are reported.

Out of all the cases that have been reported, a few ever end up in court, and most go unpunished (see above).

If many institutions have their internal ethical guidelines that give direction in cases of research misconduct :

-> the **implementation of these rules is weak** since the persons conducting the research are usually involved in their implementation,

-> **Issues around the use of research results is seldom considered** (Bird, 2014)

The legal context allows avoidance mechanisms such as whistleblowing in the case of ethical failures, which then pave the way for investigations.
But, w**histleblowing is jeopardized by the fact that denouncing the practices of peers, specifically when they are seniors usually has severe implications for careers** (Alford, 2002).

TRUST INDICATORS

Several tools have been developed over the past few years to measure the level of trust people have in scientific research.

The first tool presented is surveying, which is usually designed in binary (yes/no) format or in trinary (yes/no/no opinion) format concerning the perceptions of people towards scientific research.
The Endelman(c) Trust Barometer, which is one such tool, makes it possible to measure a lack of confidence with research in institutions such as governments, companies, NGOs, and the media.

As early as **2003** the tool was able to find that **confidence with authorities was diminishing in favour of confidence to peers**. In recent years, this trend has been made even more significant as a result of the advent of social networking sites, which have led to **more connections between people of similar ideologies** (Sturgis & Smith, 2010).
In such a context : communication is key.
In a research study seeking to establish what should be done to build trust in the organizational context, findings indicate that 82% of the respondents held the opinion that fostering a culture of clear and transparent communication was paramount.

However, **81% of the respondents also hinted that for trust to be established, the communication must be accurate regardless of whether or not it is unpopular** (Brion, Mo & Lount Jr, 2019). How can accuracy be demonstrated?

81%

RESPONSES TO THE CONFIDENCE CRISIS

Three legal approaches employed by different countries in dealing with the lack of trust in scientific outputs

1 explicitly stated statutory provisions that define the procedures of addressing issues relating to research misuses.

2 no explicit legal frameworks at the national level but specific ethical codes at the institutional level that address issues relating toscientific integrity (in which we include impacts and adequate use of results).

3 no codified laws or rules relating to these issues, and all matters touching on research ethics are dealt with on a case-by-case basis.

At the institutional level, **governance is found to play a profound role in the overall trust** during innovations. In any research project at the organizational level, there are numerous stakeholders, including public, private, governmental or not, national, and international structrues. The findings indicate that in research, each of these groups aims to protect their respective institutions hence maintain a biased view, which makes it impossible for research findings to be objective. The EU financed DEFORM project has illustrated that **different stakeholders usually set divergent objectives depending on the specific bias of each group.** This **focus on outcomes that are favourable to each respective group, thus leads each group to potentialy consider some outputs as untrustworthy , that in the end might be invalid to some extent.**

LIMITATIONS OF CURRENT GOVERNANCE STRUCTURES

1 While there are **clearly defined policies** governing research aspects such as ethics and accountability, there is **poor implementation** specifically as per research results (mis)usage (Stoett, 2016).

2 **Governance bodies** in institutions such as universities, research centres put willingly or not **too much emphasis on visible outcomes** at the expense of policies meant to ensure trustworthiness of research in the scientific, political, and economic contexts.
Frameworks necessary for implementing corrective measures are inexistent.

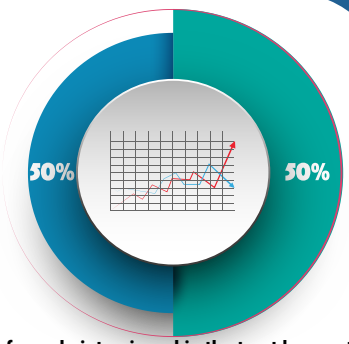
3 **Tools to measure bias in the interpretation of results in their use outside the scientific sphere do not exist.** Thus, political insights and the risk inherer a discovery (impact studies) are only seldom analysed ex ante, which means that they only bec ome significant when they arrive in the public sphere (Nelkin, 1994), as is the case, for example, with the questioning around CrispCas9 and biohacking.

TESTING THE IMPACT ON TRUST WHEN SOCIETAL ISSUES ARE NOT ANSWERED

HYPOTHESIS: A CASE STUDY ON STUDENTS SOCIETAL DEMANDS, ACADEMIC ORIENTATION CHOICES AND TRUST IMPACTS.

Why? **Lack of trust perception in the knowledge sector is built on uncomplete data** since available information limitedly consider the academic & research industry in its entirety. Most of the research on this field pay attention to the collection of knowledge and in the process, ignore dissemination.
Hypotheses : **this maybe the reason why such a trust issue remains statistically hard to capture.**

Research work (more importantly in academia) =  dissemination of knowledge +  acquisition of knowledge



of people interviewed in the trust barometer indicate that the "system" does not work for them (Endelman, 2019)

There is a discrepancy between the analysis of the industry made by research and its institutional reality as understood by the society.
This might be the root cause of the lack of trust which fuel the societal intuition that the education provided in higher learning institutions does not fulfill the Higher education promise = education will solve questions of social positioning (Brown, 2003).
This promise is the basis of the contract of trust as defined above, between the future students and the educational institution. We assume that as soon as the choice of orientation is made, the ability to succeed or fail in a given curriculum is established, that the roots of trust or lack of trust in the institution are established. Higher chances of failure are observed in cases where the learner has to choose specific areas of specialization as a result of pressures from their social ecosystem. The intersection between the forced choices and mistrust is argued to emerge from the amplification of negative experiences at any stage of their studies. The learner then enters a vicious circle that will amplify their bad experiences (bad orientation => bad social choices => bad careers => nonfulfillment: Cook-Sather, 2002).
We know that it is the accumulation of these negative experiences that leads to a lack of trust.

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If the sense of lack of trust does not seem to be statistically verified when it comes to research activities, perhaps it is knowledge transfer activities that should be addressed concomitantly.

CONCLUSION

Overall, the levels of trust towards scientific research has been said to be declining since cases of scientific inadequate practices or biased interpretation of research results are reported more than examples of prudent approaches. but this assertion is hardly analiticaly verified and does not statistically apply to science in general.

Exposure of those cases to the public such as during the 2007/8 financial crisis (Campbell, 2019), leads to the spread of mistrust towards all scientific researchers regardless of whether the findings are true or not.

There are lack of clear procedures to fully address ethical issues at the institutional level, i.e. by including issues related to the potential impact of research outputs and their use by third parties.

The transition of fraudulent or misconduct cases, including in the use of research results, to the legal system are very few. Convictions for such "malpractices" are thus virtually inexistent, **no policy makers advocating for fake scientific results have ever been brought to court (for now).**

THIS SHOWS THAT THERE ARE WEAKNESSES IN THE ENFORCEMENT OF RESEARCH POLICIES BOTH IN INSTITUTIONS AND IN THE GENERAL LEGAL CONTEXT

THE ISSUE OF TRUST ALSO ARISES AS A RESULT OF SOCIETAL DEMANDS.

Countries compete to obtain positions in international rankings as this is paramount to their attractiveness and competitiveness.
To do this, it is necessary to mass publish (global scientific output doubles every nine years, Van Noorden 2014) which is known to have serious issues on research outputs quality (Altbach & de Wit, 2018)

Some of the plausible interventions suggested as a response to ethical failures in the treatment of Research results include :

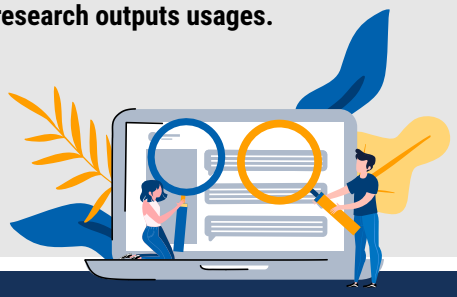
- Whistleblowing,
- The establishment of ethical guidelines,
- The creation of robust governance structures.

Whistleblowing by individuals involved in the research framework brings attention to problems before findings are put to any application, thus reducing the likelihood of mistrust in the general public.
However, the method has a weakness : there is the risk that such actions might adversely affect the WB career & personal life. or that reason, some choose not to speak out.

In the context of the establishment of **ethical guidelines**, clearly defined policies are essential in giving instructions to all actors of the research chain in terms of how findings should be treated. However, the principal limit of guidelines is that:
=> most of them **do not cover the issue of research outside the institution (impact of research use)** or even establish sanctions in the event of fraudulent communication.
In the recent case of a deliberately misleading interpretation of climate change by a radio host, NASA did not even ask for a right of reply, allowing fanciful interpretations to flourish on the subject.

=> most institutions poorly implement them leading to adverse practices, which lead to distrust.

There are no properly defined governance structures to regulate at **supra-national level research policies and most importantly research outputs usages.**



Notwithstanding all these situations, which harm the world of research more than science itself, it is perhaps also in the fact that the knowledge industry is not statistically approached in its entirety that the problems of trust in the scientific ecosystem are nested.
Our case study thus shows that the problem of trust also arises with regard to the transmission of knowledge, which constitutes nother important aspect of academic activity

AS SUCH, IT MIGHT BE WITHIN THE LIMITS OF THE CURRENT SITUATION THAT MAY ALREADY REST THE FIRST STEPS TOWARDS A SOLUTION. THREE RECOMMENDATIONS COULD THUS BE MADE

- consider the “knowledge industry” as a whole when analysing situations and attempting to provide solutions,

- extend to the use - in particular for policy-making purposes - of research results, the operating rules already applied to make such investigative processes transparent, by providing for systematic procedures in the event of misuse of research outputs (in particular for post-truth cases), which would be all the simpler as the rules already exist (public corrigendum, etc.),

- set up a recommendation tool rating the trust that can be placed in a given research governance and results use process, based on objective criteria, such as the ethical ratings set up by VigeoEiris.

BUT FOR THIS TO BE EFFECTIVELY IMPLEMENTED, IT NEEDS TO BE TAKEN OVER BY THE RESEARCH ECOSYSTEM, WHICH WILL BE EXPLORED WITHIN THE PROJECT.

REFERENCES

Aitbach, P. G., & de Wit, H. (2018). Too much academic research is being published. International Higher Education, (96), 2-3

Alford, C. F. (2002). Whistleblowers: Broken lives and organizational power. Cornell University Press.

Bateson, G. (1941). IV. The frustration-aggression hypothesis and culture. Psychological Review, 48(4), 350.

Bekelman, J. E., Li, Y., & Gross, C. P. (2003). Scope and impact of financial conflicts of interest in biomedical research: A systematic review. JAMA, 289(4), 454-65.

Ben-Yehuda, N., & Oliver-Lumerman, A. (2017). Fraud and misconduct in research: Detection, investigation, and organizational response. University of Michigan Press.

Bird Si. Socially resllonsil)le science is more than "good scienre".j licrol)iol Blot Ethic. 2014:152:169—172. Published 2014 heu IS. doi:10.ll28ljmhe.vl5i2.870

Bradley, R. S. (2011). Global warming and political intimidation: How politicians cracked down on scientists as the earth heated up. Univ of Massachusetts Press.

Brinkmann, J., & Lentz, P. (2006). Understanding insurance customer dishonesty: Outline of a moral-sociological approach. Journal of Business Ethics, 66(2-3), 177-195.

Brion, S., Mo, R., & Lount Jr, R. B. (2019). Dynamic influences of power on trust: Changes in power affect trust in others. Journal of Trust Research, 9(1), 6-27.

Brown, A. (2013). Understanding pharmaceutical research manipulation in the context of accounting manipulation. The Journal of Law, Medicine & Ethics, 41(3), 611-619.

Campbell, J. L. (2019). Self-Responsibility Gone Bad: Institutions and the 2008 Financial Crisis. American Behavioral Scientist, 63(1), 10-26.

Carucci, R. (2016). Why ethical people make unethical choices. Harvard Business Review, 12.

Cavestro, W., Durieux, C., & Monchatre, S. (2007). Travail et reconnaissance des compétences (No. halshs-00146526).

d'Ancona, M. (2017). Post-truth: The new war on truth and how to fight back. Random House.

Fensham, P. J. (2014). Scepticism and trust: Two counterpoint essentials in science education for complex socio-scientific issues. Cultural Studies of Science Education, 9(3), 649-661.

Frericks, P., & Höppner, J. (2019). The Turn Toward Self-Responsibility in Current Societies: Differences, Challenges, and Perspectives.

Funk, C., & Kennedy, B. (2017). Public confidence in scientists has remained stable for decades. Pew Research Center (April 6).

Gallup Wellcome Global Monitor 2018. Published 19 June 2019 - Accessed 1st July 2019. https://wellcome.ac.uk/reports/wellcome-global-monitor/2018

Geddes, B. (1990). How the cases you choose affect the answers you get: Selection bias in comparative politics. Political analysis, 2, 131-150.

Glover, S. (2018). Who do they think we are?: Politicians imagine the nation. Griffith Review, (61), 172.

Haber, N., Smith, E. R., Moscoe, E., Andrews, K., Audy, R., Bell, W., ... & McClure, E. S. (2018). Causal language and strength of inference in academic and media articles shared in social media (CLAIMS): A systematic review. PloS one, 13(5), e0196346.

Hardy, C., Phillips, N., & Lawrence, T. (1998). Distinguishing trust and power in interorganizational relations: Forms and facades of trust. Trust within and between Organizations, 64-87.

Hopf, H., Krief, A., Mehta, G., & Matlin, S. A. (2019). Fake science and the knowledge crisis: ignorance can be fatal. Royal Society open science, 6(5), 190161.

Langer, L. Tripney, J. Gough, D. (2016) The Science of Using Science : Researching the Use of Research Evidence in Decision-Making EPPI-Centre Social Science Research Unit UCL Institute of Education University College London Final report http://www.alliance4usefulevidence.org/assets/Science-of-Using-Science-Final-Report-2016.pdf (accessed 17 August 2019)

Lewicki, R. J., McAllister, D. J., & Bies, R. J. (1998). Trust and distrust: New relationships and realities. Academy of Management Review, 23(3), 438-458.

McTighe, T. (2019). What is considered a conflict of interest or what to disclose in lectures and publications?. Reconstructive Review, 9(1).

Mlinarić, A., Horvat, M., & Šupak Smolčić, V. (2017). Dealing with the positive publication bias: Why you should really publish your negative results. Biochemia medica, 27(3), 030201. doi:10.11613/BM.2017.030201

Nelkin, D. (1994). Forbidden research: limits to inquiry in the social sciences. Ethical issues in scientific research: An anthology, 355-370.

Peter Stoett (2016) Citizen participation in the un sustainable development goals consultation process: Toward global democratic governance?. Global Governance, 22(4), 555-574.

Ravnskov, U., & Western Vascular Institute. (n.d.). LDL-C does not cause cardiovascular disease: a comprehensive review of the current literature. Retrieved from https://www.tandfonline.com/doi/full/10.1080/17512433.2018.1519391.

Simon, H. A. (1986). Rationality in psychology and economics. Journal of Business, S209-S224.

Sturgis, P., & Smith, P. (2010). Assessing the validity of generalized trust questions: What kind of trust are we measuring?. International Journal of Public Opinion Research, 22(1), 74-92.

Van Noorden, R. (2014). Online collaboration: Scientists and the social network. Nature 512, 7513 (2014), 126–9.

Veldkamp, C. L., Hartgerink, C. H., van Assen, M. A., & Wicherts, J. M. (2017). Who believes in the storybook image of the scientist?. Accountability in research, 24(3), 127-151.

Welsh, R., Glenna, L., Lacy, W., & Biscotti, D. (2008). Close enough but not too far: Assessing the effects of university–industry research relationships and the rise of academic capitalism. Research policy, 37(10), 1854-1864.

Yudkin, J. (1957). Diet and coronary thrombosis: hypothesis and fact. The Lancet, 270(6987), 155-162.

Ziegler, R (2017) Trusting science in an age of distrust. Euroscientist. Accessed 4th December 2018.https://www.euroscientist.com/trusting-science-age-distrust/

GLOSSARY

Peer Review : A scenario where other people of comparable qualifications constructively criticize a fellow

Bibliomentrics : refers to the number of times the scientific publications from a given country are referenced in new publications

Document Title (FILENAME): “Unethical use of research results” avoidance mechanisms and their nature (whistleblowing, ethical guidelines…) and limits of the existing processes—existing responses to rebuild trust at the institutional level.

Deliverable n°: 24

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6	05/07/2019	CGC	Fourth iteration
6.1	20/08/2019	CGC	Formatted for circulation—proofread & editing
6.2	26/08/2019	CGC	Circulation

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Figures’ list:

1. The context

The question of trust in science (and scientists) is in itself controversial. While some recent reports do seem to suggest such a situation (ALLEA, 2019), the question in fact is far more debatable than appears. There is indeed no consensus on whether distrust towards science in general and scientists in particular is spreading; to complicate matters, the statistics do not confirm what more literary approaches tend to claim (Funk & Kennedy 2017). In fact, most of the recent available data (both from the US[1] and Europe[2]) indicate that science is not the issue—roughly 2/3 of Europeans and 70% of US citizens do trust science to have a positive impact on life in general and their life in particular over the next 15 years, the highest scores being on health and medical care (65%) as well as education and skills (60%), whereas the fight against climate change (54%) and quality of housing (50%) round off the pack. Certainly, we can observe that confidence levels vary, depending on the field of activity, and that some sectors are more valued than others, but there is a world of difference between the perception of a benefit and mistrust.

Where then does this "feeling" arise, of an increasing lack of trust in science?

In his interview reported by Science in 2018, John Besley[3] insists that "*there's overall stability, (…) in the confidence measure* », though there indeed might be some "*divergence (…) between people who identify with one part or ideology than another* ». The fact that ideology and related subjectivities can influence one's confidence in science has been repeatedly confirmed (Nadelson & Hardy 2015), which further casts a shadow upon the authenticity of this lack of faith both in the field and about the people who compose it.

Bechley indicates that this is probably because negative voices tend to be more extensively reported than positive speeches: "*If we keep emphasizing this idea of a decline in trust, we communicate from this sort of defensive position*». It could thus be a proclivity for self-flagellation that might lead to this belief that there could be a lack of trust in science.

In such a scenario, therefore, the problem of trust in science would primarily be a communication issue.

Beyond that, a second approach might say that it is not science which poses a problem but the humans who drive it, whether they are academic researchers or not. Such an analysis is rooted in events that immediately followed some recent crises (financial crisis, pesticide debates, obesity crisis, climate change) and which perhaps suggest that some researchers may have been led into error on account of ideological certainty (on climate change: Leiserowitz et al. 2013) or because of political and possibly financial interests (on conflicts of interest at the root of the financial crisis: Carrick-Hagenbarth, Epstein 2012, on obesity: Horel, 2019).

1 National Science Board. 2018. Science and Engineering Indicators 2018. Alexandria, VA: National Science Foundation (NSB-2018-1). https://www.nsf.gov/statistics/2018/nsb20181/ retrieved December 12th 2018.

2 Special Eurobarometer 419: Public perceptions of science, research and innovation : Added to data.europa.eu/euodp 2015-03-10 Updated on data.europa.eu/euodp 2019-02-06 –http://data.europa.eu/euodp/en/data/dataset/S2047_81_5_419_ENG Retrieved November 10th 2018 & February 14th 2019.

3 At the AAAS 2018 conference : https://www.sciencemag.org/news/2018/02/public-mostly-trusts-science-so-why-are-scientists-worried retrieved October the 7th 2018.

That might, in a way, point to the existence of rotten apples among scientists and the quest for their eradication that would have turned against the scientific community in its own right. By bringing the scandals into the public gaze, have researchers "shot themselves in the foot"? But are they to blame? In the absence of governance capable of addressing these problems other than through peer analysis, as is still the case, these actors had no choice but to issue alerts—and probably move the lines. It would then be the limits of research governance (as mentioned by the EU financed SATORI and DEFORM projects) that would be at the root of the questions surrounding the trust placed not in science, but in certain actors in science.

It is worth recalling, here, that there is no inverse homothety between science, researchers and academic researchers. Just because there may be doubts about the work of some researchers (academic or not) does not necessarily indicate that a question mark looms over the scientific community or science. And, as noted above, it may well be because there is confusion about definitions and fields that researchers themselves come to question a potential lack of trust in them. One striking aspect is that statistics are not about the researchers but about their scientific fields of research (see above), or that research when it examines a subject does so through the prism of that subject (economics, finance, climatology, nutrition and obesity, to mention a few prominent ones).

Thus, the question under discussion here relates not to a problem for science but one that pertains to scientists or certain scientists in given fields who have not made proper use of either the scientific processes (design) or the scientific results themselves, and to the use that is made of their research. The issue therefore is the proximity between trust and the existence of research misconduct, and even further, the question of the boundary between acceptable and unacceptable conduct. The case relating to a soda giant—first revealed in 2015 (O'Connor, 2015)—is emblematic of this. Renowned scientists (cardiologists, endocrinologists, nutritionists and even medical school deans) have not hesitated to lend their names to studies commissioned by these industrial giants to conclude that their products are safe for healthy people, even though many analyses may say otherwise.

These practices are not illegal, they are just questionable and raise real ethical questions that do not seem to touch those who engage in them to any great extent. In this case, the ex-ante validation by an ethics committee of research contracts concluded with the industrial world, especially with regard to the ownership or use of results, could be an interesting approach, in particular to avoid either the untimely termination of research programmes because the results obtained do not corroborate the expectations of industrial funders—what Professor Steel calls "soft control" (Horel, 2019)—or the marketing abuse of scientific studies as stated by Prof. Granjean[4]; but we will return to this.

It is therefore necessary to ask whether, beyond proven misconduct for addressing which processes exist, mechanisms can be found to counteract these *questionable research practices*, which are clearly identified but whose scope seems very vague. If such systems exist, what are they (whistleblowing, ethical guidelines), and above all are they sufficient to pre-empt unethical practices in both the design and use of research? In conclusion, are they relevant for avoiding

[4] Foucart, S (2018) « La science peut être utilisée comme instrument de marketing » Le Monde retrieved 09/10/2018 https://www.lemonde.fr/planete/article/2018/10/09/philippe-grandjean-la-science-peut-etre-utilisee-comme-instrument-de-marketing_5366779_3244.html

an erosion of trust in research practitioners and sufficient to rebuild trust that may have already been undermined, particularly at the institutional level?

Furthermore, it is not certain that it is the question of the lack of trust in researchers that society is now raising; perhaps this actually points to the existence of a certain renewed scepticism about research and educational practices that could therefore influence their results (Grimmelmann 2010). If this is the case—and it needs to be demonstrated—it would be more the latter situation that needs addressing, rather than a potential lack of trust.

During our investigations, we also identified the possibility that the lack of trust is also the result of a discrepancy between the way societal issues raised by society are addressed by actors who believe they are victims of lack of trust and the answers they provide to these questions. It appeared that there was often divergence between the questions asked by the public and the answers provided by the experts (Wagenaar & Keren 1986).

Thus, where society raises the question of the safety of adjuvants in terms of vaccination, the response focuses on the need to vaccinate, which has little to do with the question and does not address the problem at all, especially since the need to vaccinate is never called into question. Where society questions itself on the justice and equity of public actions, the answer concerns the evaluation of the said actions. Faced with this propensity to answer "in the sidelines", it becomes understandable that doubt, if not a lack of trust, sets in (Lidskog, 2008). As these are neural pathways based on differentiated semantic readings and understandings, we found it interesting to use data science logic to verify the trends analysed in our literature review. In the analysis below, these different elements are detailed.

