

Defining a new paradigm for data protection in the world of Big Data analytics

Alessandro Mantelero
Nexa Center for Internet & Society
Politecnico di Torino, Turin, Italy
alessandro.mantelero@polito.it

Abstract

All the ongoing proposals for a reform of data protection regulations, both in the U.S. and Europe, are still focused on the purpose limitation principle and the “notice and choice” model. This approach is inadequate in the present Big Data context. The paper suggests a revision of the existing model and proposes the provision of a subset of rules for Big Data processing, which is based on the opt-out model and on a deeper level of control by data protection authorities.

Keywords: Law; European Union Law; Data protection regulation; Notice and consent; Opt-in model; Big Data; Data protection authorities.

1. Introduction

In the last few years, the debate surrounding data protection and privacy has focused on the future wave of new regulations. Driven by the Web 2.0 environment and the economy of data, private companies and governments have become even more data-centric. However, the high demand for personal information, the complexity of the new tools of analysis and the increasing numbers of sources of data collection, have generated an environment in which the “data barons” [1] (i.e. big companies, government agencies, intermediaries) [2] have a control over digital information which is no longer counterbalanced by the user’s self-determination. Nevertheless, all the ongoing proposals for a reform of data protection regulations, both in the U.S. and Europe, are still focused on the traditional main pillars of the so called “fourth generation” of data protection laws [3] [4], which are represented by the purpose limitation principle and the “notice and choice” model.¹ This kind of approach seems to be inadequate in the present Big Data context and in a digital world characterized by an asymmetric distribution of the control over information. It is also inadequate in a digital economy where users accept not having an effective negotiation of their personal

¹ In the U.S. the traditional approach, based on different sectorial regulations, underestimated the role played by user’s choice, adopting a marked-oriented approach; nevertheless the recent guidelines adopted by the U.S. administrations seems to adopt a different approach, reinforcing self-determination, although these new set of principles are still unimplemented. See The White House, *A Consumer Data Privacy in a Networked World: A Framework for Protecting Privacy and Promoting Innovation in the Global Digital Economy*, 2012, pp. 47-48, retrieved February, 28th, 2014 from <http://www.whitehouse.gov/sites/default/files/privacy-final.pdf>.

information, due to market concentration and social and technological lock-ins.²

For these reasons, it is necessary to re-consider the existing data protection legal framework and define new models, which better address the various issues of this new digital environment. Different proposals have been advanced by legal scholars, which focus on privacy by design [6] [7], contextual privacy [8], data uses [9] and other combined solutions. Nevertheless, many of these proposals adopt a holistic approach to the problem. In contrast, this article suggests the adoption of different solutions for situations in which the role of the consent-based model is outdated and the contexts in which the traditional model based on opt-in can be preserved.

In doing so, the experience from the past should not be forgotten. In many cases, the first answer given by the legal system to new technological and social revolutions [1] is represented by the introduction of new ad hoc rules. Nevertheless, the lack of knowledge of past experiences makes it difficult to find adequate answers to the new questions that technology poses.

In the light of the above, this article reconsiders the history of data protection and its evolution from mainframe to Big Data, in order to give an answer to the contemporary problems of privacy and data protection. This is not a mere cultural interest in this historical perspective, since there are evidently a numbers of similarities between the context of the 50’s-60’s and the present. For this reason the analysis of that experience can offer elements to address the new challenges and to re-think the data protection framework.

2. The Reasons of Data Protection and the First Generations of Regulations

Before considering the different reasons that induce the law to protect personal information, it should be noticed that European legal systems do not recognize the same broad notion of the right to privacy, which exists in U.S. case laws. At the same time, data protection laws in the European countries do not draw their origins from the European idea of privacy and its related case law.

With regard to the first aspect (and in brief), in the U.S. the right to privacy covers a broad area that goes from informational privacy to the right of self-determination in private life decisions [10][11][12][13][14][15]. On the other

² See below para. 3.

hand, in European countries this right mainly focuses on the first aspect and is related to the activities of the media.