2. Methodology overview

2.1. Information/data collection and methodology.

Several approaches were implemented in the context of this research, depending on the intended objectives. We thus separately detail the methodologies used for literature analysis in order to determine the scope of the problem and the one used in connection with our case studies, for now limited to a data based analysis of trust in the academic world as regards its ability to secure adequate and employment-based education for students.

A - Our research process to determine the scope of the problem is based on an extensive literature review that focuses on the issues of identifying the patterns of inappropriate conduct in research, as well as the impact of such misconduct on trust or scepticism. This data identification was built and implemented through Boolean search.

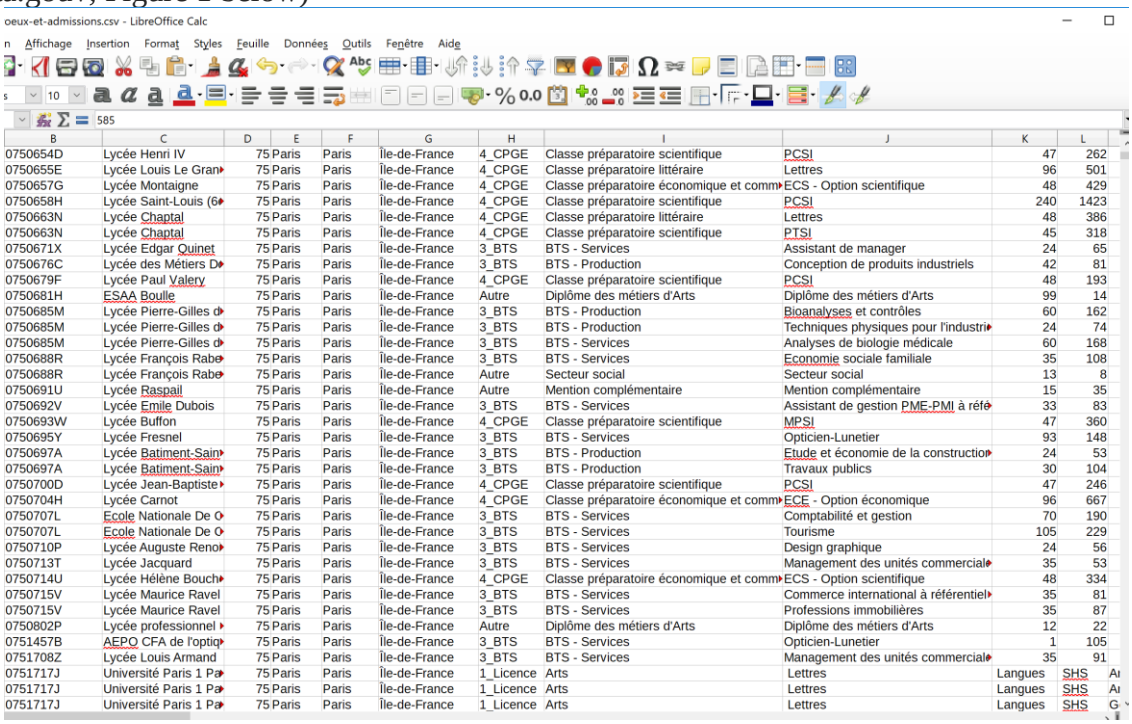
For this first part, we focused on four types of data:
1. Evidence of unethical use of research results in-house (by sponsors/funders) and outside (by third parties not originally involved in the research),
2. Evidence of lack of trust/mistrust in relation to the above (is the issue a problem of ecosystem or of individuals?)
3. Existing and non-existing mechanisms to identify risks of unethical use within and outside research organisations,
4. Mechanisms to avoid/manage cases of misuse (legal protections, etc.),

We searched using the following strings with and without inclusions (i.e., each term individually—except liaisons words such as “of”—then attached); roughly, we have 44 pathways:

- "unethical use of research"
- "unethical research process "
- "unethical financing of research"
- "Impact of research financing types"
- "Conflicts of interest in research funding"
- "processes to avoid "unethical use" of "research results"
- "organisations' safeguards against research misuse"
- "organisations' safeguards against research unethical use"
- "research controversies” and “confidence in research"
- "Trust and scepticism toward research"
- "Trust and scepticism toward researchers"
- "Analogy between academia and research"

All searches were conducted using search engines such as Qwant, Google and Scholar. All text with a coherence level > to 90% was considered (see attached source list).

B - The case study on education was based on French data (this therefore needed to be extended to Europe, although it is known that the dropout rate in France is less an issue than in other European countries) We also used datasets provided by the French open data website (opendata.gouv, Figure 1 below)



B	C	D	E	F	G	H	I	J	K	L
0750654D	Lycée Henri IV	75	Paris	Paris	Île-de-France	4_CPGE	Classe préparatoire scientifique	PCSI	47	262
0750655E	Lycée Louis Le Gran	75	Paris	Paris	Île-de-France	4_CPGE	Classe préparatoire littéraire	Lettres	96	501
0750657G	Lycée Montaigne	75	Paris	Paris	Île-de-France	4_CPGE	Classe préparatoire économique et comm	ECS - Option scientifique	48	429
0750658H	Lycée Saint-Louis (6	75	Paris	Paris	Île-de-France	4_CPGE	Classe préparatoire scientifique	PCSI	240	1423
0750663N	Lycée Chaptal	75	Paris	Paris	Île-de-France	4_CPGE	Classe préparatoire littéraire	Lettres	48	386
0750663N	Lycée Chaptal	75	Paris	Paris	Île-de-France	4_CPGE	Classe préparatoire scientifique	PTSI	45	318
0750671X	Lycée Edgar Quinet	75	Paris	Paris	Île-de-France	3_BTS	BTS - Services	Assistant de manager	24	65
0750676C	Lycée des Métiers D	75	Paris	Paris	Île-de-France	3_BTS	BTS - Production	Conception de produits industriels	42	81
0750679F	Lycée Paul Valery	75	Paris	Paris	Île-de-France	4_CPGE	Classe préparatoire scientifique	PCSI	48	193
0750681H	ESAA Boulle	75	Paris	Paris	Île-de-France	Autre	Diplôme des métiers d'Arts	Diplôme des métiers d'Arts	99	14
0750685M	Lycée Pierre-Gilles d	75	Paris	Paris	Île-de-France	3_BTS	BTS - Production	Bioanalyses et contrôles	60	162
0750685M	Lycée Pierre-Gilles d	75	Paris	Paris	Île-de-France	3_BTS	BTS - Production	Techniques physiques pour l'industri	24	74
0750685M	Lycée Pierre-Gilles d	75	Paris	Paris	Île-de-France	3_BTS	BTS - Services	Analyses de biologie médicale	60	168
0750688R	Lycée François Rabe	75	Paris	Paris	Île-de-France	3_BTS	BTS - Services	Economie sociale familiale	35	108
0750688R	Lycée François Rabe	75	Paris	Paris	Île-de-France	Autre	Secteur social	Secteur social	13	8
0750691U	Lycée Raspail	75	Paris	Paris	Île-de-France	Autre	Mention complémentaire	Mention complémentaire	15	35
0750692V	Lycée Emile Dubois	75	Paris	Paris	Île-de-France	3_BTS	BTS - Services	Assistant de gestion PME-PMI à réfé	33	83
0750693W	Lycée Buffon	75	Paris	Paris	Île-de-France	4_CPGE	Classe préparatoire scientifique	MPSI	47	360
0750695Y	Lycée Fresnel	75	Paris	Paris	Île-de-France	3_BTS	BTS - Services	Opticien-Lunetier	93	148
0750697A	Lycée Batiment-Sain	75	Paris	Paris	Île-de-France	3_BTS	BTS - Production	Etude et économie de la constructio	24	53
0750697A	Lycée Batiment-Sain	75	Paris	Paris	Île-de-France	3_BTS	BTS - Production	Travaux publics	30	104
0750700D	Lycée Jean-Baptiste	75	Paris	Paris	Île-de-France	4_CPGE	Classe préparatoire scientifique	PCSI	47	246
0750704H	Lycée Carnot	75	Paris	Paris	Île-de-France	4_CPGE	Classe préparatoire économique et comm	ECE - Option économique	96	667
0750707L	Ecole Nationale De O	75	Paris	Paris	Île-de-France	3_BTS	BTS - Services	Comptabilité et gestion	70	190
0750707L	Ecole Nationale De O	75	Paris	Paris	Île-de-France	3_BTS	BTS - Services	Tourisme	105	229
0750710P	Lycée Auguste Reno	75	Paris	Paris	Île-de-France	3_BTS	BTS - Services	Design graphique	24	56
0750713T	Lycée Jacquard	75	Paris	Paris	Île-de-France	3_BTS	BTS - Services	Management des unités commercial	35	53
0750714U	Lycée Hélène Bouch	75	Paris	Paris	Île-de-France	4_CPGE	Classe préparatoire économique et comm	ECS - Option scientifique	48	334
0750715V	Lycée Maurice Ravel	75	Paris	Paris	Île-de-France	3_BTS	BTS - Services	Commerce international à référentiel	35	81
0750715V	Lycée Maurice Ravel	75	Paris	Paris	Île-de-France	3_BTS	BTS - Services	Professions immobilières	35	87
0750802P	Lycée professionnel	75	Paris	Paris	Île-de-France	Autre	Diplôme des métiers d'Arts	Diplôme des métiers d'Arts	12	22
0751457B	AEPO CFA de l'optiq	75	Paris	Paris	Île-de-France	3_BTS	BTS - Services	Opticien-Lunetier	1	105
0751708Z	Lycée Louis Armand	75	Paris	Paris	Île-de-France	3_BTS	BTS - Services	Management des unités commercial	35	91
0751717J	Université Paris 1 Pa	75	Paris	Paris	Île-de-France	1_Licence	Arts	Lettres	Langues	SHS
0751717J	Université Paris 1 Pa	75	Paris	Paris	Île-de-France	1_Licence	Arts	Lettres	Langues	SHS
0751717J	Université Paris 1 Pa	75	Paris	Paris	Île-de-France	1_Licence	Arts	Lettres	Langues	SHS

Figure 1 : Curriculum database

and a number of APIs to anonymously collect data on the likings of individuals in their senior high school year-terminale in France). Significantly, the approach was rather different, as we focused on personal threads as expressed through web discussion forums (doctissimo—Fig 1

Below[5]—and harware.fr which are the most popular in France and on which exchanges are not limited to health or technicalities) that are to be completed by social media nodes (analysis of the likes) in the near future, if we manage to circumvent the strong distortion risk related to the data access methodologies currently in place. Indeed, for now the different APIs we studied to collect data appear to be quite restricted. Data in fact can only be obtained from individuals who agree to authenticate our app to allow access to their data. That means we can only harvest data from individuals (1) known by us, (2) who agree to allow our application to get data. In short, this introduces bias and we might as such never get the level of objectivity required for our demonstration.

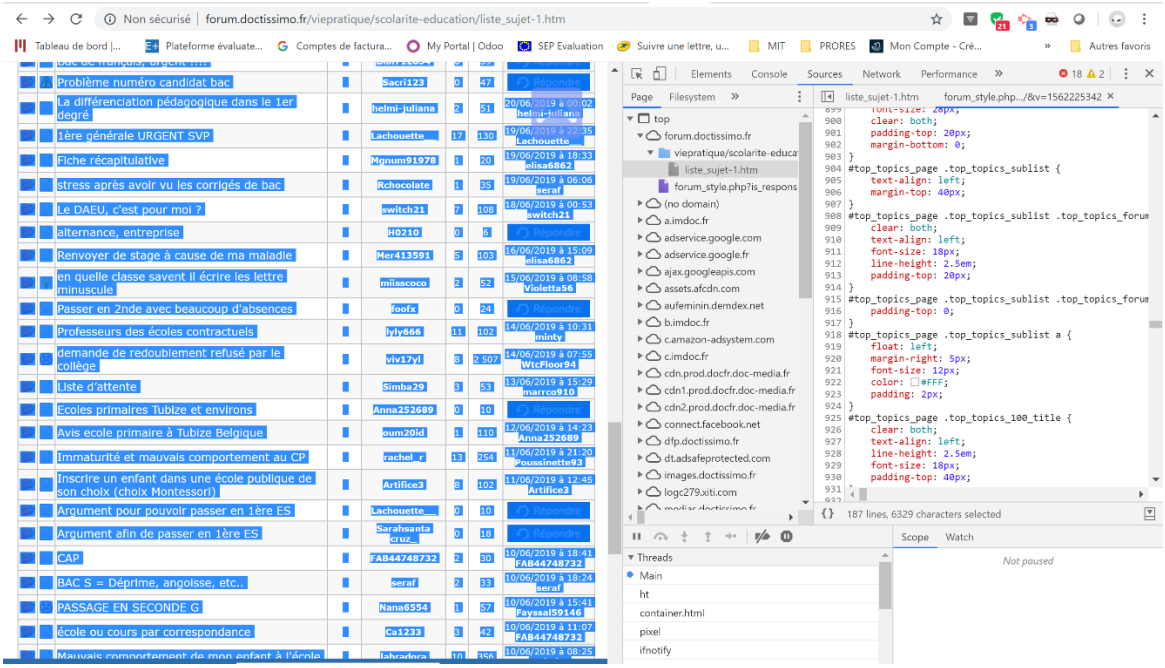


Figure 2 : Forum imports

Following the data identification phase, we collected the data through a scraping phase which was done using BeautifulSoup. This is a Python library for pulling data out of HTML and XML files. It works with a parser to provide idiomatic ways of navigating, searching and modifying the parse tree. The extracted data was numbered and saved raw in plain text for noise reduction purposes. We then proceeded to the latter operation using the Natural Language Toolkit and some python code (adapted from Pratima Upadhyay). What was scraped contained "orientation" "pas choisi/choisi" "imposé" "changement" "veux/veux pas" "parents" as well as topics such as "medecine" "sport", etc., and a number of very French acronyms such as staps, which designate curriculum.

[5] http://forum.doctissimo.fr/viepratique/scolarite-education/liste_sujet-1.htm

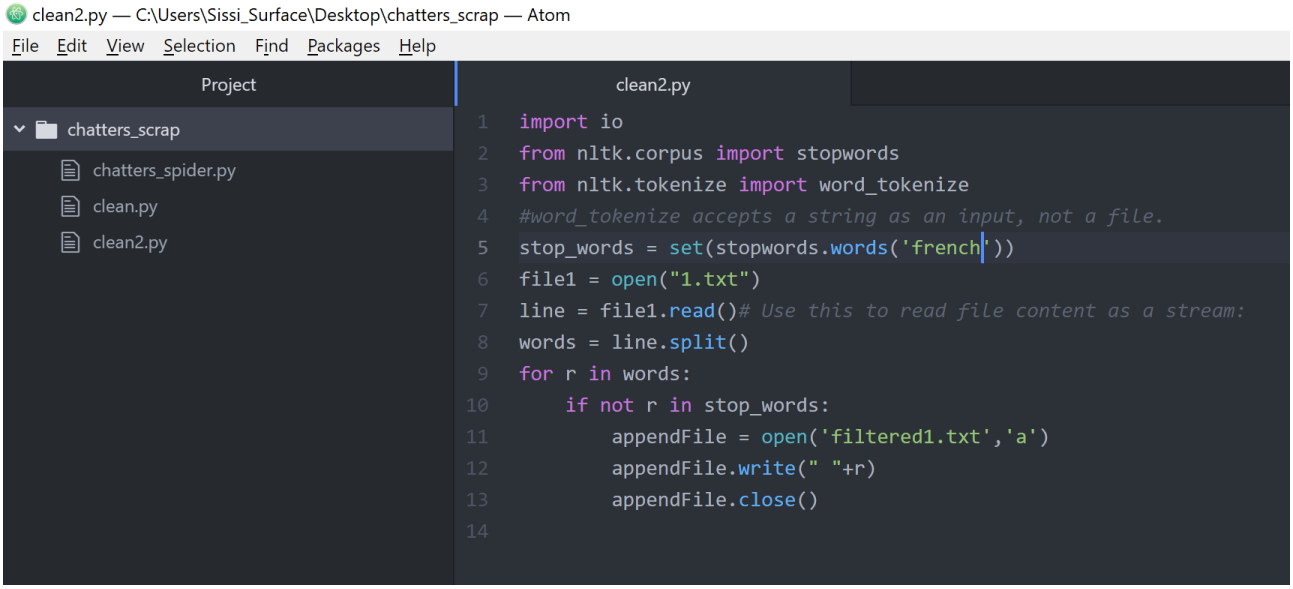


Figure 3 : Python code example

Data was then saved to a csv file for analysis. We first used Latent Semantic Analysis to extract the contextual-usage meaning of words through mathematical computations. It is an information retrieval process which analyses and identifies semantic pattern in unstructured collections of text as well as the relationship between all of them. As such it is a so-called unsupervised way of uncovering synonyms (trends) in a collection of phrases. We then used TF-IDF to weigh the semantic information. This is a retrieval technique that weighs a term's frequency (TF) and its inverse document frequency (IDF). Each word has its respective TF and IDF score. The product of the TF and IDF scores of a word is called the TFIDF weight of that word. In short, the higher the TFIDF score (weight), the less the word is seen in the document and vice versa.

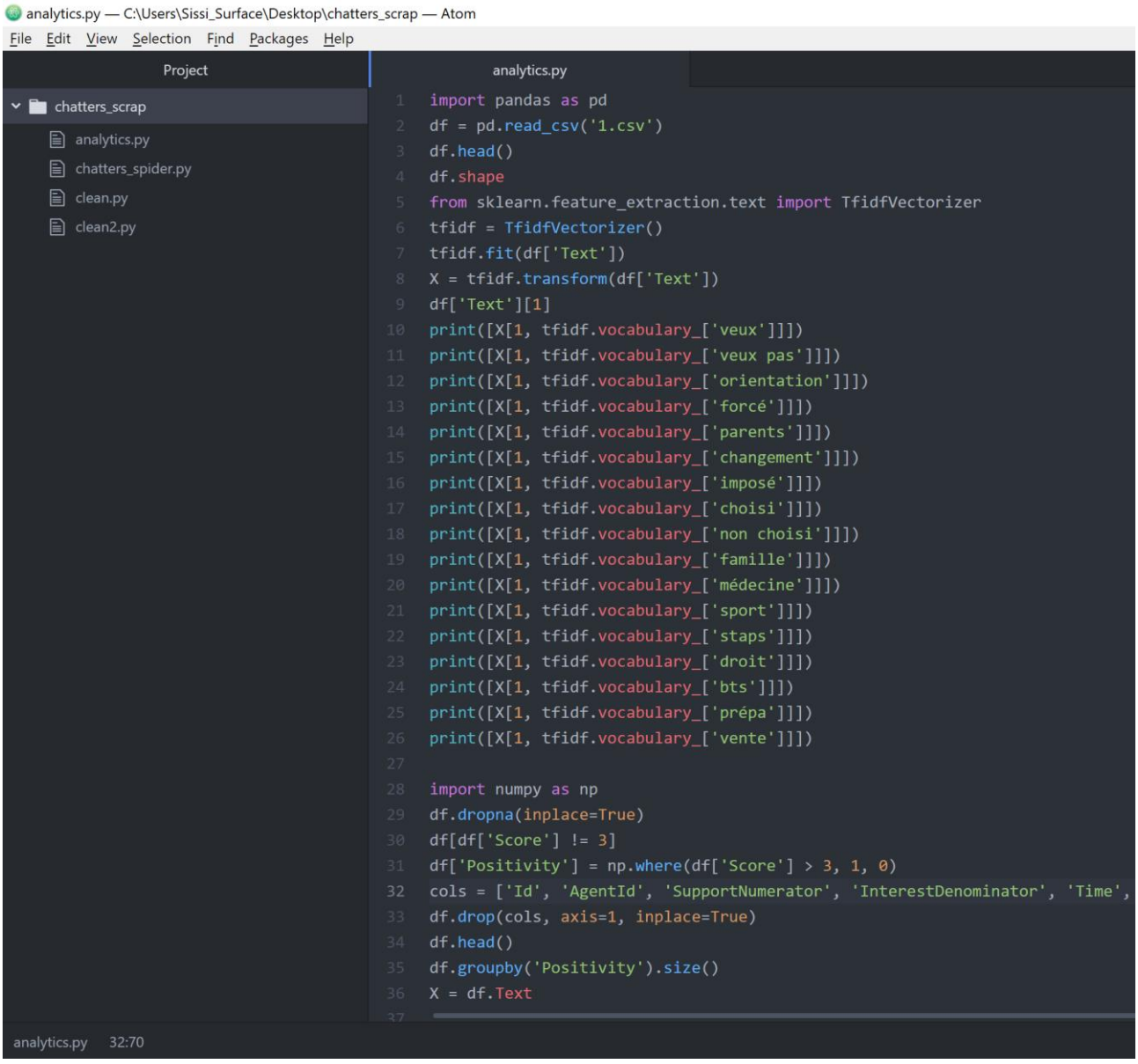


Figure 4 : Python code - feature extraction

We proceeded to sentiment classification (removing neutral score 3, then group score 4 and 5 to positive/influenced (1), and scores 1 and 2 to negative/not influenced (0): higher the score (interest) and answers (support) the more support the trend has (support level)), accuracy scores, then feature selection using a Chi square test. We then observed homogeneity and dissonance of these likes with the educational choices of the related individuals to predict potential dropout risk.

2.2. Literature review and related questions

Following an initial literature review, we noted some trends that we have attempted to verify. These include the finding that procedures to prevent misuse/biased use of research do not exist at the institutional level, but at the domain level. Indeed, it emerges from the first analysis (and literature review) that researchers in sectors such as information and communication technologies, statisticians, neuromarketers and clinicians do raise at their level the question of

the misuse of their tools/results, but it seems that these questions do not find procedural translation.

There is, however, considerable literature on making research practices ethical, and only these issues are addressed (as DEFORM has demonstrated) at all levels of different institutions and social spheres.
Everything seems to happen (though this assertion needs to be verified) as if design prevailed over impact, as if research with ethical design generated the presupposition that it would systematically generates ethical use of the results produced.

The underlying question here is how to build a dynamic of trust not only in research design but also in the use of research results.

We looked at obvious cases of lack of confidence in science to analyse its symptoms. This is mainly the case with vaccines and pesticides. First of all, it must be stressed that mistrust is unequally distributed throughout the world, and very cultural (re: the world value survey). Nevertheless, in "societies of mistrust" (such as France, where the inter-relationship trust level is very low, the second lowest in Europe), we find in both cases a parallelism of discourse that makes the two positions irreconcilable. Thus, it is not the efficiency of vaccines that is contested by the majority of people who oppose them, but their vectors, the excipients. However, the scientific world's response to these fears often lacks substance, reinforcing the cycle of mistrust. To the discourse of fear expressed about the effects of excipients (multiple sclerosis caused by the presence of aluminium, for example), the answer is: perhaps there may be some side effects but the benefit/risk ratio remains largely in favour of the former. Basically, there may be a few people sacrificed for the benefit of the community. However, such a situation is inaudible in these times of the precautionary principle and the inappetence for risk seen in modern societies.

The second strong trend in this first analysis is how a common scientific practice (the discussion on methodologies) becomes a weapon of mass destruction against science itself. The foundational standard of peer reviews implies implementation of a Schumpeterian principle of creative destruction; the scientist is used to being criticised by his colleagues, it is even part of progress. But from one criticism to another, there is sometimes a step unfortunately easily taken by scientists, and again sometimes more on account of chapels than for rigour in research (Theis, 2018). Inevitably, the sad spectacle of this attitude fuels the lack of trust (how to trust actors who do not agree with each other, and express it in a very virulent way?).

In short, it is perhaps in clarifying how science approaches (and understands) topics and presents itself that there is a first reconstruction of trust, such as by elucidating which breaks in the chain of use generate a break in the chain of trust. This, to adequately define the perimeter of our research and highlight the "symptoms" of what might form the foundations of a renewed confidence dynamic.

Prudential considerations for trusting or distrusting heterogeneous agents make up a core element of interpersonal trust. The prudential and reflexive placement of trust in or distrust of another agent is a decisive step in the gradual development of moral character. Thus, trust together with the related phenomena of enlightenment and education points to a process of development in individual human lives as well as in human history that may enable us to approach the ethical ideal of a kingdom of ends.

Mistrust and suspicion are on the increase, and confidence in our institutions is in decline. To understand why a “crisis of trust” is so serious, we must hark back to Immanuel Kant, who placed honesty and trustworthiness at the core of his theory of how we should live.

3. Defining the notion of trust (and mistrust)

3.1. An etymological detour

The comparison of etymological distinctions reveals several conceptions of trust. As such, understanding trust requires looking back at its etymological foundations, allowing for a number of distinctions that are not at first apparent. The general acception of trust refers to a feeling, a belief in the reliability of an individual or other things. Etymologically, the verb to trust refers to the idea of trusting someone or something, as confirmed by the Latin origin of confidere (cum "with", fidere "proud"). Thus, the term trust is associated with the belief in the good faith of the other. The Greek approach is even more interesting. Indeed, the term "euthumos", which means trust, indicates a passion to do good, or be good. There is therefore in this vision an understanding of trust as the recognition of a well-done action that inscribes trust as something operational, in doing rather than in a passive understanding; as found, for example, in the French language.

In this respect, the French language relies more on the Latin *confidere* : (Cum (with, shared) fides (faith, belief)) refers to the sharing of common beliefs. As such, it does not allow any precise distinction between the act and the feeling of trust. Indeed, "confidence" refers to the fact that expectations can be disappointed, it is called "cognitive trust". The disappointment, if any, will come from outside the system.

On the other hand, both English and German approaches are more subtle. A distinction is made therein between trust, "to have faith in", and trust, "to trust”, which introduces the distinction between trust: belief, and trust: action.

Trust responds to a questioning that is uncontrollable by definition. Conversely, "trust" corresponds to a rational risk assessment. Taking into account the context and the information, one decides to trust, to place one’s interests or part thereof in the hands of a third party. In doing so, it commits its responsibility, *if trust is not respected, it is because the risk assessment needs to be reviewed*.

This analysis differs from the German distinction between "vertrauen" and "trauen". These two translations refer more to "trust" than to "confidence". On the other hand, "trauen" will be used in the negative sense, in the expression of mistrust, while the addition of the prefix “ver”—understood as a transformation action—makes it possible to understand trust in the sense of "trust". This distinction is not insignificant, it implies a particular conception of trust. Indeed, the initial state is a situation of distrust, and it is only after exploration and verification that we observe a transformation of distrust into trust (Lewicki, McAllister & Bies 1998). The conception of trust in the face of opportunistic behaviour would therefore be "vertrauen" here. This conception recalls the act of trusting, the "trust" in its rational acceptance of putting oneself in a situation of vulnerability in the face of a risk of opportunism through transformation of an initially presumed "trauen" distrust.

3.2. Trust as a socio-economic notion

Although recent social events have rendered any vision historically time-bound, no reading of the notion of trust can nowadays be done without addressing Lewicki & Bunker (1995) and Putnam as excellently questioned by Maria Arup Hovmand and Gert Tinggaard Svendsen (2017), all of whom advocate the enduring link between confidence and economic growth. In doing so, however, they forget a number of exogenous factors such as resource limitations or climate issues that their colleagues at the conventions have tried to address; but we will come back to this later.

For Torche, F., & Valenzuela, trust plays on economic development by stimulating a dynamic as a moral and cultural value; for others it is civic engagement that gives rise to trust and the virtuous circle.

3.2.1. Trusted societies and societies of distrust: Lewicki and Bunker's approach (1995)

Lewicki & Bunker regard trust between individuals as essential to economic development. They define trust as an economic choice mechanism. It is a high degree of trust between economic agents that will allow cooperation, other than that condensed within the framework of family relations. Combined with the concepts of social capital and organic sociability, this notion describes the ability of individuals to cooperate spontaneously without contractual, family or administrative pressure.

Thus, trust between economic agents, emanating from moral norms and habits inherited from the past and transmitted from generation to generation, is for Lewicki and Bunker an essential determinant of economic success, which depends on the ability to organise spontaneously into growing companies. These companies will be able to manage their productive capacities as well as possibilities in terms of work organisation and resource allocation. In addition, the costs of controlling, monitoring and managing litigation inherent in economic relations are reduced, as are the costs of agency. With a somewhat symmetric, though different reasoning, Maria Arup Hovmand, Gert Tinggaard Svendsen and Putnam also place confidence at the heart of economic development.

Like Lewicki and Bunker, Hovmand and Svendsen (2017) reconsider Putnam's virtuous circle in which trust is an essential determinant. Their thesis is based on the positive effects of reciprocity standards and civic engagement networks on institutional performance, from which economic performance is derived, with a renewed reading of the civic engagement index, including recent challenges such as social evolution or climate change. This index is highly correlated with the institutional performance index, and relatively more so than with other factors that may explain government performance. A civic community brings together citizens who are willing to trust, show solidarity and be interested in public affairs, and therefore reflect a strong associative and electoral participation, i.e., a strong will to build trust within their circle.

Consequently, several questions arise that need to be answered to overcome the methodological, theoretical and even paradigmatic contradictions of the microeconomy of trust. Is trust based on belief or behaviour? Are trust and substantial rationality contradictory? Is trust understood in the dynamics? Are the existing typologies of trust sufficient? Is inter-individual trust united

or multi-dimensional? Can and should a consensual and therefore interdisciplinary definition of trust be proposed?

The first thing that strikes one, when looking at the attempt to analyse the concept of trust, is that many authors consider this notion to be vague, if not undefinable. In part, this is because of disciplinary perspective. For instance, sociologists argue that psychological views of trust are invalid because trust cannot be reduced to a personal characteristic (McKnight & Chervany, 2001). Thus, social structural definitions (Shapiro, 1987) are almost impossible to reconcile with personal expectancy definitions (Hosmer, 1995).

All in all, trust thus invites a differentiated approach closely linked to the field of study of the concerned actors; psychologists turn it into a personality trait, sociologists a social structure and economists into a mechanism of economic choice (Lewicki and Bunker, 1995). It is as if the concept takes the definition that the researcher needs for his reflections, and therefore depends not only on the research paradigm but also on what it is supposed to explain.

For personality theorists such as Rotter (1980), trust is a belief, expectation or feeling that comes from personality. Its conceptualisation is part of the psychological development of the individual. Trust is thus a cognitive or emotional approach (Lewicki, Tomlinson & Gillespie 2006). In this respect, Terpstra (2011) refers to an emotional trust arising out of emotion and a cognitive trust based on skills. Even if the cognitive perspective dominates in most approaches, with hypotheses varying, the fact remains that trust can contain an element of emotion, affect, interfering with the cognitive part. Thus, for Weber, Malhotra and Murnighan (2004), it is an irrational choice of a person in the face of an uncertain event from which the expected loss is greater than the expected gain.

From Rotter (1971) to Tanis and Postmes (2005), there is a generalised social expectation in an individual or group that they can rely on the words of others, whether these are verbal or written promises made by another individual or group. Thus, the psychological perspective underlines the emotional dimension of trust, which is relatively rarely considered in other disciplines.

3.2.2. A specific vision: trust and the convention theory

From the 1980s onward, a specific current of thought has been developed in France at the border between economics and sociology, or rather taking into consideration the two visions in order to propose a new interpretation of economic phenomena (Young, 1996) the convention theory. It opposed neoclassical theory, but also neo-institutional approaches based on a limited rationality that is truncated due to the individual optimiser hypothesis. It is part of the framework of procedural rationality (Simon,1986) and analyses mostly individuals' actions, interactions and the related impact. This approach remains micro economical, focusing on methodological individualism as opposed to the institutionalist current, and is qualified as holindividualism by the so-called regulatory economy (Suda and Ebizuka, 2007) to characterise the links between individuals and institutions. As such, individuals produce institutions, insomuch as their actions are conditioned by these existing institutions. The convention economy is an innovative analytical framework of the market economy. At the heart of this approach is an agreement between individuals (or convention), which is not possible without a constitutive contract, or common social framework. A convention is "*a particular type of rule, with a certain arbitrariness, most of the time without legal sanctions, of obscure origin, and*

relatively vague or precise wording but without formal wording" (Favereau, 1999). Economic actors therefore need institutions to act as social actors and agree on the conventions governing them, in a kind of renewed social contract. This definition has been extended to emphasise the normative dimension and the role of representations (Suda, Fumiaki, Ebizuka, 2001.). Thus, the agreements refer to formal (incomplete) and informal rules. Actions must be legitimate. Individual and collective representations are central, and individuals no longer act solely according to their needs or aspirations; they integrate the search for a "common good" that depends on the structure of the state/environment in which they live and the different principles of legitimacy that underlie them. Boltanski and Thévenot (1991) in their remarkable essay on the "economies of worth"—De la justification—distinguish six "worlds" in which the "greatness" of an individual depends on particular conceptions of what is legitimate : *The Inspired World, The Domestic World, The World of Fame, The Civic World, The Market World and finally the Industrial/Production World.*

Thus, where economists explain coordination by calculation and interest, whether it takes the form of a purely rational act or whether it involves a trust component, the economics of conventions, assuming a legitimate logic of action, leaves an opportunity to understand trust outside a logic of utilitarian maximisation. The relationship to trust is fostered, on the one hand, by the ability of conventions to reduce uncertainty, and on the other hand by the rejection of the postulate of individuals being opportunistic by nature. Conventions reduce uncertainty by making other people's behaviour more predictable and allow the trust relationship to be understood, if not built per se. Actors refer to a prescription that can be complied with, and that indicates which behaviour is required or preferred, or prohibited in specific contexts (Young, 2013). These prescriptions are not imposed, the actors refer to them because they are internalised, they are self-evident and do not result from calculation but rather from norms, rules, customs.

In this context, individuals are not defiant by nature; the search for recognition, integration into a collectivity, the pleasure of a job well done, loyalty in a trade transaction, others' perception of oneself… are all hypotheses which can guide behaviours. Likewise, action in such a framework does not exclusively refer to the individual interest. The relationship of trust no longer depends exclusively on a cost/benefit calculation in the face of opportunistic risk, but on these conventions.

Thus, cooperation is explained by the convention, which is based on various mechanisms including social representations internalised by individuals. The "belief" dimension of trust that economic analysis was unable to address makes sense in the economics of conventions. Again, individuals are not defiant by nature, and trust is a determining factor in economic relations, but no longer because it is based on a calculation but because it is a belief. The nature of this belief depends on the logic of actions, the principles of legitimacy. This belief is built, utilitarian calculation is not ruled out, but other dimensions are important—learning, values, socialisation, altruism, social and collective representations, norms. The decision to trust in a situation of uncertainty can no longer be understood under the assumption of opportunistic behaviour. The foundations of trust, which are necessary to understand it (March & Olsen 1983), must therefore be analysed in a broader context than that of interest.

3.2.3. Trust beyond interest

If we follow the economists of the conventions, it then becomes clear that trust is built beyond the well-thought-out interests of economic actors. As such, trust balances tensions between naive candour and cynical self-interest. Once again, trust is a posture beyond belief (Orléan, 1995); it is because the structure of interests cannot guarantee stable relationships between people that trust becomes essential. This vision emphasises the role of organic solidarity in explaining the social links on which the logic of interest is based. In this context, complementarities between individuals guarantee exchange through the structure of interests. But this dependence alone does not explain the very existence, even more the nature of interactions between individuals. Other Rawlsians (Rawls 1958) come into play here, structuring social elements such as rules, institutions and values. Thus, trust depends on an essential but not sufficient condition related to complementarity, and which cannot be understood without a second condition, the famous trust iteration question: "can one Z trust an unknown X, trusted by Y if he, Z, trusts only Y?" It is the intrinsic and multidimensional quality that Y gives to X which generates confidence about X in Z. Thus, trust depends on these intrinsic qualities, it is a belief (Lewicki & Wiethoff 2000). But what are the essential determinants of this belief, those that structure the concept of trust?

3.3.The double sociological approach: social action vs social structuration

In sociology, trust is approached from two perspectives: the predominance of social action (rationalisation paradigm) or that of social structure (integration paradigm). Convergence attempts—even if it has been the subject of numerous analyses—have not led to the development of a general theory that ensures an understanding of the social relationship, a "relational theory" of society (Emirbayer, 1997), even within the interactionist paradigm. Trust has never really been incorporated into these discourses (Frederiksen, 2014). Seligman (1998) alongside Durkheim emphasises the need for contract law overhanging trade and thus joining economic conceptions; without, however, incorporating trust into the reasoning. For the culturalist approach, individual actions are explained by a cultural habitus, everything is determined, and the question of trust should not be raised (Sztompka, 1999). For the rationalist current, trust is part of the tradition, custom and pre-modern era and is therefore excluded from Max Weber's theory of the modern world (Giddens, 1971). With the interactionist theory, Matsueda and Heimer (1997) attempted to bring together "action theory" and "system theory" and thus also focused on trust. The latter is based on the trust placed in "*generalized symbolic means*"; the more common the culture is the more predictable the interactions are. Thus, trust controls the capacity of systemic adaptation of all social processes, and in the end civil peace or unrest (Karpik, 2003), without which the interaction would only be based on authority and violence (Gerbner, Gross, Morgan & Signorielli 1980). The "type" of trust considered here is trust in institutions, systemic trust and its effects on interaction. In line with this trend, trust consists of a natural equilibrium between different constituent expectations, a decision that results from routines. Trust is *a routine reproduction of the moral and cognitive collective order (*Misztal, 2013). Trust in this context is a routine decision resulting from common standards. Between philosophy and sociology, Guala (2016) emphasises the role of reciprocal actions in understanding "living together". Primordial trust is of the religious order, referring either to theology or psychoanalysis (Eisenstadtn, 1992). Trust is seen as a higher principle, a moral conduct. It has the status of a "social debt", it is neither refused nor deserved. This primordial trust has an exogenous status; it is necessary for the social trust that results from social interactions, which is embedded in the history of each society on the basis of "mutual

knowledge" and which is a major attribute of complex societies. For Eisenstadtn, most important decisions are constructed out of a complex system of representations which cannot be misled. Questions about trust are quite diverse, but generally speaking its understanding depends on its links with the social order in a context of uncertainty (Misztal, 2013). In economic sociology, Barney and Hansen (1994) define trust (in the context of looking at trust as a competitive advantage) as a shared belief in the fact that neither party in the exchange will take advantage of the other's weaknesses. Individual relationships are simultaneously social and economic, whereas social relationships produce behavioural norms that can justify the absence of opportunism going beyond its being limited by control. Psychosociologists define trust as a hope in a risky and conceptualised transaction. Vulnerability and uncertainty are at the heart of these definitions.

3.4. Mapping trust, its components and relationships: trust and its modes of production

Following the analysis of Hardy, Phillips and Lawrence (1998) as well as Zucker (1986), we can assume that trust can be approached according to the way it is built. As such, trust depends on its nature and therefore on its "production" conditions. But if we have confidence-building methodologies, any shortcomings in these methods can very logically provide a foundation for lack of trust. What must be implemented to generate trust leads, if not enforced, to mistrust.
We thus need to gain knowledge of the characteristics of trust in order to, through the identification of the lack of responses to these features, identify the roots of the lack of trust and above all propose a series of tools to abolish the problem.

Lynne G. Zucker, based on a century long analysis of the transformation of economic structures in the United States, distinguishes three types of trust: "characteristics-based trust", "process-based trust" and "institutional-based trust", and thus three trust "production modes":

a) *characteristics-based trust* is understood through the personal characteristics of individuals, such as their belonging to a specific social group such as a family, although the definition of family is itself quite culturally biased, a religious congregation; all in all, a community sharing a set of common characteristics and values. This trust is built ex-ante, it is embedded within each individual, external to any social exchange relationship. It is found in the same community, with individuals sharing the same beliefs. A sense of belonging and a common culture strengthen bonds of trust.
b) *process-based trust*: This trust is based on past experience/process and an agent reputation to be preserved. It is built on the existence of exchange. It consists in economic agents expressing belief/faith in the actions or results of actions undertaken by others.
Thus, the sources of trust are multiple and above culture sharing: duration, relationship in time, transparency and knowledge of an organisation and its processes are all paramount to trust (and mistrust) deployment. In this context, the considered organisations' and structures' governance is crucial, since it is the maintenance over time of a positive reputation that drives the stakeholders to trust in the outcomes produced by the said bodies. In this case, the protagonists have a rational vision of these different entities and will only trust them (or not) depending not only on the actions but also on the proof of the activities they provide. There is therefore in confidence building an importance given not only to deeds, but also to the methodologies for demonstrating these deeds (Lewicki, Tomlinson & Gillespie, 2006). Trust is here based on cognitive reasoning, but not necessarily on financial gain and loss arbitration. Individuals invest in signals of trust, an incentive to respect commitments.

c) *institutional-based trust* depends on attributes specific to the organisation or individual, but is supported by the ability of the social system to produce trust. Confidence in professional associations or in a quality standard are constructed thereof. Zucker (ibid, 1986) identifies two types of institutional trust, depending on whether the object of trust is an individual or not. As such, she describes trust in an individual within an organisation, and trust in a structured body per se. Individualse can be trusted because they are "members" of something: a kind of quasi-tribal recognition of belonging to the same psychological or cultural movement. This reproduction of the "same" is emblematic of the "networks of influences" culture. It is infinitely dangerous in cases of lack of trust, because if individuals build the confidence that others can have in them by virtue of belonging to a network, the loss of trust in a single member of the network is transmitted as well in the negative to all the members of the latter group (Xia, Cao & Johansson 2015). In this context, the loss of confidence in a scientist raises doubts about the community as a whole, and so it is with politicians. In this continuum of institutional reliability, it is the third party that fosters confidence (e. g., the standards-generating organisation). But this third party is not a peer, rather it is a process involving experts. In order to establish norms of trust, the expertise provided by a potentially neutral standard-setting process could then replace the necessarily biased peer analysis. This may be an avenue to explore. All in all, institutional trust is based on a formal social structure such as standards, or the law, with contracts or processes guaranteeing individual attributes. However, from a completely different perspective, this trust in institutions can be analysed as a signal in itself, of the quality that the individual brings to his social system, thus referring not to rational trust but to generalised cultural trust. The same kind of typology can be found in McKnight, Cummings and Chervany (1998), who distinguish behavioural trust that is linked to a rational decision-making process from trust perceived as a capacity linked to factors that predispose individuals to be confident (due to their cultural background and even personality) and institutional trust which is linked to the presence of organisations and institutions—in a way, a state of mind (Mollering, 2006).

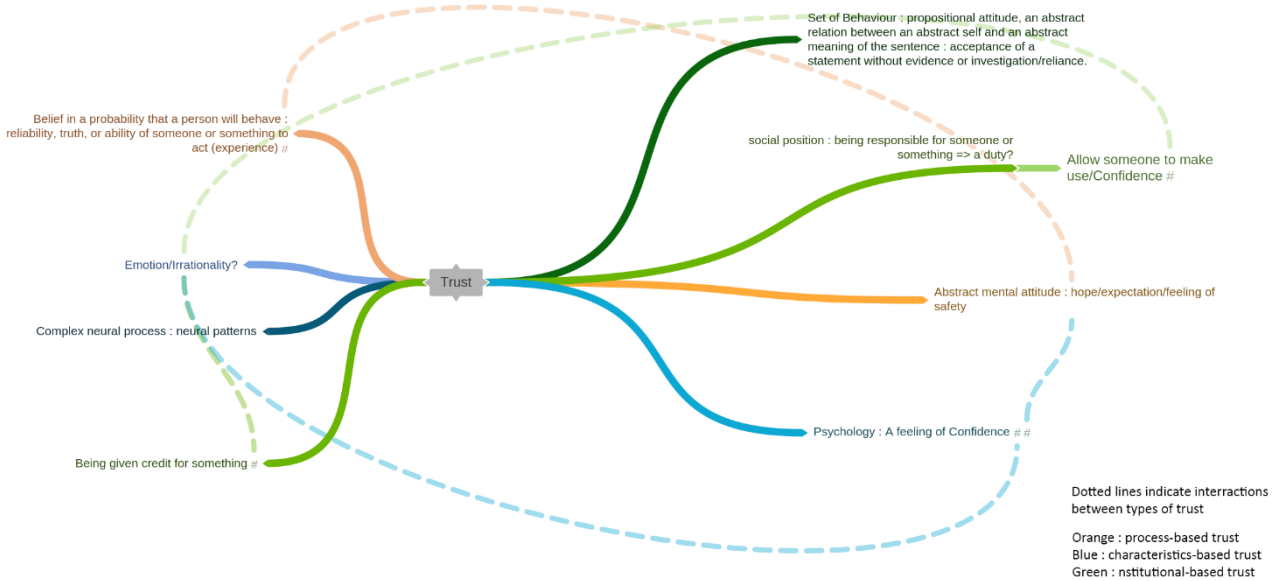


Figure 5 : Trust mapping

3.5. From trust to mistrust: shared signals but different interpretations

In short, there is so much vision of trust, so much understanding of the concept, and still such a lack of consensus (PytlikZillig & Kimbrough 2016) that asserting the lack of trust seems more than difficult. This allows us to state without fear that there is no global distrust, but rather occasional, specific and very focused distrust in particular areas or sectors, or perhaps in a given group of individuals. As a result, it appears from the multitude of possible understandings of the notion of trust (and lack of trust) that the problems cannot be assessed globally but preferably should be done contextually, as shown by the statistics mentioned in the introduction to this analysis; there is no general lack of trust, but rather an aggregation of micro-doubts that gradually build the lack of trust.

What we are now confident of, however, is that understanding trust requires knowledge about its modes of production, and that the same is true for the lack of trust. Also, in order to treat the symptoms of the shortage of confidence, it is necessary to understand their genesis, which we will do below through a number of approaches.