With regard to the second aspect, it is worth pointing out that the European data protection regulations, since their origins in the late 60's, have focused on the information regarding individuals, without distinguishing between their public or private nature [16]. The right to privacy and data protection do not concern the same aspects, even if they are entangled and connected in many senses: there is only a partial overlapping, given that private facts are also referred to individuals, but at the same time a lot of personal information is publicly available and, for this reason, it does not fall into the field of the right to privacy. However, the legal issues related to the protection of personal information had a more recent recognition in law, both in the U.S. and Europe [3][4][17], dating from the 60's, whereas the primitive era of the right to privacy was at the end of 19th century when the penny press assumed a significant role in limiting the privacy of the people of upper classes [18][19].³ For these reasons, our analysis should start from the computer revolution of the late 50's and not one century before, when the first decision on informational privacy were adopted in Europe, independently from the U.S. legal doctrine and before the milestone article of Warren and Brandeis [19].

The first generations of data protection regulations were characterized by a national approach: regulations were adopted at different times and were different in the extension of the protection they provided and the remedies they offered.

The notion of data protection was originally based on the idea of control over information, as demonstrated by the literature of that period [20][21]. At that time, the migration from dusty paper archives to computer memories was a Copernican revolution which, for the first time in history, permitted the aggregation of information about every citizen previously spread over different archives. For this reason, the first regulations represented the answers given by legislators to the rising concern of citizens about social control as the introduction of big mainframe computers gave governments and big companies the opportunity to collect and manage large amount of personal information [22].

In that period, people were afraid of being visible like a gold fish in a glass bowl [23][24][25]. In the mainframe era a concentration of information, which was massive for the time, was in the hands of few entities, which were able to support the investments required by the new mainframe equipment. This concentration was also induced by the centralized architecture of mainframes, with their single central processing unit and a main memory in which all the computational power was placed and made available to other specialized terminals, which were connected.

The solution given by the legal systems was the opportunity to have a sort of counter-control over the collected data. The purpose of the regulations was not to spread and democratize power over information but to increase the level of transparency about data processing and guarantee the right to access to information. Citizens felt they were monitored and

the law gave them the opportunity to know who controlled them, which kind of data were collected and for which purposes.

Technically speaking, a fundamental element of these new regulations was the mandatory notification to independent authorities of the creation of every new database, necessary in order to know who had control over information. Another key component of the first legal frameworks is the rights to access, which allowed citizens to ask the data owners about the way in which the information was used and, consequently, about their exercise of power over information. Finally, the entire picture was completed by the creation of ad hoc public authorities, to guarantee the respect and enforcement of citizen's rights, control over the data owners and the reaction against abuses.

In this model there was no space for individual consent, due to the economic context of that period. The collection of information was mainly made by public entities for purposes related to public interests, so it was mandatory and there was no space of autonomy in terms of negotiation about personal information. At the same time, personal information did not have an economic value for the private sector, as the data about clients and suppliers were only used for operational functions regarding the execution of the activities of the company.

Nevertheless, there was also another element that contributed to exclude the role of self-determination: the lack of knowledge, the extreme difficulty for ordinary people to understand how the mainframes worked. The computer mainframes were a sort of modern god, with sacral attendants, a selected number of technicians that was able to use this new equipment. In this scenario, it did not make sense to give citizens the chance to choose, since they were unable to understand the way in which the data was processed.

Finally, it is worth pointing out that all these aspects (concentration of information, centralized architecture, complexity of data processing) are now present again in the Big Data context, hence the practical relevance of this past experience, which will be more extensively considered in the following paragraphs.

3. The New Generations of Regulations and the Economic Value of Personal Information

The following period – during the 80's and 90's – was the era of distributed computers: now many people had the chance to buy a personal computer to collect and process information. The big mainframe computer “became” the small desktop personal computer, with a relatively low cost, and consequently the computational capacity was no longer an exclusive privilege of governments and big companies, but became accessible to many other entities and to consumers.