Likewise, trust being a three-dimensional construction that can only be understood as a belief whose foundations lie in its modes of production, we will verify if this is also the case for mistrust. In short, we will see if mistrust can result from a strategic decision that would be more than one socially oriented or individually learned and reflecting lack of faith. Indeed, the mode of production of this (mis)trust can reside as much in a strategic individual interest as in individual and collective learning or in a generalised, latent belief resulting from the economic and social context of reference but internalised by individuals. Personal trust (and mistrust) is based on the intensity of social ties; it is, for trust, a belief in the goodwill of the other based on experience, learning or personal proximity, whereas in a mistrust situation individuals are convinced that they are right not to trust, because promises have not been kept. It is also the (bad) collective experience that guides the lack of faith (Jones & George 1998). The DEFORM project has shown the importance of the concept of PROMISEOMICS in the design of research to avoid misconduct issues. It would therefore seem that it is also in this approach that one of the solutions to confidence-building is to be found. More than in the punishment, denunciation or ostracism that today constitute the majority of responses to the problem of trust, it may be that a *redesign of expectations and methodologies for the conception of research processes* can provide solutions, as we discuss later. Generalised trust emanates from the social structure; not based on a computational process, learning or experience, but on the macro social structure and internalised social representations. *Thus, the propensity to trust (and mistrust) is individual but results from micro, meso and macro determinants*. It is interesting to note that questions about the origins of fraud are based on the same determinants (Brinkmann & Lentz 2006), thus confirming that the elements that initiate fraud as well as appropriate conduct, just like those concerning trust and lack of trust, have identical roots but different readings; the concepts mirror each other, one side being positive and the other hazardous.

Indeed, if we take as a hypothesis that trust and lack of trust are built on the same signals but interpreted differently (Lindenberg 2000)—as sometimes seen in financial markets where analysts, based on the same data, draw the same conclusions—the objective signals of trust linked to reputation, institutional guarantees, whether they relate to the contract, the judicial system, the company's operating rules, quality standards or the legitimacy of a curriculum, can have the reverse effect from that foreseen. Given the formal or informal signals, the institutional guarantees inherent in the individual, the company or the quality of the country's judicial

system, can one consider "guarantees" as having enough "evidence" to rationally believe that the output will be positive?

It therefore requires guarantees such as contracts, sanctions, a legal system as well as institutional cues such as reputation to build trust (Offe 1999). Thus, to trust is to renounce a situation of uncertainty. However, if the guarantees are seen as insufficient or have lost their meaning, their value, a process of trust can equally perfectly—taking identical beacons as starting points—generate a lack of trust; and this is how doubt in a political or a scientific system may arise (Crocker, 2011). Solving this problem would therefore require rethinking trusted operators (institutions, etc.) as sociological actors whose outputs could be misinterpreted. This is also an issue that we discuss below.

Furthermore, in human relations, not everything can be foreseen in the framework of a contract, agreement or convention, either because the economic and social realities are too complex to be entirely predictable, or because in the context of a relationship there is arbitration between the cost of these guarantees to the transaction (in terms of time, resources and credibility of the sanction) and the costs generated by a failure of the trust relationship. In this “contractual trust” (a sort of reboot of Rousseau’s approach: Elsner & Schwardt 2015), mediation is provided by a third party, the judicial system that guarantees the relationship by offering credible sanctions for the improper performance of a contract. The understanding of this belief results from the ex-ante cost/benefit calculation at the exchange, the perception that the individual has of the guarantees at the exchange and his level of control. It would therefore be the breach of the social contract, or even more the failure to apply the sanction, that might generate the lack of trust.
In summary, the existence of a primary gap between the existence of a common law sanction for a given breach of contract (fraud) and the non-application of this sanction to a given field (science, politics, etc.) would be at the root of the lack of trust in these fields (Glover, 2018). If this is the case, a generalised application for all breaches of common law sanctions might be an appropriate response, but this must also apply. As the DEFORM project has again shown, this is not so simple.

The decision-making perspective is not only structural, it is also moral; it follows a logic suggesting that two individuals behave as if they were trustworthy. The individuals who trust are convinced that the counterpart will honour them, not because there is an interest but because their behaviour is guided by their individual characteristics which push them to act in benevolence, reciprocity, honesty, even altruism (Cugueró & Rosanas 2019). These individual characteristics are not all innate and are mostly within the context of the individual, the norms and values acquired by the individual within their ecosystem (family, etc.) In a way, there is a cognitive dimension to trust (Falcone & Castelfranchi 2001), and it is partly a matter of believing in the loyalty of the other. The latter may be based on its characteristics, or its attitude and membership of various groups. The decision of trust is therefore no longer based on calculation but on a belief, a more abstract cognitive state, *a faith in the honesty of the exchange partner*. The lack of trust would then result from a loss of faith in each other, a cognitive mechanism more complex to deal with sociologically than institutional reform (Remington, Abramson & Senyshyn 2010).

In this sense, personal trust results from the density of relationships between actors, whether they are part of socialisation bodies, the family or professional or friendly circles—it is the acquisition of “trust capital” through learning and experience in economic and social relations. By multiplying the experiences of connection with others, the trustor develops an ability to trust

based on their own values (trustworthy), on the sharing of common norms and values, on informational gains. Thus, trusters will trust because they themselves have acquired values which guarantee that they will be trustworthy. It incorporates norms of reciprocity, altruistic and honest values. These values are acquired through experience in a conscious way, whether in the economic sphere or not. But these same experiences, if negative, can become a "capital of lack of trust" that also grows, as counter-experiences accumulate (Damico, Conway & Damico 2000).

In conclusion, therefore, trust is not cooperation, it is the promise to deliver a social situation in a given field (as such trust is topical). It is a “belief” that determines the relationship in a situation of uncertainty. This belief is based on calculation but also on moral and social/cultural dimensions. Trust is thus action related, resulting from the combination of a number of social abilities and attitudes based on interrelations (need for a truster—a person who trusts—and a person who is trusted).

In its Kantian acception, trust can be active or passive (passive, habitual trust embedded in the social environment to active, reflective placement of trust in others.). This combination refers to an ability to trust. Cooperation in situations of uncertainty will depend on this individual belief.

As such, mistrust could appear when this promise to deliver a social situation in a given field is not fulfilled. The “belief” is betrayed, and the situation of uncertainty prospers. The truster is no longer able to trust, having experienced the betrayal of their belief; cooperation is no longer an option as the foreseen risk can no longer be contained but the trust contract: “mistrusting someone is not just a prediction of betrayal, but also a bad emotional feeling about the untrustworthy person” (Jones, 1996). Since humans inherently hate risk (Slovic, 1999), they will throw themselves into the arms of any organisation promising to restore the lost "agreement of trust". More than a "social contract", it is therefore the latter that should be reinstated to reduce the feeling of lack of faith expressed by the research community, but also shared by politicians, the media.... finally, a growing number of social actors.

4. Findings

4.1. Rising mistrust or scepticism towards science or the scientist: a question of communication?

Mistrust or scepticism just like fraudulent attitudes does not arise ex-nihilo; this is the result of certain practices which can be considered as having limited impact but whose repetition and accumulation can lead, on the side of the social actors, to increasing doubts about scientists, particularly because of the lack of sanctions, and on the side of the perpetrators to considering that there is statistically little chance in a given context of their being blamed in a context of peer-sanctioned processes (Kumar, 2010).

It could therefore be a combination of different factors, including the perception of the persistence of weak sanctions for proven misconduct or fraud in terms of research, combined with increased media coverage of such deceptive conduct that could be at the root of the possible wave of scepticism currently being experienced by the scientific community. However, what are these factors?

In recent years, misconduct cases have become more public and visible. However, it is certain that trust is based on a subtle combination of faith and doubt (Fensham 2014). This growing visibility has led to a questioning that, from the point of view of confidence in the sector, has simply unbalanced the vision that actors in the field had of their own environment (more so than that of society in general, which, as we have seen, majorly still adheres to science). Originally, the question for the players in the sector was no longer: is this visibility of fraud the outcome of greater vigilance or because cases of fraud in a fiercely competitive context have multiplied? "*It is impossible to say whether the increase in article retractions is due to an increase in fraud or simply to greater vigilance on the part of scientists, who are less and less isolated from each other. However, the percentage of items withdrawn on the specific ground of "fraud" has increased tenfold since 1975. It is unlikely that this alone is due to better detection*," (Fang, 2012). Indeed, vigilance is increasing with regard to misconduct, but the scientific community agrees that this more informed view is an effect of the multiplication of misconduct, and that there seems to be little reduction in misconduct due to heightened vigilance even though mechanisms are being adopted to organise better detection of fraud. The 2018 PWC report on Fraud (Pulling Fraud out of the Shadows) appears to confirm this vision.

At the same time, the degree to which one expects others to behave in a trustworthy manner is crucial for each individual willingness to trust. As such, expectation of trust in scientists affects the likelihood that this trust is well placed. In this context, the higher the expectation in terms of trust, the higher the achievement and higher the disappointment in the event of non-compliance with this expectation. Moreover, if the public has been satisfied and maintains its confidence in the scientific world notwithstanding the scandals, it may well have tended to gradually move away from ethical practices (Reuben, Sapienza & Zingales, L. 2009)

4.1.1. The lack of trust “little song”

Another finding of our analysis is that lack of trust does not arise quickly and autonomously. This requires consistency and above all a certain repetition of problematic facts (Hoog, Clement-Cuzin & Baudent 2019). Thus, *it is the repetition and viral spread of "fake news" that has undermined the credibility of digital media, as well as the multiplication of unfulfilled promises that has affected policymakers* (Cheurfa & Chanvril 2019). It could thus be repeated negligence, "tactlessness" in behaviour or the prevalence of conflicts of interest, all known to the public, which can, in the long run, build the foundations of lack of trust. To wit, a "little song" of the lack of trust would tend to become a symphony, at least for the stakeholders.

In research, the notion of neglect covers a series of behaviours which, although generally carried out less maliciously than recklessly, can harm other members of the scientific community by causing them to waste precious time trying to repeat pointless experiments, or by dragging them along paths of research with no potential.

In this context, what is pointed out can take different forms such as:

⇒ A lack of critical thinking about one’s own results, which are deemed valid without serious cross-checking.

⇒ Lax data management, either at the data capture stage, where conditions are not sufficiently controlled, or at the data retention stage, where data integrity is not maintained.

⇒ Lack of rigour in the choice of methods or analytical tools, or in the interpretation of the results they provide.

⇒ The non-disclosure of useful information, even essential to the success of an experiment, in the documents that report on the research work.

Likewise, the prevalence of conflicts of interest, particularly in biomedical research, has been continuously highlighted in recent years (Bekelman, Li & Gross 2003). Conflict of interest in research occurs when the researchers or institutes within the framework of which the research is carried out have particular interests that may have affected the fundamental obligations to be respected in research. It is not necessary to prove that the conflict of interest will inevitably influence a person’s behaviour. Strategies in this area are preventive; they aim to avoid situations that could have a negative impact on the most important duties of researchers or that could reasonably be perceived as such. In other words, conflict of interest exists when individuals who have been assigned a role in a decision, expecting that the decision will be made in the collective interest, have personal interests that may lead them to make judgments that are contrary to the collective interest. It also occurs when that individual tries to take advantage of that role for personal gain or benefit.

Conflict of interest is not misconduct in itself; it becomes misconduct when individuals actually give priority to their own interests (McTighe, 2019). It is first up to the individual to assess whether they have conflicting interests, and if so whether they can minimise their influence sufficiently to be able to discharge their role honestly and fairly. In any event, they must disclose such conflicting interests to other participants and/or to those who appointed them. Neglecting to do so also constitutes misconduct. For a group decision, the group should also consider whether they are comfortable with the presence of the person admitting to such conflicting interests. Since it is very difficult, if not impossible, to demonstrate that someone has in fact distorted the decision-making process by putting their personal interests first, it is essential not

to prematurely give rise to such suspicions or decisions with serious consequences, for example when someone's career may be affected or when large-scale funding is at stake. We will go no further here on the definition of conflicts of interest and their impact, as this has been dealt with in detail in the context of the DEFORM project (2018).

4.1.2. The presentation of events as a source of lack of trust

There is a possibility, sometimes, that the media coverage of problems and their consistently suspicious colouring—a simple mistake being sometimes presented as fraud (Carey, 2017)—becomes the root cause of the escalation in lack of trust (Pujas, 2006).

An act of scientific fraud (Ryan, 1998) is an action intended to mislead in the field of scientific research. It constitutes a violation of research and professional ethics in force within the scientific community. There are three main forms of scientific fraud: data falsification, data fabrication and plagiarism. In addition to these forms of fraud, there are other forms of behaviour, such as failure to comply with ethical rules and failure to declare any conflicts of interest, as seen above, which include scientific fraud in the broad sense of its unethical nature.

A conceptual severity scale can supplement these definitions. Plagiarism is stealing or copying from an author. It is certainly very unpleasant for the author who finds himself plagiarised, but it does not harm the solidity of the scientific edifice. Thus, on this conceptual scale, this represents the least serious type of fault. The most serious and negatively impacting fault in the scientific community is data fabrication. This is simply about concocting results. Although this is very serious from an ethical point of view, it should be pointed out that when the result has a certain impact, an attempt will be made to reproduce this same result and the fraud will be discovered. Thus, gravity is to be balanced by the concern among peers as to reproducibility
Falsification also poses the problem of where fraud begins and where it ends in terms of "beautifying" the data. The desired result will usually be supported with manipulated data so that they go in the desired direction. According to a leading journal in cell biology, *Journal of Cellular Biology*, which has software that automatically detects image retouching (using Photoshop and other image editing software), one study in five is embellished. This review found, among all the cellular imagery intended to be published, that these alterations concerned one-fifth of the studies. Why do researchers do that? Is that necessary? The aim here is to make the result more convincing, striking and impactful, thus giving the researcher an opportunity to be artificially more convincing and effective, motivated by the desire to build a reputation as a particularly skilled and competent experimenter, obtaining incisive results (Weissmann, 2006). The DEFORM project demonstrated the existence of a continuum of fraudsters (putting aside the large repeat offenders/fraudsters motivated by money and/or recognition from the scientific community) who engage in "small arrangements", to camouflage a standard deviation a little too large, to highlight a cellular reaction, etc. From a methodological point of view—for this sequence, if mentioned in the literature, finds its verification in the field—it is particularly interesting to note that some professions that now have a track record in the identification of fraudulent practices (particularly in the field of finance) are able to classify what, for them, constitutes this continuum.

Another interesting finding is that practices which, for researchers, fall under the definition of misconduct, are seen by these stakeholders (some of them being also engaged in research) as benign and without consequences. *Within research itself, there is thus no consensus on what constitutes benign infringement.* In this context, individuals are all the more encouraged to engage in activities that could be described as deviant, *as the institutional response remains weak and limited in scope and duration* (Drexler, 1993). Thus, in this galaxy of actions of greater or lesser gravity, only a few are likely to trigger either undoubtedly or partially some sort of legal response. The truth lies in the fact that perpetrators know that they incur—at least legally—limited risks and that they will in some cases be able to benefit from a certain leniency from their peers. Indeed, if the action is individual, the sanction is collective as it generates a real crisis of confidence in the scientific profession and in research activity in general (Andersson, 2015).

Concomitantly with the analysis of the notions of trust and mistrust, identifying factors that may induce lack of confidence in research is required.

4.1.3. Lack of trust: a symptom of higher societal demands and increased competition between individuals?

In international scientific competition, a country is supposedly falling back because its researchers do not publish enough. This idea stems from a secular trend that tends to subject all professional activity to quantitative evaluations (Dujarier, 2010 – Guskey & Sparks, 2000). “Bibliometrics” is the science that measures this publishing activity of researchers and academics. It is not simply a question of counting the number of articles but also of determining their “impact”, based on the number of times they are cited in other scientific publications. Bibliometrics is certainly of great interest for following the research movement. However, can it be used to evaluate the work of researchers or scientific communities?

This has been such a massive trend in recent years—in some countries such as China, where the government decided that all academics had to publish in international journals under penalty of sanctions that could go as far as revocation—that it was bound to have adverse effects, including transforming local universities into “*deviant entities*” (Hvistendahl, 2013).

In France, the Agence d’évaluation de la recherche et de l’enseignement supérieur (AERES) and all the major research organisations—Commissariat à l’énergie atomique (CEA), Centre national de la recherche scientifique (CNRS), Institut national de la recherche en informatique et en automatique (Inria), Institut national de la santé et de la recherche médicale (Inserm), etc.—have been adhering to this vision. Most sections of the National Council of Universities also use bibliometric indicators for recruiting and promoting researchers, funding research projects, etc. In 2011, a report from the “Académie des Sciences” widely validated the use of bibliometric indices for the evaluation of researchers.

Yet many questions must be asked. For example, have bibliometric indicators been seriously tested? Are they safe from manipulation? Many recent events show that these questions are justified. For example, on 24 February 2014, *Nature* revealed that several leading scientific publishers—including Springer Verlag—were removing more than 100 fake articles detected by a French researcher from their publications (Van Noorden, 2014).

Indeed, the environment for researchers has changed dramatically. Today, they are more than six million strong (according to the OECD), while methodologies, thought structures and academic formalism have remained almost identical since the last major post-war reforms and the creation of important research institutes (CNRS, NSF, etc.). The possibilities for professional development have thus shrunk, even as the populations concerned have continued to grow (Høstaker, 2000, 2005), generating what is now called hyper-competition and the emergence of "cognitive capitalism".

Hyper-competition has non-negligible effects on the scientific environment to such an extent that different schools of thought have emerged to promote a functional slowdown in research in favour of the precautionary principle: citizen science, itself based on so-called post-normal science (McQuillan, 2014).

The *first effect is the inversion of ends and means*. To reprise, researchers are judged by the quantity and quality of their publications. However, publication presupposes, at a minimum, the execution of a research program and, in this system for the allocation of project funding, the execution of a program presupposes the obtaining of staff and budgetary resources. The struggle for the appropriation of these resources is then a matter of survival. It is therefore no longer a question of competition but of hyper-competition, because the purpose (to make discoveries) has disappeared in favour of the means (resources). The search for funding becomes researchers' main objective. The production of verifiable knowledge per se is relegated to the background. Results, when not immediately usable, are demoted.

Robert Merton, in 1957, told the American Biological Society Congress, "*The culture of science is to some extent pathogenic. There is no merit, no reward, no recognition except for the first to describe a phenomenon, to make an experiment, to obtain a result. The second and third will get nothing before posterity*". This is detrimental, because this system puts the former on a pedestal without there being an immediate concern to ensure the reproducibility of the results and it is perhaps in this that the latter could have a useful role to play and could rationally be rewarded up to their contributions.

Reproducibility is indeed a criterion of serious epistemological validity of an experiment. All these articles would probably not be withdrawn if preventive measures were taken before publication. Moreover, this race to be the first can sometimes lead to taking liberties with scientific rigour: 2% of researchers acknowledge having falsified data or having occasionally deviated from the ethical rules of research (Fanelli, 2009). An unknown trail leads more often to a dead end than a gold mine. For statutory researchers, it is simpler and more cost-effective to refine their previous work to the extreme and to multiply publications (the practice of "salami-slicing"), even if each of them is only a slight variation of the others. Consequently, this encourages the contemporary trend wherein scientific literature is largely standardised, predictable and without real added value.

The percentage of articles withdrawn is about 0.1%, (a minuscule minority), but often the articles withdrawn are among the most scrutinised, those that appear in the most prestigious journals (*Nature*, *Science*, etc.) and will sometimes be the subject of attempts at reproducibility, at least more often than less noticed articles that appear in less prestigious journals.

It can therefore be assumed that there is a share of articles published in numerous second-rate journals which are just as fraudulent in nature but for which no one has taken the trouble to establish that they are fraudulent.

Would the editorial boards of the major journals be more attentive so that so many frauds are detected within the publication? Some researchers appear to have the following reasoning: even if it means engaging in a form of fraud, as much as the game is worth the candle, if you are going to cheat, you might as well do it for something that looks innovative. Moreover, in some countries such as China, budgets are allocated to researchers according to the prestige of the journals, and to publish in these journals, significant results are required.

The second effect, a corollary of the first, is that this *hyper-competition encourages deviant behaviours* (Edwards & Roy 2017) which are themselves more publicised than virtuous ones, and thus encourage mistrust. The search for funding has become so important, in the perspective of an academic career, that in response many scientists are willing to deviate significantly from the basic rules of scientific ethics. Attempts at corruption are becoming more frequent, fraud cases are constantly on the rise and are reaching worrying proportions.

The third effect is that *the time devoted to fundraising devours that devoted to "laboratory" work*, i.e., the actual work of the researcher. It is not uncommon for a scientist to spend 30 to 50% of his working time writing projects. Moreover, this effective working time is reduced by many other factors, notably communication on scientific networks, posters, which replace action by maintenance, "updating the profile" of the researcher, who in this hyper-competitive environment has no choice but to put himself forward by all possible means. The Anglo-Saxons sometimes use the term "Big Science" to define contemporary science. Every year, $1 trillion is invested in science (1.6% of world GDP). From the 1950s onwards, there was a proliferation of major scientific projects, first in the United States and the Soviet Union, then in Western Europe. To carry out these programs, it was necessary to call upon a large number of scientists, in particular PhD students or equivalent.

There was, thus, sustained growth in scientific employment, assisted by (and helping) the democratisation of higher education. Once integrated into the research system, doctors trained to become professors in their turn moved relatively quickly to a status where they could recruit doctoral students. Such a circular logic could only last with an increasing injection of credits and could therefore only be conceived in the long-term during periods of strong growth. As a result of this financial influence, fund-raising is taking up more and more space in the researcher's schedule, which further reduces the actual research time.

It is these different societal expectations of research outputs, if they are known to the general public, which tends to be the case, that are the roots of lack of trust. Indeed, what should one think of a result that is notoriously under influence (Yan, 2018)? How to subscribe to such finding?

Competition may generate fraud, but it also gives rise to a succession of "bad experiences" with regard to the research that underlies the lack of trust. This is all the more so as in these times of overabundance of liquidity; the appetite of the markets for promising investments is such that the time required for scientific verification and precaution is often ignored, even on subjects as serious as gene publishing (Waltz, 2018).

It would therefore be in the acceptance by funders and the ecosystem that research may not succeed in the temporality of the measurement of economic efficiency (which is in the order of the quarter) that the solution could be found (Schmoch, 2007)—the promotion of a research time that would be different from economic and financial time. But is this acceptable, if not possible, for environments that are subject to the expectations of financial markets? This has yet to be demonstrated.

4.2 Lack of trust: a question of limited and unreadable sanctions.

Since the theme of scientific misconduct has been considered in some media and scientific literature, the behavioural analysis of the reason of fraud or misconduct in research has been *pointing* most exclusively to the individual, the researcher who is at the heart of the sanction and whose responsibility seems complete. Yet, a growing number of stakeholders now also envisage that the research ecosystem and the academic work environment might also be faulty (Brown, 2013). Indeed, the research process is becoming more and more collective and is embedded in political and economic settings. It is, therefore, necessary to put things in perspective and grasp the diversity of forces at play in the researcher's workplace, and even more, what is the extent of the current legal arsenal if any targeting scientific institutions (and not the individual researcher), before turning attention to the shift from individual to collective responsibility.

Some whistleblowers deplore the lack of transparency of internal investigations and the superficiality and innocuousness of sanctions in the light of the various media reports of fraud. In this respect, the DEFORM project not only reported on the very limited number of frauds that are discovered or even brought to court but also on the lack of severity and readability of the sanctions. How can the public understand that a bank fraud brings its perpetrator to prison while a research fraud whose consequences can be much more serious goes largely unpunished, unless it can be read as a common law legal issue (e.g., intellectual property issues, poisoning, forgery, etc.) rather than as a mere search fraud. Furthermore, even where institutions can deploy internal processes to avoid research misconduct as a token of integrity, the implementation of institutional rules remains mostly in the hands of the practitioners themselves (at all levels, as based on reporting) and the translation of internal sanctions into legal actions is rare.

In Canada, for example, the three federal research agencies (SSHRC, NSERC and CIHR) created the Group on the Responsible Conduct of Research (CRG) in 2011 and drafted a framework of good practice to which all universities are required to adhere. Both researchers at the micro level and institutions (at the mezzo: laboratory & macro: institution level) must report allegations of fraud they receive and submit their investigation report to the PRCG, which may go as far as to terminate funding or request reimbursement of funds paid. The obligation to respect the terms of reference rests with the researchers, but also with the institutions. "*We do not have the right to do our own investigation, but we can ask the investigation committee for clarification. Furthermore, we also require that at least one member of this committee be external to the university*", says Susan Zimmerman, Director of the Secretariat on Responsible Research Conduct.

The competition inherent in research, once motivating, is now creating an increasingly unhealthy work climate, as budgets shrink and the number of positions dwindle. Rather than throwing stones at individuals caught in the wrong, the academic world denounces the vices of

the system. “Cheating is inexcusable, but it is a sign that the very precarious research conditions have perverse effects. The system is not working well, and the situation is very worrying”, says Charles Dupras.

Figure 6 : The trust gap : from hyper-competition to confidence loss/mistrust

Like him, many scientists are sounding the alarm. On the web, blogs that track down fraudulent articles, doctored photos or plagiarised texts flourish. On one of them (now closed for legal reasons), Paul Brookes, a researcher at the University of Rochester in the United States, recorded more than 500 suspicious images in 300 articles in six months, thanks to dozens of informers, most of them anonymous.

“*It is very difficult, if you are a simple student or a young researcher, to openly denounce the bad practices of others without jeopardising your career, especially when they have presented important results*”, says Professor Fantechi[6] quoted by Anne Laure Nouvion, a neuroscience PhD turned science coach. According to several studies, almost half of all cases of misconduct are never reported to the institution’s authorities. “*Fraud investigations are conducted internally by universities that have no interest in losing a research eggbeater, even if he cheated, who raises several millions of US dollars in scholarships each year*”, comments Paul Brookes.

4.2.1. Mistrust and trust: embedded notions.

As we have stated earlier, distrust seems to require several points of support. It is never the result of a single factor and remains predominantly cognitive, built on: knowledge (drawn in particular from practical experience) and non-knowledge (degree of uncertainty characterising situations and interactions). In all the cases we have considered, these two intervene in a preponderant—though not exclusive—way, whatever the differences between the situations or issues specific to the contexts of the situations analysed. Having the ability to choose the

[6] Professor Fantechi is a full professor at Sissa (https://www.sissa.it/), an Italian excellence centre, where she teaches in the PhD program in Geometry and Physics and in the Master program.

adequate curriculum and succeed, limit fraud in scientific and research work, protect oneself against social betrayal or prejudice.

However, this does not mean that mistrust and the reactions it induces would always be the result of a rational decision taken on the basis of the information held by the involved individuals; rather, they seem to be the consequence of facts assessment and “emotional” and practical learning correlated to the recurrent confrontation with a certain environment or experience. Our case studies show that situations where uncertainty about what is factually happening (e.g., lack of success after a wrong curricular choice influenced by wrongly answered questions, lack of trust after a misplaced answer to a given query, adjuvant in vaccines) and what is likely to happen is high, and therefore constitutes an intrinsic part of the action, are particularly conducive to the development of mistrust, as are those involving the repetition of experiences that we have summarily described as negative (lies, malicious acts) or that generate a destabilising surprise effect. It should be noted that these situations are often embedded in the ordinary life of the concerned individuals (work associates, social neighbourhood), they are sources of affect (fear, worry) and can involve "strong" ties—relationships based on solid inter-knowledge and where benevolence and relationships of trust or loyalty usually prevail (Schehr, 2016). The cases above-mentioned indicate in any case that new, unusual, unreadable or "unfamiliar" situations cannot be considered as exclusively being the roots of mistrust (Lau, 2010). As such, mistrust cannot be reduced to a single mode of expression. It can therefore take a different form depending on the context, the issues underlying the situation and the actors involved.

Mistrust is thus likely to experience a certain gradation in its intensity, deployment or temporality, it may be of the order of attitude or it may also be part of the strategy. In the case of war zones or unsecured environments (Ember & Ember, 1992), it appears as a widely shared, common and systematic attitude, affecting several dimensions of the subject's experience.

The war zone examples show that mistrust can be expressed in various ways and that it is always related to a given context. But they also reveal that, even when it tends to become systematic, it cannot become definite. Indeed, in the cases studied by Ember and Ember, mistrust always involves a minimum of trust, which is in fact congruent with what Hardy, Phillips, and Lawrence (1998) argue by distinguishing the concept of trust from that of confidence. It is because individuals trust their skills and personal information, which they consider reliable indicators of the presence or probable occurrence of a danger or other harmful event, that they adopt such an attitude and the practices that result from it, i.e., they mistrust. It would therefore be in the face of danger that a lack of trust in science would develop. There is a great deal of common sense in this statement when we consider the cases of scientific validation that have supported asbestos (Ruff, 2012) or tobacco consumption (Calfee & Ringold 1992) or more recently opiates (Volkow & Collins 2017), various elements that have actually been shown over time to carry health risks.

These elements of information—which are mainly drawn from ordinary experience—act as warning signals which, when they multiply, are in the end routinely accompanied by a number of signals that we can define as “affects” such as doubt, fear or worry, creating cognitive and emotional learning of distrust. Mistrust is thus even more a trauma because “usual” environments are not organised, with few exceptions, on the basis of doubt or mistrust (Kydd, 2000, Moss, 2007). Indeed, a large part of most individuals’ daily life is based on passive trust

and a kind of tacit adherence to things and appearances, an attitude that is never completely or definitively altered by the situations that give rise to distrust.

In this context, the examples considered show that even the so-called *suspicious agent* continues to rely on expectations and knowledge that they believe to be shared, in other words on the fact that events will happen in the future as they usually do. This last point seems particularly revealing; the lack of confidence thus presents the same organisational mechanisms as trust-based processes. Mistrust, even when it becomes widespread and permanently entrenched, is therefore not incompatible with trust—at least some of its forms—and cannot therefore be characterised by the latter's absence. We can therefore only agree with Hanna Arendt (1958) when she argues that mistrust is much more than "non-confidence" and that these two notions, while well-articulated, do not necessarily belong to a common continuum or process (mistrust as the opposite pole to trust). According to Meyer, Ward, Coveney and Rogers (2008), while commenting and extending the social theories of Giddens and Luhmann, the opposite of trust is not mistrust but a form of "anxiety", with trust implying a sense of security. In this context, the differentiation between trust and mistrust would therefore partly depend on the type of possible issues anticipated by agents according to the way they interpret experiences (benevolence/malevolence; security/danger) and on the forms of emotions that accompany those. This roughly results in two opposing attitudes built on the same framework. While the "confident persons" wave aside doubts about others and rely on them, ignoring voluntarily the risk specific to the situation in which they find themselves and accepting this state of, in a way, dependency, "suspicious persons" cannot—because of practical experience (past and present), their perception of the situation, their skills, but also their beliefs and emotional state (anxiety, fear)—ignore the risk they face and the uncertainty that characterises their context of action.
As a result, such individuals will object to certain forms of delegation and the resulting state of dependence (Whaley, 2001). However, contrary to what is often said, this does not imply that mistrust necessarily tends to stop action or make any relationship or cooperation impossible. Even if such situations are often accompanied by negative consequences, they nonetheless allow the concerned individuals to take action in the particular contexts in which they evolve and to face certain situations with which they are confronted in their daily lives; this is even necessary for action, in certain circumstances.

This vision of two interdependent notions makes it possible to consider the idea that it is perhaps delicate to capture the lack of confidence, quite simply because it is complex to nuance the visions, i.e., to determine what is seriously related to the proven lack of faith, compared to the feeling or the suspicion of lack of trust (Wicks, Berman & Jones,1999).

4.3 Using trust indicators to capture the reality of mistrust and solve it?

Mistrusting " knowledgeers " or experts, in short all those who, in a way or another, have a voice that speaks, has become in recent years a recurring antiphon that seems to amplify without these same knowers seeming to be overly moved or giving tangible guarantees of change. Even more worryingly, researchers are also increasingly in the public eye. Society sinks into an apprehension, where no one will have anything to gain in the end. This widening gap is extremely worrying, because it is far from new.

If we look at the tools used to measure trust indices, we see, in the background, that the question of lack of confidence is systematically raised. Indeed, surveys are essentially built around

closed-ended questions whose answers are either binary (yes/no) or trinary (yes/no//no opinion). In addition, the different types of trust are discussed, from interpersonal trust to institutional issues (Sturgis & Smith, 2010). Confidence indicators (of which Edelman is an emblematic example) would therefore make it possible to measure the lack of confidence, which opens the door to models using data science technologies, as we have begun to do in our case studies.

The Endelman Trust Barometer has been measuring the trust index assigned to four categories of institutional actors around the world: companies, governments, the media and NGOs.

The sample on which the Edelman probe is built is far from being a wet-finger panel. The survey is conducted in 27 countries among 33,000 respondents aged 25 to 64 with a high level of information on socioeconomic issues. In other words, the corpus is robust enough to provide an edifying grid of readings and comparison over the years.

According to Edelman's annual investigations, it appears that confidence is crumbling relentlessly, despite some sporadic rebounds. Thus, as early as 2003 the Trust Barometer had already noted a *shift from trust in authorities to trust in peers*. The advent of social media has only clearly validated and amplified this trend, which has now become a relational paradigm. Since 2006, another factor has also emerged, almost as a matter of course in digital 2.0: *the concept of "person like me" being able to be a credible spokesperson.*

Newton, Stolle and Zmerli (2018) reckon that over the past twenty years a very large gap has opened between the elite, those who have the power to “dictate” trends, and those people who do not have the power to do so. They see this as a global crisis of representation that affects the old republican social contract. Every society needs to say to itself and to tell itself. Even if the speech is only ritual, it serves as a common reference or storytelling. This function of a society able to tell/say is for clerics.. However, today the discourse of clerics no longer corresponds to reality. This break-up introduces a feeling of global lies. Individuals no longer feel represented. So, they assume that they are misguided, if not betrayed.

When the Trust Barometer takes a closer look at the levers that build public trust in leaders, part of the answer can be identified. Many executives from all domains are currently agog with excitement about their good students who have been ranked by the countless polls of the most admired organisations. Similarly, they do not hesitate to focus—depending on their nature—on their financial performance and dividends paid to shareholders of companies or other types of bodies, on partnerships with NGOs, associations or government agencies in the context of ambitious and attractive sustainable development or social responsibility programmes. Substantial sums are even spent on communication operations to completely convince audiences and build a flattering reputation for themselves.

4.3.1 Communication as a solution?

Even if this diagnosis established by the Trust Barometer is clear and should invite organisations to reflect on their future strategic orientations, the balance is not just going to shift back on the right side of societal trust at the snap of a finger. Just as a reputation takes time to grow, restoring trust requires will and patience. This is especially so in the contemporary

context, wherein large companies, institutions and their managers are often viewed negatively, and are thus mostly untrusted (Brion, Mo & Lount Jr, 2019).

Paradoxical though it may seem, given that communication among stakeholders is frequently fraught with doubt, it is nevertheless addressing the latter that is mostly invoked as being vital to create lasting trust between all stakeholders. When asked what a manager and his organisation must do to build this trust, 82% of respondents cite clear and transparent communication. Similarly, 81% advocate that the discourse be true even if it must be unpopular or unpleasant. Other behaviours expected of a manager include regular engagement with employees on the state of business (79%) and an increased presence in the event of a crisis or serious problem (79%). On the other hand, it is quite amusing to note that only 69% of them now want to see their managers invested in noble causes and 53% for them to be active on media. Alas, even today, these two pursuits are the non-negotiable priorities on the agendas of leaders!

4.3.2 Debate and transparency as a tool?

To overcome this mistrust that repeatedly plagues the most ambitious communication strategies, some voices are calling for greater transparency within organisations and greater debate acceptance and engagement with stakeholders. Faced with the long-decried opacity and bludgeoning, unilateral communication, the societal body no longer hesitates to demand greater transparency.

This transparency must necessarily and intrinsically be accompanied by tangible acts and a demonstrated willingness to engage in dialogue. Invoking transparency is not enough to generate trust (Abelson, Gauvin, MacKinnon & Watling, 2004). Indeed, *the multiplication of transparency initiatives does not automaically generate an increase in confidence*. As much, an overzealous crusade is hardly advisable; transparency at any rate does not necessarily bring confidence. During the inter-war period in the 20th century, the American guru of communication and public relations (and CEO of AT&T) Arthur Page already had solid convictions about what inspires and guides the perception of opinion and the trust that may or may not result from it (the now famous “Page principles”): "*The public perception of an organization is 90% determined by what it does and 10% by what it says*" (Rawlins, 2007). In other words, the culture of honest, concrete and sustainable action must be given priority over the occasional agitation and speeches with one hand on the heart. In terms of trust, the benefits may take longer and be more complex to reap, but they are of an infinitely and incomparably superior quality, which no single communicating device can replace. In this era obsessed with short-term thinking and return on investment at all costs and sometimes at cut rates, this is a path that new generation communication could successfully explore (Kirchgässner & Pommerehne 1993). The lessons of the Edelman 2019 Barometer Trust only reinforce this urgent need to rebuild the communication of leaders and companies.

As such, and to conclude this analysis, mistrust presents certain structural and functional similarities with trust. As previously detailed, it presupposes, like trust, points of support for development such as information, experiences and more. It can also be noted that all the forms of distrust we have mentioned imply an expectation, just as they also include a dimension of belief. Based on their experience and the situation they face, those moved by suspicion expect to be the victims of harm or to be exposed to danger, believing in the unreliability of others or in their malicious intentions (Weiss, Burgmer & Mussweiler 2018). Mistrust is therefore also

an extrapolation; it develops from imperfect or fragmentary information available to the individual, based on experience (Alesina & Ferrara, 2000). It thus involves, like trust, a certain relationship with the future. By seeking to determine the possible consequences of its action or commitment, those possessed by suspicion anticipate the future, isolate scenarios and act as if they were somehow certain of their realisation.

4.4 Must the response to the research "confidence crisis" be legal?

Issues related to poor research practices are quite differently addressed in countries. The DEFORM project, for instance, details three types of legal frameworks that exist to tackle the lack of trust in a scientific environment:

1. An approach based on the a priori existence of legal provisions from which processing procedures derive directly, as in the United States and Denmark.
2. An approach covering countries without national rules, but where scientific institutions have adopted codes of ethics or codes specific to scientific integrity, such as Germany.
3. An approach concerning countries in which the maintenance of integrity is not codified either by law or by a charter, but remains a local initiative, in which treatment is dealt with on a case-by-case basis.

The responsibilities of researchers have to be mitigated to be combined in the relationships they maintain between themselves, through direct relationships between colleagues (collaboration, paper signatures, etc.), but also in those relationships in which they are collectively taken as producers of new scientific knowledge.

The proposed systems are based on the visions of trust as discussed above. Trust is both personal and systemic. If the system has failed and people have failed, how can we restore the link and, above all, will it address the problem of a feeling of lack of trust? As we have seen, there is, with regard to science, a certain stability of the doubt curve. Without even acting, it indicates a 70/30 stability rate of confidence in science and scientists. Two questions then remain: (1) Do we want (and is it necessary) to reach the remaining 30%? (2) Is this proportion of the population permeable to the proposed reforms? Nothing could be less certain.

4.5 The Institutional approach: governance and the issue of trust

Answering the trust issue implies focusing on either a fully individual or an institutional response; in other words, responsibility and accountability.

However, asking this question in the context of research and science implies a differentiated approach. Schumpeter (1951) clearly differentiated between the production of knowledge—scientific concepts or knowledge qualified as primary according to Morvan (1991)—and its transformation by economic actors, constituting innovation. The OECD, as early as 1963 with the Frascati Manual, adopted this process-oriented and multifunctional vision that Porter (1977) later called a value chain: "the innovation process covers all the scientific, technical, commercial and financial activities necessary to go as far as the successful marketing of the new product or service or until the effective implementation of the new way of doing things".

If misconduct occurs as soon as knowledge is produced, it cannot be understood without integrating the fact that it will lead to transformation into a new use, process, good or practice. Scientific research contributes more globally to innovations that many authors historically have sought to qualify and classify by adopting different theoretical perspectives. As Romon (2003) explains:

- Incremental, radical innovations, with more or less evolutionary perceptions (cf. Freeman and Perez, 1988);
- Niche, breakthrough, architectural or current innovations (see Abernathy and Clark's (1988) transilience map), depending on the degree of obsolescence of technological skills and the level of destruction of commercial relations;
- More systemic technical or organisational innovations (Alter, 2000).

Therefore, the lack of trust will produce its effects not only on the research institutions, or the researchers as individuals, but also, and this might be the most serious threat, on the output of research itself.

Governance is a common term in management literature today. Charreaux (1997) and Caby and Hirigoyen (2001) agree on defining it as the set of measures designed to supervise the autonomy of managers and executives. According to the analysis of Berle and Means (1932), governance became necessary when property and decision-making rights were separated in companies, a prelude to the institutionalisation of managers and organisers of large American companies (cf. La main visible des managers, Chandler, 1977). The opportunism of non-owner managers had then to be supervised and, if necessary, sanctioned by shareholders. Governance was therefore initially part of the regulation of the manager–shareholder agency relationship, with the shareholder delegating his decision-making power over the capital entrusted to the manager in return for a return on investment (see the strict definition of Shleifer and Vishy (1997, p. 2) "cor*porate governance deals with the ways in which suppliers of finance to corporations ensure themselves of getting return on their investment*").

However, this hierarchical vision of governing/governing relations between funding and research conceals several characteristics specific to research and innovation: uncertainty (and not only risk), complexity, and the fact that it is difficult to measure (a fortiori financially) the outputs of research or innovation as long as the latter does not give rise to a purchase by a beneficiary that attributes a value to it and the difficulty of modelling the relations between the results obtained and the resources mobilised. A rational cybernetic control model does not apply. According to Hofstede (1981), this model is only relevant under four conditions: absence of ambiguity of objectives, measurability of results, good knowledge of the effect that interventions will have in the process, repetitiveness of the activity. Failure to respect these conditions makes the research/innovation process not a profit centre for a client but rather an "organised anarchy" whose decision-making processes fall under the garbage can model (Cohen, March and Olsen, 1972), a model till recently perceived as relevant for universities or political organisations coordinating professionals from different fields (Bendor et al., 2001). As Bouquin and Kuszla (2014, p. 123) have pointed out, it is in these organisational situations that "the failure of control gives rise to multiple sources of power", where the coherence of goals is not sought and where professional misconduct can go unnoticed or even be encouraged. Control, and therefore governance, takes other forms of rationality.

The governance of the research–innovation processes is effectively not limited to a single client/researcher, funder/institution or team relationship. Even in the field of management, authors quickly highlighted "partnership" governance beyond shareholder governance. According to Charreaux (1997), for example, the partnership governance system is the set of mechanisms that define and delimit the discretionary space of leaders. This vision, always centred on the manager, makes it possible to go beyond the shareholder vision, reductively based on the contribution of financial resources alone, in order to better understand the relationships existing between the governance system and the creation of value. The governance of an organisation is then part of a network of relationships established between several stakeholders; shareholders, managers and the board of directors on the one hand and customers, suppliers, bankers and the business community on the other, within the framework of determining the company's strategy and performance. The concept of corporate governance here refers directly to the influence of strategic decisions on value creation. However, it can still be interpreted in a very contractualist way; the control of relations between stakeholders could be ensured by contracts of objectives/means with each stakeholder. Such a design is not applicable to research/innovation processes. Even if several companies adopt management by objectives (MBO), including financial objectives such as return on investment or creation of economic value (EVATM, Gleadle and Haslam, 2010) for the control of their research processes, this contractualisation is not systematic, and in all cases remains internal (managers/managers–researchers) or is extended to direct research actors (subcontractors, consortia, partnerships) and has several limits (Kuszla, 2007). Direct contracting with actual members of the corporation potentially affected by the R&I process does not exist. Societal governance takes more elaborate forms:

- in terms of influence (e.g., lobbying)
- via elective or non-elective governmental or supra-governmental bodies, which may, in part, enter into contracts,
- normatively, via hard or soft laws.

4.6 The different governance bodies and their role in building trust (or not)

The structures that support the research and innovation processes are therefore multi-stakeholders and influence both research and innovation decisions, the research/innovation activities themselves and the individuals acting in that process.

These actors are diverse: public, private, governmental or not, national, international, specifically dedicated to research (CNRS, Pew) or associated with an education and training mission (business schools, universities), focused on the dissemination of research (journals), driven by a vision—and a mission—and above all commercial (companies).

The same is true of their governance structure.

In this way, they maintain a certain biased view of their environment, a strong tendency to protect the institution at the expense of establishing processes of trust in the ecosystem (Sheehan, 2007). This is particularly evident in the way methodologies and organisations are set up to deal with real or suspected research fraud or misconduct, which are, as has been said, at the root of the problems of trust in scientific institutions more than in science itself (Funk & Rainie 2015).

Nonetheless, it has been demonstrated by the EU-funded SATORI and DEFORM projects that while these actors interact with each other and in their own political and economic environments, they set potentially divergent research/innovation objectives and seek—or not—to limit any harmful impact of their innovations (Sheehan, 2007).

It is this context of doubt as to the strategic choices of researchers and their adherence to the general interest that seems characteristic of the question of trust or distrust in them. As such, the problems posed to economists following the financial crisis are emblematic, because it seems that *personal benefit has often outweighed the caution that should have been exercised in the deployment of models designed and proposed by researchers* (Argandoña, 2012). Before going further, there is thus a need to characterise governance structures, their possible strategies and why they have limits in the context of a trust-building framework.

4.6.1. Governance structured by institutionalised actors.

These governance bodies know how to confront difficult or complex problems but are weakly armed to organise themselves to face pernicious issues (Stoett, 2012, 2016). The governance bodies of public or private research each reason in their direct sphere of influence—the career of scientists, the choice of financing national or supranational scientific projects in the case of the EU, a discipline, or even the only fundamental research in a given discipline, the budgetary allocation of universities, or for a company the development of products or services likely to generate a return on investment. While these problems can be described as complex at the level of each governance body, they can still be resolved because they do not challenge social values and institutional conceptual frameworks, and when the solution to the problem is found it seems all too evident. Conversely, questions that have an impact on "social values and institutional frameworks", which "defy (easy) analysis and have no obvious solutions", are called "wicked issues" (Stoett, 2012, p. 37). However, societal expectations regarding research and science might raise ticklish problems: environmental issues, economic development issues, security and global health issues, etc.

These issues require that governance have:
o greater adaptivity, as they constantly evolve with stakeholder representations (Stoett, 2016),
o broader scope, because the decisions taken by the authorities rarely concern a single actor,
o and a more systemic understanding of the direct effects and externalities of research processes, necessary for decision-making, steering and evaluating R&I processes (cf. Roy-Lemieux, 2018).