At that time, we also witnessed to another transformation represented by the advent of direct marketing. This was based on customer profiling and necessarily required an extensive data collection to apply data mining software and to suggest to any single consumer the commercial proposal that was most suitable for him or her. This was a new form of data processing driven by new purposes: information was no longer collected

³ See Trib. civ. Seine, 16 giugno 1858, *D.P.*, 1858.3.62.

to support supply chains, logistics and orders, but to sell the best product to every single user. From this perspective, the data subject became the focus of the process and the information referred to him or her assumes an economic and business value, given its role in sales.

These changes of the technological and business frameworks created new requests from society to legislators: since personal data have become an economic and strategic asset of companies, citizens wanted to have the chance to negotiate their personal data and gain something in return.

Since the new generations of the European data protection laws put the personal information in the context of fundamental rights [26][27], the main goal of these regulations was to satisfy the economic interest to have a free flow of personal data to boost the economy at large and especially the digital economy. This is also affirmed by the Directive 95/46/EC, which represents at the same time the general framework and the synthesis of this second wave of data protection laws.⁴ Nevertheless the roots of data protection still remained in the ground of personality rights and, for this reason, the European approach is less market-oriented than in other legal systems and it recognizes the fundamental role of public authorities in protecting the individual against unwilling or unfair exploitations of his or her personal information for market purposes.

The theoretical model of fundamental rights, based on self-determination, and the rising data-driven economy highlighted the important role played by user consent in data processing [17][28].⁵ Consent is not only the expression of choice about the use of a personality right made by third parties, but is also the instrument to negotiate the economic value of personal information [29]. In this new data-driven economy users cannot be put aside and personal data cannot be exploited for business purposes without any involvement of data subjects: it is necessary that data subjects become part of the negotiation, since data are no longer used mainly by government agencies for public purposes, but also by private companies for monetary revenues [30].

Nevertheless, an effective self-determination about data processing, both in terms of protection and economic exploitation of personality rights, cannot be obtained without adequate and prior notice, which describes how the data are processed and the purposes of data processing. For these reasons, the new generation of data protection laws has added a new layer represented by the “notice and consent” model [31] to the existing paradigm based on transparency and access.⁶

⁴ The EU Directive 95/46/EC has this bivalent nature, since it was written on the basis of the existing national data protection laws, in order to harmonize them, but at the same time it also provided a new set of rules. See the recitals in the preamble to the Directive 95/46/EC.

⁵ See Charter of Fundamental Rights of the European Union (2010/C 83/02), art. 8, OJEU, 30 March 2010, C83/389. See also Bundesverfassungsgericht, 15 December 1983, *Neue Juristische Wochenschrift*, 1984, p. 419.

⁶ With regard to personal information collected by public entities, in various cases the Directive 95/45/EC allows data collection without the consent of data subject; however, the notice to data subjects is necessary also in these cases. See Articles 7, 8 and 10, Directive 95/46/EC.

Finally, it is important to notice that during the 80’s and 90’s the level of data analysis that was possible was still limited and users were able to understand the correlation between data collection and related purposes of data processing (e.g. profiling users). So, at that time, informed consent and self-determination were really synonyms; this would not be the case in the future Big Data era.

4. The Future Generations of Regulations in a Context Characterized by Big Data and Big Players

The present Big Data era is different from the previous period both in terms of economic and technological context, with direct consequences on the adequacy of the legal model adopted to protect personal information.

The new environment is mainly digital and is characterized by an increasing concentration of information in the hands of a few entities, both public and private. The role played by specific subjects in the generation of data flows is the principal reason for this concentration. Governments and big private companies collect huge amounts of data while performing their daily activities. This bulk of information represents a strategic and economically relevant asset, since the management of large databases enables these entities to assume the role of gatekeepers with regard to the information that can be extracted from the datasets, by limiting access to the data, perhaps to specific subjects only or to circumscribed parts of the entire collection, or by keeping it completely closed.