Cruz-Castro et al. (2005) analysed the emergence, dissemination and adoption of the Parliamentary Offices of Technology Assessment's (POTA) technical assessment in different national, particularly European, contexts. They established a typology of these bodies according to the type of major actor in the structure: politicians, scientific experts, or representatives of society—political, technocratic and social. Several conceptions of the construction of science/policy decisions are therefore at work in different countries at the time of this study. However, beyond the very composition of the bodies, it is necessary to identify their evaluation logic. Delvenne, Fallon and Brunet (2011) have deepened the study of "parliamentary assessment" structures, and their conclusions are quite radical in terms of dominant type of control. However, Faucheux and Hue (2001) stressed the importance of participatory methods (Delphi, relevance trees, method of scenarios, etc.), known in the field of management and

economics, to generate creativity and allow the construction of shared representations between experts and representatives of the public world around environmental issues. As early as 1995, Faucheux and Froger argued for the use of more flexible decision models in uncertain processes (Faucheux and Froger, 1995). Governance does not only concern the evaluation of research but also addresses the co-construction of a "social contract" between science, technology and society.

We can summarise, in the following figure (Figure 7), the characteristics of the two forms of governance and the control of evaluation processes suggested by previous work.

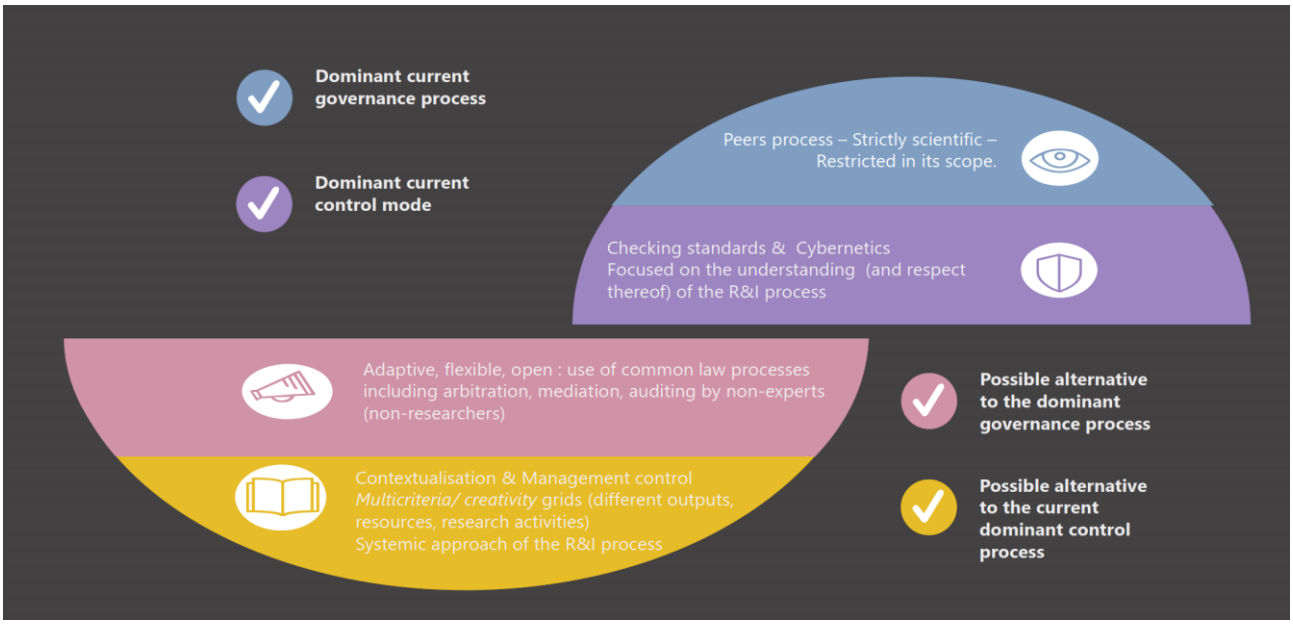


Figure 7 : Governance grid of the R&I processes.

Another approach is the mobilisation of a specific professional category, known as experts, concomitantly to the institutionalisation of the scientific "Council" both as a governance structure and as an activity (advisor). Today, "scientific councils" are available at all levels of governance (UN, EU, States, Agencies, research organisations, universities, foundations, projects, internal corporate R&D departments, etc.), but without necessarily creating interactions between them. Glynn, Flanagan, Keenan et al. (2001) studied, on the basis of the work of 12 researchers, the composition and functioning of scientific councils (advice structure) in the framework of the European ESTO project. Their analysis reveals nine key characteristics of these structures that we can express through nine questions:

- Who is at the origin of the Council—initiation: head of government, ministry, legislature, public, other advisory body, self-initiated?
- Is the structure created permanent and what is its status—status/permanence of body: statutory, non-statutory, fixed-term ad hoc body?
- What is the scope of action of the Council—scope of action: purely advisory, monitoring, licensing, setting standards, wider legislative function? This is the very purpose of the Council that is described (what for?).
- What role does the Board play—role: risk assessment, risk management? The authors here are interested in the control phases taken over by the Council. Assessing and managing risks related to R&I processes are two different approaches. The second involves steering and actions vis-à-vis the community and the managed process.

- What is the scope of competence of the Council—remit (competence): narrow, , broad, no remit?
- How does the board establish its opinions and with whom—consultation: no external consultation, interview, consultation process aimed at other experts, consultation process going beyond scientific experts to include stakeholders?
- What are the Council's research activities, is it an agent or examiner—research: reviews research results or able to commission or conduct research?
- How does the Council report on its own activities—transparency: reports via published report, partly transparent like open meetings, very transparent minutes/agenda, other information on web?; and finally,
- How inclusive are the different stakeholders—composition: scientific or mix of scientific and non-scientific experts, and are legislators involved?

Glynn, Flanagan, Keenan et al. (2001) demonstrate the diversity of these governance bodies. Even if they clearly analyse the limits of their segmentation and the specificities of certain countries such as France, where the legislature plays a major role in the definition of the scientific councils, they reveal nine major characteristics, each of which implies two to five options. Thus, there are potentially 43, 200 governance configurations that can be modelled. The dimensions they highlight make it possible to draw up a profile of scientific governance bodies.
However, the effectiveness of these governance structures cannot be prejudged. Nonetheless, the question of the adequacy of these structures and their operating modalities for the R&I processes at stake has been studied. Misconducted research begins when the governance body is not in phase with the R&I process, its business model and context. Examples are: when teacher-researchers are evaluated as full-time researchers; when principals require partnerships to solve research problems that are ultimately simple and marked out, thus creating coordination costs and potential inconsistencies, and vice versa; a top-down and linear approach to the problems is recommended by the governments of the R&I process, whereas the research problem is complex, even pernicious, and has a strong societal impact.

It is in this gap between governance on the one hand and R&I processes on the other that the roots of research-related trust issues lie. Indeed, as Zucker (op. cit.) points out, trust also comes from a positive institutional experience. If civil society does not have this background, in particular because of misinformation, including from the organisation itself, it will tend not to trust the organisation. It is therefore more in the conformity of governance with the process of seeking knowledge than in the process of governance per se that institutions should seek tools to rebuild trust. However, this does not seem to be the case, because what is highlighted is the existence of governance or its absence, rather than its design or architecture.

The proposed solutions must therefore be confronted with the characteristics of the R&I process, particularly when this implies a scientific and political confrontation.

4.6.2. The concept of "boundary organisations" or universal safeguards structures: Keating's *Health Effects Institute* case study

The HEI, created in 1980 in the United States, funds research to improve air quality. As Keating (2001) explains, after a period of strong questioning in the 1990s, this organisation undertook several organisational and strategic changes that today make it a recognised player in scientific

governance. Governance institutions are described as “boundary” when they present three characteristics identified by Guston (1999) on the basis of the work of Star and Greisemer (1989) and Fujimura (1991). According to Keating, they are placed at the border between two social worlds and report to these two worlds—professionals representing the stakeholders and scientists—side by side. Finally, common control mechanisms are used by the two worlds in relation for the achievement of their own objectives (Keating, 2001).

Three structuring principles have been adopted since the creation of the HEI, principles frequently encountered in other similar organisations: a public-private balance in financing; the constitution of an independent management committee approved by the sponsors; and the setting up of expert committees in charge of research planning, management and evaluation of funded processes. However, compliance with these principles did not prevent a crisis of governance in 1993, which led the HEI first of all to extend its field of action to the effects of all pollutants, not only automobile emissions but also their activities, by giving priority not only to funding new research but also to launching various studies aimed at overcoming controversies, by playing the role of facilitator between industry and regulatory authorities, and finally by playing the informal role of representative of the scientific community involved in research on the health effects of pollutants in other scientific communities in related fields. From “shareholder” governance (delegating funds to researchers), the HEI has moved to partnership governance. Moreover, as Keating notes, relationships with new stakeholders have been formalised and their involvement in the strategic planning process strengthened.

Nevertheless, Keating (2001) highlights several limitations, also encountered in large international organisations with a universal vocation (Roy-Lemieux, 2018), which must include all or almost all global government actors and/or which must conduct or promote policies on a global scale (Grant, 2009, p. 75):

- firstly, the fact that collaboration between stakeholders, particularly public and private, is only possible when circumstances are serious and crises must be dealt with,
- secondly, bureaucratisation, which is a source of inefficiency,
- thirdly, the difficulty of guaranteeing the relevance and quality of the actions financed,
- fourthly, the poor adaptability of these structures,
- fifthly, the difficult articulation between the short-term needs of sponsors and a long-term vision of scientific evolution, and
- sixthly, an exacerbated search for independence from sponsors, which in fact isolates researchers and prevents them from understanding the real needs of the latter.

It is possible that by providing a detailed answer to these clearly identified limitations, the question of lack of trust in institutions (Keating's second level of trust) can be answered, but what about the other the two remaining typologies also identified by the sociologist ?

4.6.3. Safeguarding organisations and research: structuring science-policy relations

Gustafsson and Lidskog (2018) enrich the definition of organisations that work as societal safeguards by articulating Guston’s (1999) concept with two notions that resonate with our concerns:
The first is Miller’s (2001) notion of *hybrid management*, which is fundamentally based on Latour’s multiform and anthropological conception of science. Scientific organisations can be

seen as ongoing relationships between institutions, actors and artefacts that carry diverse norms, facts and values. Miller (2001) defines four strategies for these organisations: hybridisation, deconstruction, boundary work and cross-domain orchestration. These four strategies make sense in the context of a hybrid management of research practices. Indeed, hybridisation means sharing standards and measures that are relevant to the policies pursued. This strategy aims to create political-scientific standards, whether in the technical field (e.g., a maximum level of toxicity of the innovations produced, a level of quality or quality achievement in line with ISO standards), in the accounting field (e.g., share of ecologically acceptable assets or cost of the damage suffered due to poor research practice—37,500 dollars per customer vehicle affected by Volkswagen fraud in the case of the Clean Air Act in the United States) or in the legal field (laws relating to sustainable development, cf. Dernbach and Mintz, 2011). Deconstruction refers to the emergence of controversies to re-examine assumptions and hidden values. It is indeed the role of research governance bodies to highlight both conflicts of interest and supposed epistemological or ideological research. The boundary work consists, in our case, in ensuring that the allocation of responsibilities in the innovation research process is done at the right level, on the right organisational "mesh", in order to be perceived as legitimate both by the internal actors of the process and by external actors. Finally, the strategy of orchestration of the different research fields is a coordination activity that leads the different stakeholders to agree on the meaning they give to the aims of R&I and to the R&I activities themselves.

The notion of *ecosystemic tension frameworks* was initially developed by Parker and Crona (2012). In the described environment, the various and opposing relationships between all actors in the R&I process are reckoned. They form a "landscape", or rather a system that must be balanced. The challenge for safeguarding organisations lies in this constant search for a balance between scientific, social, economic and political issues. Parker and Crona (2012) identify "four tensions ... that emerge among the different stakeholders' expectations of the boundary organisation: expectations that the organisation (i) is disciplinary and interdisciplinary, (ii) has a long-term and a short-term focus, (iii) provides basic and applied research, and (iv) aims for autonomy and consultancy". The governance system of the R&I process is in fact part of what Bernard-Weil (1988) called a system of ago-antagonistic forces where paradoxes must be managed, ideally outdated, on a permanent basis. Hargrave and Van de Ven (2016) go further in the construction of a framework for managing contradictions in organisations by integrating a dialectical dimension, more political, more complex than the paradoxical dimension that can exist in companies. The usual paradoxes of organisations (short term/long term, centralising/decentralise) are certainly perceived as contradictory, but are admitted by their members and the importance of interdependencies is recognised. However, from a dialectical perspective, contradictions are the object of "conflict" and "mobilisation" that produce unexpected consequences, and therefore transformations to be brought under control.

The generic modelling of paradoxical relationships that results from this systemic vision, proposed by Martinet and Payaud (2011), although limited to companies' strategic management systems in their work, highlights two fundamental ago-antagonist couples that make it possible to characterise partnership governance: the planning/learning pair and the teleological/ecological pair (the visible hand of Chandler's (1977) managers versus, in the strict sense, the invisible hand of the market (Smith) and by extension of any actor in the company environment).

Within the framework of R&I processes, a "*dialectico-paradoxal*" conception of governance requires thinking of its mechanisms not as tools at the service of governments in charge of

defining objectives and allocating resources, managing some paradoxes, but as places, methods and instruments for the manufacture of knowledge, products and new goods co-constructed according to known and sometimes conflicting representations and facts, but also co-regulated.

4.7 Limitations of the current governance bodies in building a trust framework.

The four strategies proposed by Miller (2001) are not necessarily implemented, as few technical, accounting or legal standards are shared and co-constructed within R&I governance bodies at all levels. Universities do not include much in the scientific committees of representatives of the social and economic world, except in partnership foundations, but rather do so within the framework of their boards of directors. Scientific governance bodies focus on the visible productivity of researchers and not on the definition of policies recognised by both the scientific and the political and economic world. Finally, in companies, societal concern about R&I remains limited, and worse, some of them, notably through sectoral groupings, are succeeding in devaluing the role of NGOs, which are supposed to carry the voice of civil society (Delalieux, 2007, 2017). If standards emerge, they tend to overvalue certain societal criteria to the detriment of others. Dahan and Aykut (2015) refer to the "single grammar of the carbon market".

Likewise, few governance bodies of R&I processes offer a space where controversies can be expressed, discussed, and lead to validations, revalidations or reversals, apart from a few reviews.

The "boundary work" based on the creation of relations and the coordination of the different worlds remains confined to international organisations such as the United Nations or the European Union. The Scientific Advisory Board (SAB), composed of 26 leading scientists to advise the United Nations, was not formally established until January 2014. The characterisation of scientific councils, their degree of openness and their role still remains a central topic (Glynn, Flanagan, Keenan et al., 2001).

Finally, "cross-domain orchestration" would involve considering all the social and economic implications of R&I processes and creating bridges between international bodies in charge of economic or societal issues (from the G7/G8/World Trade Organization to the United Nations Environment Programmes, for example). At a micro level, an orchestration between scientific fields should a priori allow inter- and multi-disciplinary research. These are sometimes clearly favoured by the governance bodies (e.g., AERES—Criteria for the evaluation of the 2014 Research Entities) or simply recognised, as evidenced by the latest benchmark (2017) for the evaluation of HCERES research units. Finally, research conducted in such a way as to straddle several scientific fields runs the risk of not being published. Reviews remain excessively disciplinary. The creation of specialised journals or prizes is part of the process of institutionalising a scientific discipline, each field being built by differentiation (Fourcade, 2006; Percebois, 2006). The evaluation of scientists' careers remains linked to the publication of work in the best journals in the field in question.

The opposition defined by Parker and Crona (2012), which we redefine as a system of paradoxical relations in which learning and the search for balance must be encouraged, is not understood constructivistically. As Dahan and Aykut (2015) point out, approaches to governance issues remain top down. The question of the learning of stakeholders, and a fortiori

of researchers, in terms of defining objectives, steering their R&I process and post-evaluation within these systems (Bouquin, 1994) is rarely raised, since places for sharing are rare, particularly at a macro-societal level.

Finally, Dahan and Aykut (2015) recall that scientific, technological and financial exchanges are unbalanced between industrialised nations and developing countries. The latter struggle to be recognised in governance bodies, and even more so in R&I governance bodies that can impact them.

Most R&I governance bodies still seem to be in the hands of institutionalised actors who establish rational forms of control initially adapted to difficult or complex situations or problems. However, the problems to be addressed and dealt with by scientific research or innovation are now proving pernicious (wicked) (Stoett, 2012), and other actors are creating new forms of governance.

To conclude this discussion, the literature on scientific or research governance appears very fragmented, especially between various fields of social (political science, economics, law, management, accounting and auditing) or hard sciences.

A large number of articles, mainly from the sciences affected by fraud (cf. DEFORM study, University of Crete, on the occurrence of fraud according to scientific disciplines), plead for more or better governance without specifying the modalities, except to strengthen the scientific committees, tools of governance of research par excellence yet extremely heterogeneous (Glynn, Flanagan, Keenan et al., 2001). As such, and as explained above in the analysis of the components of trust and mistrust, without a dedicated and specific approach there can be no confidence building.

There is no conceptual framework for research governance. Different tools of government, politics, public administration or business coexist for “directing” or “exercising political power”, two meanings of the term “governance” present since the thirteenth century in the French language and which spread in the Anglo-Saxon world from the fifteenth century (Gobin, 2007). This author specifies that this concept settled in the language in the twentieth century, first between the two wars to qualify the direction of the companies with the expression “corporate governance”, and was taken up again by public administration, in particular the international organisations of the seventies.

Attempting to build a conceptual framework for research and innovation implies adopting a shared vision of the R&I process, a process with a universal vocation because of its impact, a complex process that deals with complex, even pernicious societal issues (wicked), whose governance is a hybrid management based on four strategies (Miller, 2001) and deals with paradoxical situations.

The issue of responsibility and accountability of the different actors involved in the R&I process can only be addressed by identifying the interests of different stakeholders, all of whom may behave in unethical ways. The responsibility for bad practices does not lie solely with the researcher. The conceptual framework of governance must therefore integrate, according to Kumar’s (2010) model, not only a “personal” approach to responsibility but also a systemic approach (person/system).

It must also be structured according to the phases of the research process in which misconduct may occur. Each of the phases corresponds to a mode of governance that is based on different managerial tools or methods that are still imperfectly adapted to the specific challenges of R&I: quality management, risk management and the establishment of soft and hard laws (norms) in terms of more or less magnifying societal responsibility.

It is nonetheless clear that if the crisis of trust felt by the research sector was solely due to fraud problems, and therefore that, as a corollary, the restoration of confidence could be limited to detailed answers to the questions raised by the analysis of the organisational problems of the research process, there was an easy and achievable answer to these doubts (Crocker, 2011). In any case, this is exactly the path that research institutions have taken in recent years. But then, why does the feeling of lack of trust remain (ALLEA 2019, op. cit.)?

We put forward another hypothesis that we have chosen to expose through a case study.
Perhaps the lack of trust also comes from the famous "shifted response" provided by institutions that are victims of a certain lack of trust, which is often pointed out in studies on confidence (Ryan, 1998).

5. The “misplaced response to the question asked” test: case study on academic orientation choices & trust impacts.

As mentioned above, our hypothesis, that the lack of trust would result from a delayed response by experts to a question raised by the social ecosystem, requires a rational demonstration. We have thus chosen to use data science methodologies to verify the consistency (or otherwise) of this assertion. The detailed methodology used is provided in the methodology section above.

Academic work includes research activities on the one hand and teaching activities on the other (Coaldrake & Stedman, 1999). Likewise, more than a third of the researchers employed in private research centres or within research compounds in private companies are involved in adult education activities—either internal training through “corporate universities” or other VT activities—the point being that even for non-academic researchers, knowledge transfer remains an inherent part of their activity (Cavestro, Durieux & Monchatre 2007). The knowledge professions are therefore broken down as, on the one hand, the collection of knowledge and on the other hand the dissemination of knowledge. *However, most of the analyses focus on the collection of knowledge, and therefore possible research errors, to support the assertion of lack of trust.* But what about the transfer of knowledge, and in particular the methodologies for bringing people to higher education.

We hypothesise that the problem of the lack of trust felt by the academic world (and contingently other researchers) is as much the result of the potential ineffectiveness of the education provided to meet the problems expected by students (employment, security, etc.) either at the end of their studies or because they have failed in them as a result of misdirection, as it is linked to some of the scandals in the research field made public in recent years. Indeed, if only research was responsible, the different actions that are being implemented in terms of governance, transparency, etc. should have started to bear fruit, but this is not yet the case (50% of people interviewed in the trust barometer indicate that the "system" does not work for them, and the percentage of trust in the institution especially has consistently remained at the same level for 20 years; at 65-70%, according to the indicators: Endelman, 2019).

The rationale for this analysis comes from the fact that the OECD clearly indicates that tertiary education is a growth factor; the less the tertiary education a population has, the less its growth is efficient. There is a direct cause/effect relationship between growth and educated workforce availability (OECD: A10 indicator). If tertiary education is a growth factor, then dropout rates can be correlated to "losses" in the growth potential, and as such the cost is not only what is spent, but also what is lost in growth potential. *If dropout is one of the by-products of lack of trust, then it might be worth studying why students drop out, through an indicator than can be cross-educational sector, in order to restore trust*, drastically reduce this unsustainable educative waste and enhance education productivity efficiency.

We hypothesise that higher education makes a promise by integrating young people (and increasingly older people as part of continuing education) into the system in different curricula on the basis of answers it would be able to provide to their questions of social positioning (Brown, 2003). *This promise is the basis of the contract of trust as defined above, between the future students and the educational institution*. We assume that as soon as the choice of orientation is made, the ability to succeed or fail in a given curriculum is established, that the roots of trust or lack of trust in the institution are established.

More importantly, we hypothesise that a poor response to the expectations of future learners (whatever their age) leads to misdirection and therefore failure, which would explain why the population of graduates with a university degree or equivalent remains at a relatively low level in Europe (37%: Eurostat) and that the dropout rate in university studies is around one third (OECD) for all curriculums and age groups combined. *We thus believe that the combination of the high level of enrolment in tertiary education and the low level of achievement (OECD's A4 indicator) is a symptom of potential future lack of trust in education institutions, and a component of the "feeling" of lack of trust actually expressed by such organizations*. Curiously, *the abovementioned 37%* also corresponds to the proportion of individuals who do not trust research institutions. Could there be a connection? This remains to be verified, but a demographic analysis may be of interest in this regard.

Similarly, we would like to verify that populations who succeed in their university studies have received an adequate answer to the question asked of the institution about their ability to succeed, while those who fail have received insufficient answers, in other words that there is a match between social persona and academic response when students succeed, and on the other hand a divergence in case of failure.

We hypothesise that it is—for a given type of population—the questions asked to determine the appetite of candidates for a course of study that are biased, and that it is in the dissonance between the answers to these questions (which lead to a specific course of study) and the real expectations of future students that the roots of failure, and therefore of the breach of trust between the institution and its student stakeholders, are found.

To illustrate our hypotheses, we assume that dropout is correlated to two factors, each including correlated subfactors:

⇒ F1, which is the expression of **lack of trust in the knowledge delivery sector to fulfil its task, that is building for each enrolled or potential learner** a pathway to personal equilibrium (social persona) as defined by Maslow (1943) and reconsidered

by Wahba & Bridwell (1976), including: personal and financial comfort, social appreciation, pleasure, free time, work; all in all, a fulfilling function. F1 measures the proximity of the academic methodology and the two social personae (see below); and

⇒ F2, which stands for the **lack of adequation of the educational orientation with one's expectations, taking into account the fact that there are** difficulties in correcting this when one pathway is taken = > problematic of academic fields & silos/specialties (we want to minimise the differences between the personae).

Using the different datasets (OECD, Eurostat, open data.gouv.fr), we then built three technical personae, including:

✓ Achieving population characteristics including social ecosystem and the chosen orientation (persona)
✓ Non-achieving population characteristics including social ecosystem and the chosen orientation (persona)
✓ Curricular profiles

The population characteristics are built bringing together socioeconomic information provided by different French and European census & data sets (see sources) completed by live information extracted from (or calculated out of) social networks discussions (see methodology).

220	1127046	0,979392904	0,929581172	1,053585135	3	43600,5038 veux, orientation,choisi, m,decine,sport, staps, bts, pr,pa,vente, droit
221	5445924	0,692669002	0,656521772	1,055058692	3	43600,5038 veux, orientation,choisi, m,decine,sport, staps, bts, pr,pa,vente, droit
222	6267611	0,829947931	0,786508262	1,055231041	3	43600,5038 veux, orientation,choisi, m,decine,sport, staps, bts, pr,pa,vente, droit
223	3913485	0,215113466	0,203699101	1,056035419	3	43600,5038 veux, orientation,choisi, m,decine,sport, staps, bts, pr,pa,vente, droit
224	5254216	0,789159118	0,730789435	1,079872094	3	43629,4038 veux, orientation,choisi, m,decine,sport, staps, bts, pr,pa,vente, droit
225	6576274	0,558143647	0,510574891	1,093167049	3	43629,4038 veux, orientation,choisi, m,decine,sport, staps, bts, pr,pa,vente, droit
226	5143762	0,592581512	0,540174021	1,097019643	3	43629,4038 veux, orientation,choisi, m,decine,sport, staps, bts, pr,pa,vente, droit
227	4437642	0,483948958	0,436119694	1,109670042	3	43605,5038 veux, orientation,choisi, m,decine,sport, staps, bts, pr,pa,vente, droit
228	2937101	0,104485438	0,093879436	1,112974713	3	43629,4038 veux pas, droit, pr,pa,
229	5401893	0,075338648	0,067677872	1,113194699	3	43629,4038 veux pas, droit, pr,pa,
230	6803968	0,36761428	0,326221998	1,126883784	3	43629,4038 veux pas, droit, pr,pa,
231	7610363	0,349460724	0,308012572	1,134566428	3	43605,5038 veux pas, droit, pr,pa,
232	3949244	0,809039076	0,71295364	1,134770944	3	43629,4038 veux pas,non choisi,forc,, parents,impos,,famille,changement, droit, bts, pr,pa, vente
233	5151116	0,403202191	0,354504225	1,137369213	4	43605,5038 veux pas,non choisi,forc,, parents,impos,,famille,changement, droit, bts, pr,pa, vente
234	2765111	0,337526626	0,294232145	1,147143951	4	43629,4038 veux pas,non choisi,forc,, parents,impos,,famille,changement, droit, bts, pr,pa, vente
235	2326270	0,931058176	0,804199957	1,157744622	4	43605,5038 veux pas,non choisi,forc,, parents,impos,,famille,changement, droit, bts, pr,pa, vente
236	6084514	0,831134052	0,713471071	1,16491626	4	43607,5038 veux pas,non choisi,forc,, parents,impos,,famille,changement, droit, bts, pr,pa, vente
237	5701001	0,969902205	0,83249967	1,165048156	4	43607,5038 veux pas,non choisi,forc,, parents,impos,,famille,changement, droit, bts, pr,pa, vente
238	7219642	0,763506611	0,651330726	1,172225693	4	43607,5038 veux pas,non choisi,forc,, parents,impos,,famille,changement, droit, bts, pr,pa, vente
239	5227455	0,924730279	0,770994203	1,199399782	4	43607,5038 veux pas,non choisi,forc,, parents,impos,,famille,changement, droit, bts, pr,pa, vente
240	9484823	0,934454045	0,776965969	1,202696235	4	43607,5038 veux pas,non choisi,forc,, parents,impos,,famille,changement, droit, bts, pr,pa, vente
241	4612112	0,80007161	0,657142153	1,21750158	4	43605,5038 veux pas,non choisi,forc,, parents,impos,,famille,changement, droit, bts, pr,pa, vente
242	7336122	0,833899839	0,682636266	1,221587367	4	43605,5038 veux pas,non choisi,forc,, parents,impos,,famille,changement, droit, bts, pr,pa, vente
243	4838116	0,92170721	0,751046972	1,227229779	4	43600,5038 veux pas,non choisi,forc,, parents,impos,,famille,changement, droit, bts, pr,pa, vente
244	3042465	0,603754995	0,483770044	1,248020631	4	43600,5038 veux pas,non choisi,forc,, parents,impos,,famille,changement, droit, bts, pr,pa, vente

datachat_clean_testbase

Figure 8 : Personae dataset

These personae are confronted to build patterns (Ps, the social pattern & Pc, the curricular pattern) using modern nonlinear regression (trees) to weight and identify the regressors' inference/interaction with each other. We thus observe the adequation of the curricular choices with the social aspirations of the populations observed as freely expressed on social networks (F2). We therefore calculate the probability that the sum of social aspirations minus the sum of curriculum elements is equal to zero, i.e., corresponds perfectly (which is very rarely the case, if ever. We at least have not yet observed such convergence) => equation 1 below. The more significant F2 is, the greater the difference between academic choice and personal aspirations.

$$F2 = P(\sum_{n}^{1} Ps - \sum_{n}^{1} Pc) = 0$$

Equation 1 : The F2 factor

We then observed homogeneity and dissonance of these likes with the educational choices of the related individuals to predict potential dropout risk. This analysis allows several observations to be made.

(1) Adhesion to curriculum tends to fade when orientation choices are driven by social ecosystems (parents' choice, third party choices such as ParcourSup algorithm…) => Figure 9)

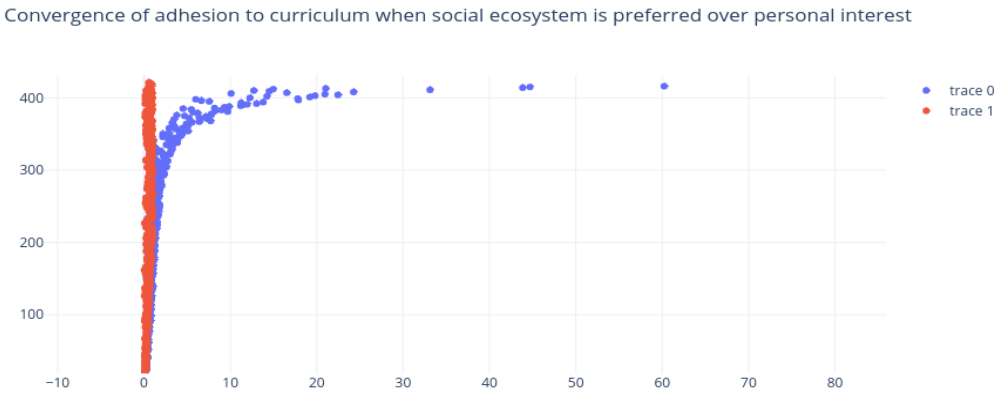


Figure 9 : Fading Adhesion to curriculum when orientation choices are driven by social ecosystems (trace 0 = adhesion – trace 1 = ecosystem preference)

(2) Adhesion is total when orientation choices are driven by the learner own's interest (Figure 10).

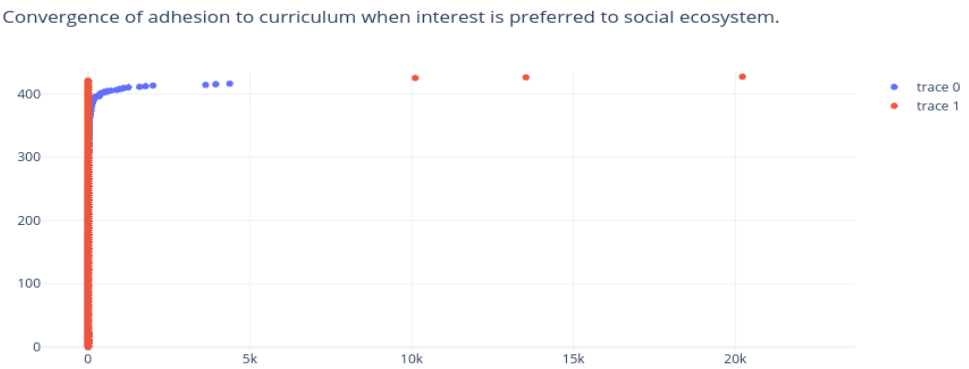


Figure 10 Adhesion to curriculum persists when orientation choices are driven by personal interest (trace 0 = adhesion – trace 1 =personal interest preference)

(3) first choice curriculums are socially based (biased?); that is, highly influenced by the social environment of the student, thus confirming Luis Bernal (2005) and Brooks's (2003) analysis in that respect. The personal aspiration of the future learner is thus less considered, which might be one of the foundations of mistrust,
(4) Failure comes when there is a divergence between the ecosystem "wishes" and the future learner's aspirations,

But what does it say about trust and confidence building? With reference to the three levels of trust building (Zucker, op cit), it can reasonably be argued that the failure to take into account the personal aspirations of each future learner constitutes not only an immediate negative experience but also sets the ground for future frustration through a failure to respond to "Maslowian" aspirations. The learner then enters a vicious circle that will amplify their bad experiences (bad orientation => bad social choices => bad careers => nonfulfillment: Cook-Sather, 2002). We know that it is the accumulation of these negative experiences that leads to a lack of trust. The chain then seems to be completed. If the sense of lack of trust does not seem to be verified when it comes to research activities, perhaps it is knowledge transfer activities that should be addressed; as, indeed, initial analyses seem to verify this.

More than the production of standards for administrative governance, or sanctions, which have now been fully explored, it may therefore be in the construction of processes for the creation and dissemination of knowledge and know-how that efforts are needed.

6. References

Abelson, J., Gauvin, F., MacKinnon, M. P., & Watling, J. (2004). Transparency, trust and citizen engagement. Ottawa: Canadian Policy Research Networks Inc.

Adewuyi, A., Fleming, A., Herzog, L., Lepenies, R., Rios Rojas, C., & Vermeir, K. (2019). Academic incentives need to change if we are to build trust in science https://www.timeshighereducation.com/blog/academic-incentives-need-change-if-we-are-build-trust-science . Retrieved February, 5th 2019.

Alesina, A., & Ferrara, E. L. (2000). The determinants of trust (No. w7621). National Bureau of Economic Research.

ALLEA discussion paper. (2018). 1. Loss of Trust? Loss of Trustworthiness? Truth and Expertise Today - https://www.allea.org/wp-content/uploads/2018/05/ALLEA_Discussion_Paper_1_Truth_and_Expertise_Today-digital.pdf - Retrieved 22 December 2018.

ALLEA discussion paper. (2019). 2. Trust Within Science: Dynamics and Norms of Knowledge Production. https://www.allea.org/wp-content/uploads/2019/01/ALLEA_Discussion_Paper_2.pdf - Retrieved 05 February 2019.

ALLEA discussion paper. (2019). 3. Trust in Science and Changing Landscapes of Communication - https://www.allea.org/wp-content/uploads/2019/01/ALLEA_Trust_in_Science_and_Changing_Landscapes_of_Communication-1.pdf - Retrieved 05 February 2019.

Allen, D., & Wilson, T. (2003). Vertical trust/mistrust during information strategy formation. International Journal of Information Management, 23(3), 223-237.

Aras, H., Beckstein, C., Buchegger, S., Dittrich, P., Hubauer, T., Klan, F., ... & Wolfson, O. (2009). Uncertainty and trust. In Univ. of Illinois, Dagstuhl Seminar Proceedings (Vol. 8421).

Arendt, H. (1958). The modern concept of history. The Review of Politics, 20(4), 570-590.

Argandoña, A. (2012). Three ethical dimensions of the financial crisis.

Arlauskaitė, E., Sferle, A(2013). Ethical issues in neuromarketing. Science, 311, 47-52.

Artz, D., & Gil, Y. (2007). A survey of trust in computer science and the semantic web. Web Semantics: Science, Services and Agents on the World Wide Web, 5(2), 58-71.

Bajoit, G. (2005). La place de la confiance dans la formation de l'identité et du lien social. Confiance et Lien Social, 73-90.

Balsa, C. (2005). Confiance et Lien Social (Vol. 24). Saint-Paul.

Barney, J. B., & Hansen, M. H. (1994). Trustworthiness as a source of competitive advantage. Strategic Management Journal, 15(S1), 175-190.

Baskaran, A., & Boden, R. (2004). Science: A controversial commodity. Science, Technology and Society, 9(1), 1-26.

Batanero, C. (2000). Controversies around the role of statistical tests in experimental research. Mathematical Thinking and Learning, 2(1-2), 75-97.

Bieber, J.B. (1997) Faculty Work and Public Trust: Restoring the Value of Teaching and Public Service in American Academic Life, The Journal of Higher Education, 68:2, 233-234, DOI: 10.1080/00221546.1997.11780884

Bijlsma-Frankema, K., & Woolthuis, R. K. (Eds.). (2005). Trust under pressure: Empirical investigations of trust and trust building in uncertain circumstances. Edward Elgar Publishing.

Bloom, P. N., Milne, G. R., & Adler, R. (1994). Avoiding misuse of new information technologies: legal and societal considerations. The Journal of Marketing, 98-110.

Boltanski, L., & Thévenot, L. (1991). De la justification. Les économies de la grandeur, 1, 87.

Boulianne, S. (2019). Building Faith in Democracy: Deliberative Events, Political Trust and Efficacy. Political Studies, 67(1), 4-30.

Brewer, P., & Venaik, S. (2012). On the misuse of national culture dimensions. International Marketing Review, 29(6), 673-683.

Brewer, P. R., & Ley, B. L. (2013). Whose science do you believe? Explaining trust in sources of scientific information about the environment. Science Communication, 35(1), 115-137.

Brion, S., Mo, R., & Lount Jr, R. B. (2019). Dynamic influences of power on trust: Changes in power affect trust in others. Journal of Trust Research, 9(1), 6-27.

Brooks, R. (2003). Young people's higher education choices: The role of family and friends. British Journal of Sociology of Education, 24(3), 283-297.

Brown, A. (2013). Understanding pharmaceutical research manipulation in the context of accounting manipulation. The Journal of Law, Medicine & Ethics, 41(3), 611-619.

Brinkmann, J., & Lentz, P. (2006). Understanding insurance customer dishonesty: Outline of a moral-sociological approach. Journal of Business Ethics, 66(2-3), 177-195.

Bryman, A., & Bell, E. (2015). Business research methods. Oxford University Press, USA.

Calfee, J. E., & Ringold, D. J. (1992). The cigarette advertising controversy: Assumptions about consumers, regulation, and scientific debate. ACR North American Advances.

Canovan, M. (1999). Trust the people! Populism and the two faces of democracy. Political Studies, 47(1), 2-16.

Carey, M. (2017). Mistrust: An ethnographic theory. Hau Books.

Carrick-Hagenbarth, J., & Epstein, G. A. (2012). Dangerous interconnectedness: Economists' conflicts of interest, ideology and financial crisis. Cambridge Journal of Economics, 36(1), 43-63.

Casella, A., Kartik, N., Sanchez, L., & Turban, S. (2018). Communication in context: Interpreting promises in an experiment on competition and trust. Proceedings of the National Academy of Sciences, 115(5), 933-938.

Caulfield, T., Fullerton, S. M., Ali-Khan, S. E., Arbour, L., Burchard, E. G., Cooper, R. S., ... & Kittles, R. (2009). Race and ancestry in biomedical research: Exploring the challenges. Genome Medicine, 1(1), 8.

Cavestro, W., Durieux, C., & Monchatre, S. (2007). Travail et reconnaissance des compétences (No. halshs-00146526).

Coaldrake, P., & Stedman, L. (1999). Academic work in the twenty-first century
Cohen, H. W. (2011). P values: Use and misuse in medical literature. American Journal of Hypertension, 24(1), 18-23.
Cook, K. S., Hardin, R., & Levi, M. (2005). Cooperation without trust? Russell Sage Foundation.

Cook, K. S., Levi, M., & Hardin, R. (Eds.). (2009). Whom can we trust? How groups, networks, and institutions make trust possible: How Groups, Networks, and Institutions Make Trust Possible. Russell Sage Foundation.

Cook-Sather, A. (2002). Authorizing students' perspectives: Toward trust, dialogue, and change in education. Educational Researcher, 31(4), 3-14.

Conchie, S. M., & Donald, I. J. (2008). The functions and development of safety-specific trust and distrust. Safety Science, 46(1), 92-103.

Corritore, C. L., Wiedenbeck, S., & Kracher, B. (2001, March). The elements of online trust. In CHI'01 Extended Abstracts on Human Factors in Computing Systems (pp. 504-505). ACM.

Cox, M. (Ed.). (2008). Social capital and peacebuilding: Creating and resolving conflict with trust and social networks. Routledge.

Chang, A., & Li, P. (2015). Is economics research replicable? Sixty published papers from thirteen journals say 'usually not'.

Crocker, J. (2011). The road to fraud starts with a single step. Nature News, 479(7372), 151-151.

Cugueró, N., & Rosanas, J. M. (2019). Trust under bounded rationality: Competence, value systems, unselfishness and the development of virtue. Intangible Capital, 15(1), 1-21.

Dahl, T. (2004). Textual metadiscourse in research articles: A marker of national culture or of academic discipline?. Journal of Pragmatics, 36(10), 1807-1825.

Damico, A. J., Conway, M. M., & Damico, S. B. (2000). Patterns of political trust and mistrust: Three moments in the lives of democratic citizens. Polity, 32(3), 377-400.

Dans, A. L., Dans, L. F., Silvestre, M. A. A., Halstead, S. B., & Guyatt, G. H. (2018). Cause and consequence of loss in vaccine trust. Human Vaccines & Immunotherapeutics, 1-2.

Das, T. K., & Teng, B. S. (2004). The risk-based view of trust: A conceptual framework. Journal of Business and Psychology, 19(1), 85-116.

Deutsch, M. (1958). Trust and suspicion. Journal of Conflict Resolution, 2(4), 265–279. https://doi.org/10.1177/002200275800200401

De Cremer, D., & Van Vugt, M. (1998). Collective identity and cooperation in a public goods dilemma: A matter of trust or self-efficacy. Current Research in Social Psychology, 3(1), 1-11.

Daniel, L. G. (1998). Statistical significance testing: A historical overview of misuse and misinterpretation with implications for the editorial policies of educational journals. Research in the Schools, 5(2), 23-32.

De Montalvo, Jääskeläinen (2015). Benefits as improper inducement.

Dhillon, G. (1999). Managing and controlling computer misuse. Information Management & Computer Security, 7(4), 171-175.

Dimoka, A. (2010). What does the brain tell us about trust and distrust? Evidence from a functional neuroimaging study. MIS Quarterly, 373-396.

Dinesen, P. T., & Sønderskov, K. M. (2018). Ethnic diversity and social trust. The Oxford handbook of social and political trust, 175.

Dirks, K. T. (1999). The effects of interpersonal trust on work group performance. Journal of Applied Psychology, 84(3), 445.

Dirks, K. T., & Ferrin, D. L. (2001). The role of trust in organizational settings. Organization Science, 12(4), 450-467.

Dresser, R. (2011). The role of patient advocates and public representatives in research. Emanual, E.; Grady, C.; Crouch, R, 231-241.

Dupuy, J. P. (1988). L'individu libéral, cet inconnu: d'Adam Smith à Friedrich Hayek. Individualisme et justice sociale. A propos de John Rawls (C. Audard, JP Dupuy & R. Sève eds.), Paris: Le Seuil, 73-125.

Edwards, M. A., & Roy, S. (2017). Academic research in the 21st century: Maintaining scientific integrity in a climate of perverse incentives and hypercompetition. Environmental Engineering Science, 34(1), 51-61.

Eisenstadt, S. N. (1992). The order-maintaining and order-transforming dimensions of culture. Theory of Culture, 64-88.

Elsner, W., & Schwardt, H. (2015, January). From emergent cooperation to contextual trust, and to general trust: overlapping meso-sized interaction arenas and cooperation platforms as a foundation of pro-social behavior. In *Forum for Social Economics* (Vol. 44, No. 1, pp. 69-86). Routledge.
Emanuel, E. J., Wendler, D., & Grady, C. (2000). What makes clinical research ethical?. Jama, 283(20), 2701-2711.

Ember, C. R., & Ember, M. (1992). Resource unpredictability, mistrust, and war: A cross-cultural study. Journal of Conflict Resolution, 36(2), 242-262.

Emirbayer, M. (1997). Manifesto for a relational sociology. American Journal of Sociology, 103(2), 281-317.

Evans, A. M., & van de Calseyde, P. P. (2018). The reputational consequences of generalized trust. Personality and Social Psychology Bulletin, 44(4), 492-507.

Falcone, R., & Castelfranchi, C. (2001). Social trust: A cognitive approach. In Trust and deception in virtual societies (pp. 55-90). Springer, Dordrecht.

Feenstra, R. A., & Pallarés-Domínguez, D. (2017). Ethical debates on political neuromarketing: The technological advance and its potential impact on the formation of public opinion. *Veritas: Revista de Filosofía y Teología* 36:9-28 10.4067/s0718-92732017000100001

Fensham, P. J. (2014). Scepticism and trust: Two counterpoint essentials in science education for complex socio-scientific issues. Cultural Studies of Science Education, 9(3), 649-661.

Ferrin, D. L., Cooper, C. D., Dirks, K. T., & Kim, P. H. (2018). Heads will roll! Routes to effective trust repair in the aftermath of a CEO transgression. Journal of Trust Research, 1-24.

Fairweather, J. S. (2002). The mythologies of faculty productivity: Implications for institutional policy and decision making. *The journal of higher education*, *73*(1), 26-48.

Fairweather, J. S. (1996). Faculty work and public trust: Restoring the value of teaching and public service in American academic life. Allyn and Bacon ISBN 13 : 978-0205179480

Favereau, O. (1999). Salaire, emploi et économie des conventions. Cahiers D'économie Politique, 34(1), 163-194.

Franzen, M., Rödder, S., & Weingart, P. (2007). Fraud: Causes and culprits as perceived by science and the media: Institutional changes, rather than individual motivations, encourage misconduct. EMBO Reports, 8(1), 3-7.

Freedman, L. P., Cockburn, I. M., & Simcoe, T. S. (2015). The Economics of Reproducibility in Preclinical Research. PLoS Biol 13(6): e1002165. https://doi.org/10.1371/journal.pbio.1002165

Frederiksen, M. (2014). Relational trust: Outline of a Bourdieusian theory of interpersonal trust. Journal of Trust Research, 4(2), 167-192.