Not only governments and big private companies acquire this power, but also the intermediaries in information flows (e.g. search engines, Internet providers, credit report agencies, marketing companies), which do not generate information, but play a key role in circulating it.

There are also different cases in which information is accessible to the public, both in raw and processed form. This happens with regard to open data sets made available by government agencies, information held in public registries, data contained in reports, studies and other communications made by private companies and, finally, online user-generated contents, which represent a relevant and increasing portion of the information available online.

The concurrent effect of all these different sources only apparently diminishes the concentration of power over information, as access to information is not equivalent to knowledge. A large amount of data creates knowledge if the holders have the adequate interpretation tools to select relevant information, to reorganize it, to place the data in a systematic context and if there are people with the skills to define the design of the research and give an interpretation to the results generated by Big Data analytics.

Without these skills, data only produces confusion and less knowledge in the end, with information interpreted in an incomplete or biased way.

In the Big Data context, the availability of data is not sufficient. It is also necessary to have the adequate human and computing resources to manage it. For this reason, control over

information does not only regard limited access data, but can also concern open data, over which the information intermediaries create an added value by means of their instruments of analysis.

Because only few entities are able to invest heavily in equipment and research, the dynamics described above enhance the concentration of power over information and are increased by the new expansion of Big Data and its global dimension.

Under many aspects, this new environment resembles the origins of data processing, when in the mainframe era technologies were held by a few entities and data processing was too complex to be understood by data subjects. Could this suggest that in the future the scenario will change again in a sort of “distributed Big Data analytics”, as it happened in the change from mainframe to personal computer? Probably not. The new “data barons” do not base their position only on expensive hardware and software, which may become cheaper in the future. Neither is their position based on the growing number of staff with specific skills and knowledge, able to give an interpretation to the results of data analytics. The fundamental element of the power of “data barons” is represented by the large databases they have. These data silos, considered the goldmine of the 21st century, do not have free access, as they represent the main or the side-effect of the activities realized by their owners, due to the role they play in creating, collecting or managing information.

For this reason, with regard to Big Data, it does not seem so easy to imagine the same process of “democratization” that happened concerning computer equipment during the 80’s: the access to the above mentioned large databases is not only protected by legal rights, but it is also strictly related to the peculiar positions held by the data holders in their market and to the presence of entry barriers.

Another aspect that characterizes and distinguishes this new form of concentration of control over information is given by the nature of the purposes of data collection: data processing is no longer focused on single users (profiling), but it increased by scale and it trying to investigate attitudes and behaviours of large groups and communities, up to entire countries. The consequence of this large scale approach is the return of the fears about social surveillance, which characterized the mainframe era.

Nevertheless, it is important to highlight that this new potentially extensive and pervasive social surveillance differs from the past, since the modern surveillance is no longer realized only by intelligence apparatus, which autonomously collects a huge amount of information through pervasive monitoring systems. It is the result of the interplay between private and public sectors, based on a collaborative model made possible by mandatory disclosure orders, which are issued by courts or administrative bodies, and extended to an undefined pool of voluntary or proactive collaborations from big companies. In this way, governments obtain information with the indirect “co-operation” of the users who probably would not have given the same information to public entities if requested. Service providers for example collect personal data on the base of private agreements (privacy policies) with the

consent of the user and for specific purposes, but governments exploit this practice by using mandatory orders to obtain the disclosure of this information. This dual mechanism hides from citizens the risk and the dimension of the social control that can be realized by monitoring social networks or other services and using Big Data analytics technologies [32][33][34][35].

In this scenario, the traditional data protection framework defined in the 90’s goes to crisis [9][36][37], since the new technological and economic (i.e. market concentration, social and technological lock-ins) context undermined two of its fundamental pillars: the purpose limitation principle and the “notice and consent” model.

The purpose limitation principle has its roots in the first generations of data protection regulations, since it is strictly related to the intention of avoiding extensive data collections, which may imply risks in terms of social surveillance and control. With the advent of the new generation of data protection regulations – during the 80’s and 90’s –, this principle not only represented a limit to data processing, but also became a key element of the “notice and choice” model, since it defines the use of personal information made by data controllers that is an important information impacting the user’s choice. Nevertheless, the advent of Big Data analytics makes it difficult to provide detailed information about the purposes of data processing and the expected outputs. Since Big Data analytics are designed to extract hidden or unpredictable inferences and correlations from datasets, the description of these purposes is becoming more and more “evanescent”, as a consequence of the “transformative” [38] use of Big Data, which makes it often impossible to explain all the possible uses of data at the time of its initial collection.

These critical aspects concerning the purpose limitation have a negative impact on the efficiency of the “notice and consent” model. First, the difficulty in defining the expected results of data processing induces introducing generic and vague statements in the notices about the purposes of data collection. Second, also in the hypothesis of the adoption of long and detailed notices, the complexity of data processing in the Big Data environment does not offer to users a real chance to understand it and to make their choice.

Moreover, this scenario is made worse by economic, social and technological constraints, which definitively undermine the idea of self-determination with regard to personal information that represented the core principle of the generation of data protection regulations approved during the 80’s and 90’s. As mentioned before, we assisted to an increasing concentration of the informational assets, due to the multinational or global nature of some big players of the new economy, but also due to merger and acquisition processes, which created big companies both in the online and offline markets. In various cases, mainly with regard to online services, these large scale trends drastically limit the number of the companies that provide specific kind of services, which consequently have hundreds of millions of users. This dimension of the dominant players also produces social and technological lock-in effects that increase

data concentration and represents further direct and indirect limitations to user's self-determination and choice.⁷

In the described scenario, characterized by complex data processing and concentration of control over information, the decision to maintain a model mainly focused on "notice and choice" represents a risk, since it is easy for companies to give notice and require the consent without an effective self-determination of users, given the abovementioned reasons.

This leads us to reconsider the role of user's self-determination and to differentiate the situations in which users are not able to understand deeply the data processing and its purposes, or are not in the position to decide,⁸ from the other different situations in which they can take an actual, free and aware decision. With regards to the first hypothesis, there it seems to be an analogy between the characters of data processing in the Big Data era and what it happened in the mainframe age: like at the beginnings of computer age, today, data are collected by a limited number of entities and users are not able to understand the purposes and methods of data processing. In these cases the focus cannot be maintained mainly on the user and his or her self-determination: the role of users should be reduced and conversely the role of independent authorities should be increased. Data protection authorities, rather than users, have the technological knowledge to evaluate the risks associated to data processing and can adopt legal remedies to tackle them. Furthermore, they are also in the best position to balance all the different interests of the various stakeholders with regard to extensive projects of data collection and data mining.⁹

⁷ A social lock-in effect is evident in social networks and it is the consequence of the dominant position held by some big players, which intrinsically limits the user's possibility to recreate the same network elsewhere and, for this reasons, it also reduces user's propensity to change platform and limits their chances of not being profiled or tracked. Differently, the technological lock-in is related to technological standards and data formats adopted by service providers and it limits the data portability and migration from one service to another, which offers the same functions.

⁸ See also Article 7 (4), Proposal for a regulation of the European Parliament and the Council on the protection of individuals with regard to the processing of personal data and on the free movement of such data (General Data Protection Regulation), COM(2012) 11 final, Brussels, 25 January 2012, retrieved February, 28th, 2014 from http://ec.europa.eu/justice/data-protection/document/review2012/com_2012_11_en.pdf ("Consent shall not provide a legal basis for the processing, where there is a significant imbalance between the position of the data subject and the controller"). In 2013, The Committee on Civil Liberties, Justice and Home Affairs (LIBE) of the European Parliament has dropped the former Article 7 (4), see Proposal for a regulation of the European Parliament and of the Council on the protection of individual with regard to the processing of personal data and on the free movement of such data (General Data Protection Regulation),(COM(2012)0011 – C7 0025/2012 – 2012/0011(COD)), compromise amendments on Articles 1-29 and on Articles 30-91 (hereinafter abbreviated as PGDPR-LIBE), retrieved February, 28th, 2014 from http://www.europarl.europa.eu/meetdocs/2009_2014/documents/libe/dv/comp_am_art_01-29/comp_am_art_01-29en.pdf and http://www.europarl.europa.eu/meetdocs/2009_2014/documents/libe/dv/comp_am_art_30-91/comp_am_art_30-91en.pdf.