Funk, C., & Rainie, L. (2015). Public and scientists' views on science and society. Pew Research Center, 29.

Funk, C., & Kennedy, B. (2017). Public confidence in scientists has remained stable for decades. Pew Research Center (April 6).

Gay, C. (2002). Spirals of trust? The effect of descriptive representation on the relationship between citizens and their government. American Journal of Political Science, 717-732.

Galanxhi-Janaqi, H., & Fui-Hoon Nah, F. (2004). U-commerce: Emerging trends and research issues. Industrial Management & Data Systems, 104(9), 744-755.

Gambetta, D. (Ed.). (1988). Trust: Making and breaking cooperative relations (pp. 213-238). New York, NY: B. Blackwell.

Garfinkel, H. (2017). Routledge Revivals: Ethnomethodological Studies of Work (1986). Routledge.

Gerbner, G., Gross, L., Morgan, M., & Signorielli, N. (1980). The "mainstreaming" of America: Violence profile no. 11. Journal of communication, 30(3), 10-29.

Giddens, A. (1971). Capitalism and modern social theory: An analysis of the writings of Marx, Durkheim and Max Weber. Cambridge University Press.

Giddens, A. (2013). The consequences of modernity. John Wiley & Sons.

Gosling, S. D., Vazire, S., Srivastava, S., & John, O. P. (2004). Should we trust web-based studies? A comparative analysis of six preconceptions about internet questionnaires. American Psychologist, 59(2), 93.

Goulding, C. (2002). Grounded theory: A practical guide for management, business and market researchers. Sage.

Glover, S. (2018). Who do they think we are?: Politicians imagine the nation. Griffith Review, (61), 172.

Guala, F. (2016). Understanding institutions: The science and philosophy of living together. Princeton University Press.

Grace, P. J. (2008). Research Ethics: Advanced Practice Roles and Responsibilities. Nursing Ethics and Professional Responsibility in Advanced Practice, 153.

Green, H. P. (1986). Scientific responsibility and the law. U. Mich. JL Reform, 20, 1009.

Grimmelmann, J. (2010). Some skepticism about search neutrality. The next digital decade: Essays on the future of the Internet, 435.

Grissom, R. J., & Kim, J. J. (2005). Effect sizes for research: A broad practical approach. Lawrence Erlbaum Associates Publishers.

Gross, A. G. (1994). The roles of rhetoric in the public understanding of science. Public Understanding of Sscience, 3(1), 3-24.

Guskey, T. R., & Sparks, D. (2000). Evaluating professional development. Corwin Press.

Hardin, R. (2002). Trust and trustworthiness. Russell Sage Foundation.

Hardin, R. (Ed.). (2004). Distrust. Russell Sage Foundation.

Hardy, C., Phillips, N., & Lawrence, T. (1998). Distinguishing trust and power in interorganizational relations: Forms and facades of trust. Trust within and between organizations, 64-87.

Harrison McKnight, D., & Chervany, N. (2001). Trust and distrust definitions: One bite at a time. Trust in Cyber-societies, 27-54.

Haustein, S. (2016). Grand challenges in altmetrics: Heterogeneity, data quality and dependencies. Scientometrics, 108(1), 413-423.

Horwitz, W. A., Deming, W. E., & Winter, R. F. (1969). A further account of the idiots savants, experts with the calendar. American Journal of Psychiatry, 126(3), 412-415.

Hovmand, M. A., & Svendsen, G. T. (2017). Can Putnam's theory explain high levels of social trust?. Belgeo. Revue Belge de Géographie, (1).

Hwang, M. I., & Thorn, R. G. (1999). The effect of user engagement on system success: A meta-analytical integration of research findings. Information & Management, 35(4), 229-236.

Inglehart, R., C. Haerpfer, A. Moreno, C. Welzel, K. Kizilova, J. Diez-Medrano, M. Lagos, P. Norris, E. Ponarin & B. Puranen et al. (eds.). 2014. World Values Survey: Round Six - Country-Pooled Datafile Version: http://www.worldvaluessurvey.org/WVSDocumentationWV6.jsp. Madrid: JD Systems Institute.

Jones, K. (1996). Trust as an affective attitude. Ethics, 107(1), 4-25.

Jones, G. R., & George, J. M. (1998). The experience and evolution of trust: Implications for cooperation and teamwork. Academy of Management Review, 23(3), 531-546.

Kaase, M. (1999). Interpersonal trust, political trust and non-institutionalised political participation in Western Europe. West European Politics, 22(3), 1-21.

Kincaid, H. (1996). Philosophical foundations of the social sciences: Analyzing controversies in social research. Cambridge University Press.

Kirchgässner, G., & Pommerehne, W. W. (1993). Low-cost decisions as a challenge to public choice. In The Next Twenty-five Years of Public Choice (pp. 107-115). Springer, Dordrecht.

Kiousis, S. (2001). Public trust or mistrust? Perceptions of media credibility in the information age. Mass Communication & Society, 4(4), 381-403.

Koocher, G. P. (2014). Research ethics and private harms. Journal of Interpersonal Violence, 29(18), 3267-3276.

Kramer, R. M., & Cook, K. S. (Eds.). (2004). Trust and distrust in organizations: Dilemmas and approaches. Russell Sage Foundation.

Kuhlau, F. (2013). Responsible conduct in dual use research: Towards an ethic of deliberation in the life sciences (Doctoral dissertation, Acta Universitatis Upsaliensis).

Kydd, A. (2000). Overcoming mistrust. Rationality and Society, 12(4), 397-424.

Lai, H. M., & Hsieh, P. J. (2018). The Effects of the Norm of Reciprocity and Interpersonal Trust on Knowledge-Sharing Behavior: A Longitudinal Analysis. In *PACIS* (p. 70).
Lau, E. (2010). Trust and distrust in conflicting situations: Legal case review of antecedents of distrust. Journal of Legal Affairs and Dispute Resolution in Engineering and Construction, 3(3), 116-122.

Lewicki, R. J., McAllister, D. J., & Bies, R. J. (1998). Trust and distrust: New relationships and realities. Academy of Management Review, 23(3), 438-458.

Leiserowitz, A. A., Maibach, E. W., Roser-Renouf, C., Smith, N., & Dawson, E. (2013). Climategate, Public Opinion, and the Loss of Trust. American Behavioral Scientist, 57(6), 818–837. https://doi.org/10.1177/0002764212458272

Levidow, L. (1999). Britain's biotechnology controversy: Elusive science, contested expertise. New Genetics and Society, 18(1), 47-64.

Levy, Y., & Ellis, T. J. (2006). A systems approach to conduct an effective literature review in support of information systems research. Informing Science, 9.

Lewicki, R. J., McAllister, D. J., & Bies, R. J. (1998). Trust and distrust: New relationships and realities. Academy of Management Review, 23(3), 438-458.

Lewicki, R. J., & Wiethoff, C. (2000). Trust, trust development, and trust repair. The handbook of conflict resolution: Theory and Practice, 1(1), 86-107.

Lewicki, R. J., Tomlinson, E. C., & Gillespie, N. (2006). Models of interpersonal trust development: Theoretical approaches, empirical evidence, and future directions. Journal of Management, 32(6), 991-1022.

Lidskog, R. (2008). Scientised citizens and democratised science. Re-assessing the expert-lay divide. Journal of Risk Research, 11(1-2), 69-86.

Lindenberg, S. (2000). It takes both trust and lack of mistrust: The workings of cooperation and relational signaling in contractual relationships. Journal of Management and Governance, 4(1), 11-33.

Luhmann, N. (2018). Trust and power. John Wiley & Sons.

Luhmann, N. (1979). Trust: A mechanism for the reduction of social complexity. Trust and power: Two works by Niklas Luhmann, 1-103.

Luis Bernal, J. (2005). Parental choice, social class and market forces: The consequences of privatization of public services in education. Journal of Education Policy, 20(6), 779-792.

Malul, M., Rosenboim, M., & Shavit, T. (2010). Costs of mistrust between ethnic majority and minorities: Evidence from Israel. Review of Social Economy, 68(4), 447-464.

March, J. G., & Olsen, J. P. (1983). The new institutionalism: Organizational factors in political life. American Political Science Review, 78(3), 734-749.

Maslow, A. H. (1943). A theory of human motivation. Psychological Review, 50(4), 370.

Matsueda, R. L., & Heimer, K. (1997). A symbolic interactionist theory of role-transitions, role-commitments, and delinquency. Developmental Theories of Crime and Delinquency, 44(3), 163-213.

McKnight, D. H., & Chervany, N. L. (2000). What is trust? A conceptual analysis and an interdisciplinary model. AMCIS 2000 Proceedings, 382.

McQuillan, D. (2014). The countercultural potential of citizen science. M/C Journal, 17(6).

McTighe, T. (2019). What is considered a conflict of interest or what to disclose in lectures and publications?. Reconstructive Review, 9(1).

Miller, F. G., & Brody, H. (2007). Clinical equipoise and the incoherence of research ethics. The Journal of Medicine and Philosophy, 32(2), 151-165.

Misztal, B. (2013). Trust in modern societies: The search for the bases of social order. John Wiley & Sons.

Mollering, G. (2006). 20 Trust, institutions, agency: Towards a neoinstitutional theory of trust. Handbook of trust research, 355.

Morten, F. (2014) Trust in the face of uncertainty: A qualitative study of intersubjective trust and risk, International Review of Sociology, 24(1), 130-144, DOI: 10.1080/03906701.2014.894335

Moss, G. K. (2007). What is attachment? Retrieved August, 8, 2019.

Nadelson, L.S., Hardy, K.K. (2015) Trust in science and scientists and the acceptance of evolution Evolution: Education and Outreach https://doi.org/10.1186/s12052-015-0037-4

Neeley, L. (2013). What the science tells us about “trust in science.”.

Newton, K. (2006). Institutional Confidence and Social Trust: Aggregate and Individual Relations. In Political disaffection in contemporary democracies (pp. 103-122). Routledge.

Newton, K., Stolle, D., & Zmerli, S. (2018). Social and political trust. The Oxford handbook of social and political trust, 37.

Nooteboom, B. (2000). Trust as a governance device. In Cultural factors in economic growth (pp. 44-68). Springer, Berlin, Heidelberg.

OCDE/Eurostat (2018), Oslo Manual 2018 : Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition, The Measurement of Scientific, Technological and Innovation Activities, Éditions OCDE, Paris/Eurostat, Luxembourg,https://doi.org/10.1787/9789264304604-en.

O'Connor, A. (2015) Coca-Cola Funds Scientists Who Shift Blame for Obesity Away From Bad Diets - New York Times https://well.blogs.nytimes.com/2015/08/09/coca-cola-funds-scientists-who-shift-blame-for-obesity-away-from-bad-diets/ Retrieved 15th July 2018.

Offe, C. (1999). How can we trust our fellow citizens. Democracy and Trust, 52, 42-87.

Oluffa Pedersen, E. (2012). A Kantian Conception of Trust. , 13(2), pp. 147-169. SATS Northern European Journal of Philosophy Retrieved 7 Feb. 2019, from doi:10.1515/sats-2012-0009

Orléan, A. (1995). Bayesian interactions and collective dynamics of opinion: Herd behavior and mimetic contagion. Journal of Economic Behavior & Organization, 28(2), 257-274.

Ortiz-Ospina, E., & Max Roser, M. (2019) - "Trust". Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/trust' [Online Resource]

Parry, G. (1976). Trust, distrust and consensus. British Journal of Political Science, 6(2), 129-142.

Peters, H. P. (2015) Science dilemma : between public trust and social relevance. https://www.euroscientist.com/trust-in-science-as-compared-to-trust-in-economics-and-politics/ Retrieved January,15th, 2019.

Pfattheicher, S., & Böhm, R. (2018). Honesty-humility under threat: Self-uncertainty destroys trust among the nice guys. Journal of Personality and Social Psychology, 114(1), 179.

Porter, T. M. (2003). FOCUS ARTICLE: Measurement, Objectivity, and Trust. Measurement: Interdisciplinary Research and Perspectives, 1(4), 241-255.

Pretty, J., & Ward, H. (2001). Social capital and the environment. World Development, 29(2), 209-227.

Pujas, V. (2006). Understanding the wave of scandal in contemporary Western Europe. Scandals in past and contemporary politics, 30-45.

PytlikZillig, L. M., & Kimbrough, C. D. (2016). Consensus on conceptualizations and definitions of trust: Are we there yet? In *Interdisciplinary perspectives on trust* (pp. 17-47). Springer, Cham.

Quere, L. (2001). Structure cognitive et normative de la confiance. Réseaux, no 108.

Rawlins, B. L. (2007). Trust and PR practice. Institute for Public Relations, 1-11.

Rawls, J. (1958). Justice as fairness. The Philosophical Review, 67(2), 164-194.

Remington Abramson, N., & Senyshyn, Y. (2010). Effective punishment through forgiveness: Rediscovering Kierkegaard's knight of faith in the Abraham story. Organization Studies, 31(5), 555-581.

Renn, O., & Levine, D. (1991). Credibility and trust in risk communication. In Communicating risks to the public (pp. 175-217). Springer, Dordrecht.

Resnick, H. E., Sawyer, K., & Huddleston, N. (2015). Trust and confidence at the interfaces of the life sciences and society: Does the public trust science?: A workshop summary.

Reuben, E., Sapienza, P., & Zingales, L. (2009). Is mistrust self-fulfilling?. Economics Letters, 104(2), 89-91.

Rezaei, M., Salehi, S., Shafiei, M., & Sabet, S. (2012). Servant leadership and organizational trust: The mediating effect of the leader trust and organizational communication. EMAJ: Emerging Markets Journal, 2(1), 70-78.

Richards, J. (2008). The many approaches to organisational misbehaviour: A review, map and research agenda. Employee Relations, 30(6), 653-678.

Robson, C., & McCartan, K. (2016). Real world research. John Wiley & Sons.

Robinson, C., & Latham, J. (2013). The Goodman affair: Monsanto targets the heart of science. Independent Science News, 20.

Robinson, S. L. (1996). Trust and breach of the psychological contract. Administrative Science Quarterly, 574-599.

Ross, C. E., Mirowsky, J., & Pribesh, S. (2001). Powerlessness and the amplification of threat: Neighborhood disadvantage, disorder, and mistrust. American Sociological Review, 66(4), 568.

Rothstein, B. (2000). Trust, social dilemmas and collective memories. Journal of Theoretical Politics, 12(4), 477-501.

Ruff, K. (2012). Quebec and Canadian governments end their historic support of the asbestos industry.

Rutjens, B. T., Sutton, R. M., & der Lee, R. van. (2018). Not all skepticism is equal: Exploring the ideological antecedents of science acceptance and rejection. Personality and Social Psychology Bulletin, 44(3), 384–405. https://doi.org/10.1177/0146167217741314

Ryan, K. J. (1998, April). Research fraud and public trust. In Forum for Applied Research and Public Policy (Vol. 13, No. 1, p. 50). University of Tennessee, Energy, Environment and Resources Center.

Sandler, I., Saini, M., Pruett, M. K., Pedro-Carroll, J. L., Johnston, J. R., Holtzworth-Munroe, A., & Emery, R. E. (2016). Convenient and Inconvenient Truths in Family Law: Preventing Scholar- Advocacy Bias in the Use of Social Science Research for Public Policy. Family Court Review, 54(2), 150-166.

Sandstrom, A. R., & Sandstrom, P. E. (1995). The use and misuse of anthropological methods in library and information science research. The Library Quarterly, 65(2), 161-199.

Sapsford, R., & Abbott, P. (2006). Trust, confidence and social environment in post-communist societies. Communist and Post-communist Studies, 39(1), 59-71.

Sauro, J., & Lewis, J. R. (2016). Quantifying the user experience: Practical statistics for user research. Morgan Kaufmann.

Schehr, S. (2008). Traîtres et trahisons: de l'Antiquité à nos jours. Berg.

Schehr, S. (2016). L'expérience ordinaire de la méfiance. Tracés. Revue de Sciences Humaines, (31), 151-167. Consulted july the 4th 2019.URL : http://journals.openedition.org/traces/6743 ; DOI : 10.4000/traces.6743

Schmoch, U. (2007). Double-boom cycles and the comeback of science-push and market-pull. Research Policy, 36(7), 1000-1015.

Scott, D. (2003). Science and the consequences of mistruct: Lessons from recent GM controversies. Journal of Agricultural and Environmental Ethics, 16(6), 569-582.

Seligman, A. B. (1998). Trust and sociability: On the limits of confidence and role expectations. American Journal of economics and sociology, 57(4), 391-404.

Sheehan, J. G. (2007). Fraud, conflict of interest, and other enforcement issues in clinical research. Cleveland Clinic Journal of Medicine, 74, S63.

Shelton, A. M., & Sears, M. K. (2001). The monarch butterfly controversy: Scientific interpretations of a phenomenon. The Plant Journal, 27(6), 483-488.

Sheppard, B. H., & Sherman, D. M. (1998). The grammars of trust: A model and general implications. Academy of Management Review, 23(3), 422-437.

Shrader-Frechette, K. S. (1994). Ethics of scientific research. Rowman & Littlefield.

Sindre, G., & Opdahl, A. L. (2005). Eliciting security requirements with misuse cases. Requirements Engineering, 10(1), 34-44.

Simmel, G. (1950). The sociology of Georg Simmel (Vol. 92892). Simon and Schuster.

Simon, H. A. (1976). From substantive to procedural rationality. In 25 years of economic theory (pp. 65-86). Springer, Boston, MA.

Simon, H. A. (1986). Rationality in psychology and economics. *Journal of Business*, S209-S224.

Siegrist, M., Cvetkovich, G., & Roth, C. (2000). Salient value similarity, social trust, and risk/benefit perception. Risk Analysis, 20(3), 353-362.

Siegrist, M., & Cvetkovich, G. (2000). Perception of hazards: The role of social trust and knowledge. Risk Analysis, 20(5), 713-720.

Slovic, P. (1993). Perceived risk, trust, and democracy. Risk Analysis, 13(6), 675-682.

Slovic, P. (1999). Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. Risk Analysis, 19(4), 689-701.

Smyth, M. B. (2009). 11 Subjectivities,'suspect communities', governments, and the ethics of research on 'terrorism'. Critical terrorism studies: A new research agenda, 194.

Sturgis, P., & Smith, P. (2010). Assessing the validity of generalized trust questions: What kind of trust are we measuring?. International Journal of Public Opinion Research, 22(1), 74-92.

Suda, F., & Ebizuka, A. (2007). Philippe Batifoulier (ed), Théorie des Conventions, Economica, Paris, 2001, 328 pages.

Sztompka, P. (1999). Trust: A sociological theory. Cambridge University Press.

Tanis, M., & Postmes, T. (2005). A social identity approach to trust: Interpersonal perception, group membership and trusting behaviour. European Journal of Social Psychology, 35(3), 413-424.

Thompson, B. (1999). If statistical significance tests are broken/misused, what practices should supplement or replace them?. Theory & Psychology, 9(2), 165-181.

Tyler, T. R. (1996). Trust in organizations: Frontiers of theory and research. Sage.

Van der Meer, T. W. (2018). Economic performance and political trust. In The Oxford handbook of social and political trust.

Van Ingen, E., & Bekkers, R. (2015). Generalized trust through civic engagement? Evidence from five national panel studies. Political Psychology, 36(3), 277-294.

Vodicka, D. (2006). The Four Elements of Trust. Principal Leadership, 7(3), 27-30.

Volkow, N. D., & Collins, F. S. (2017). The role of science in addressing the opioid crisis. New England Journal of Medicine, 377(4), 391-394.

Warren, M. E. (Ed.). (1999). Democracy and trust. Cambridge University Press.

Watson, S., & Moran, A. (Eds.). (2005). Trust, risk, and uncertainty (p. xii275). Palgrave Macmillan.

Weiss, A., Burgmer, P., & Mussweiler, T. (2018). Two-faced morality: Distrust promotes divergent moral standards for the self versus others. Personality and Social Psychology Bulletin, 44(12), 1712-1724.

Weissmann, G. (2006). Science fraud: From patchwork mouse to patchwork data. The FASEB Journal, 20(6), 587-590.

Wagenaar, W. A., & Keren, G. B. (1986). Does the expert know? The reliability of predictions and confidence ratings of experts. In Intelligent decision support in process environments (pp. 87-103). Springer, Berlin, Heidelberg.

Wahba, M. A., & Bridwell, L. G. (1976). Maslow reconsidered: A review of research on the need hierarchy theory. Organizational Behavior and Hhuman Performance, 15(2), 212-240.

Waltz, E. (2018). With a free pass, CRISPR-edited plants reach market in record time.

Whaley, A. L. (2001). Cultural mistrust: An important psychological construct for diagnosis and treatment of African Americans. Professional Psychology: Research and Practice, 32(6), 555.

Wiersma, Y. F. (2011). Variation, use, and misuse of statistical models: A review of the effects on the interpretation of research results. In predictive species and habitat modeling in landscape ecology (pp. 209-227). Springer, New York, NY.

Wicks, A. C., Berman, S. L., & Jones, T. M. (1999). The structure of optimal trust: Moral and strategic implications. Academy of Management Review, 24(1), 99-116.

Winter, M., Devictor, V., & Schweiger, O. (2013). Conquering current obstacles for avoiding the misuse of evolutionary diversity in nature conservation: A reply to Rosauer and Mooers. Trends in Ecology & Evolution, 28(6), 323-324.

Xia, W., Cao, M., & Johansson, K. H. (2015). Structural balance and opinion separation in trust–mistrust social networks. IEEE Transactions on Control of Network Systems, 3(1), 46-56.

Yan, C. (2018). Analysis of the influence of local government's behavior and preference on industrial agglomeration under Chinese promotion game. International Journal of Economics, Finance and Management Sciences, 6(2), 43.

Young, S. S., & Karr, A. (2011). Deming, data and observational studies. Significance, 8(3), 116-120.

Young, H. P. (1996). The economics of convention. Journal of Economic Perspectives, 10(2), 105-122.

Young, O. R. (2013). Compliance & public authority: A theory with international applications. RFF Press.

Zaghloul, R., & Hartman, (2003). Construction contracts: The cost of mistrust. International Journal of Project Management, 21(6), 419-424.

Zucker, L. G. (1986). Production of trust: Institutional sources of economic structure, 1840-1920. Research in Organizational Behavior, 8, 53-111.

Data Sources:

Edelman Trust Barometer (2019) – 20 January 2019 - https://www.edelman.com/trust-barometer

The world value survey – Wave 6 – Wave 7 is under way and results should be made available by mid-2020 - http://www.worldvaluessurvey.org/WVSDocumentationWVL.jsp

Statista on trust – 445 series - https://fr-statista-com.ezproxy.inseecgateway.com/recherche/?q=confiance&qKat=search

PwC (2018) Global Economic Crime and Fraud Survey Pulling fraud out of the shadows. https://www.pwc.com/gx/en/services/advisory/forensics/economic-crime-survey.html Retrieved 25th October 2018

Doctolib forum

Data.gouv.fr : Education and Research topics https://www.data.gouv.fr/fr/topics/education-et-recherche/

Eurostat AES survey 2016 - trng and trng_cvt databases - https://ec.europa.eu/eurostat/web/microdata/adult-education-survey - Last accessed 19 August 2019 following a pushed information received on an update.

OECD online education database : https://www.oecd.org/education/database.htm