⁹ See, e.g., Article 29 Working Party, Letter from the Article 29 Working Party addressed to Google regarding the upcoming change in their privacy policy, 2 February 2012, retrieved February, 28th, 2014 from http://ec.europa.eu/justice/data-protection/article-29/documentation/other-document/files/2012/20120202_letter_google_privacy_policy_en.pdf.

The suggestion is not to change the entire traditional model of data protection, but to reshape with regard to the Big Data context and the other contexts in which asymmetries in data negotiation drastically reduce the role of self-determination. In the remaining cases, the "notice and consent" model, as traditionally designed, can still be effective, although it needs to be reinforced by increasing transparency, service provider's accountability and data protection-oriented architectures.¹⁰

5. A Subset of Rules for Big Data and Lock-in Situations

The context described above and the related observations suggest defining specific rules for Big Data uses and the situations characterized by asymmetries in data negotiation.¹¹ The necessity to distinguish this area seems not to be felt neither by the E.U. legislator, in the proposal for a new data protection regulation, nor by the U.S. administration, in the Consumer Privacy Bill of Rights [39]. Although the E.U. proposal provides various rules that can be useful, it still adopts a holistic approach, in which the consent is still "purpose-limited" and based on the "notice and choice" and the opt-in model.

Conversely, legal scholars and companies propose a different approach, which focuses on the use of the data, on the likely risks (of benefits and harms) associated with the proposed use of the data and on accountability [40]. Although this last approach has the undoubted merit to underline the crisis of the traditional model and to suggest a solution more suitable to address the issues of the existing and future context of data processing, nevertheless it offers a holistic solution, but this "one solution fits all" approach does not seem to be coherent with the different contexts.

With regard to Big Data context, the new issues should not be necessarily addressed by making a choice between a "consent based" model and a "corporate accountability" model. Although Big Data and lock-in effects drastically limit self-determination at the moment in which the data are collected, the fundamental right of any person to decide about his or her own information cannot be erased and users should have the right to be informed about data processing and not to take part of it.

In this sense, the model here suggested is the result of the past experiences: like in the first regulations, the decision about data processing cannot be left to users, but at the same time user's rights to oppose to data processing and not to have personal data collected – codified in data protection laws during the 90's – should be preserved.

The fundamental pillars of this model are the adoption of the "opt-out" scheme and the definition of a rigorous data protection assessment, which should be publicly available. With regard to the latter, the same approach that is used in the

¹⁰ See Articles 13a, 23, 32a, 33, 33a, 34, 35, 39, PGDPR-LIBE.

¹¹ For this reason, the following paragraphs will leave aside the cases in which users are able to understand the purposes of data collection and data processing, where the existing "notice and choice" and "purpose limited" consent can be kept valid.

field of product security and liability (e.g. drugs authorization) should be extended to data processing: in presence of complex data processing systems or data collections influenced by lock-in effects, the risk and benefit assessment should not be done by users, but it should be made by companies, under the supervision of data protection authorities. Users should only decide to give their information or, when the data have already been collected, to exercise or not their right to opt-out.

In this model, companies intend to adopt a strategy based on Big Data should conduct an assessment of its impact on data protection, social surveillance and discrimination, in order to adopt all the adequate measures and standards to reduce it. This assessment, as in clinical trials, should be conducted by third parties and supervised by data protection authorities, which should also define the professional requirements of these third parties. Once the assessment is approved by data protection authorities, the process should be considered secure in terms of protection of personal information and risks of social surveillance and, for this reason, companies can enlist all users in the specific data processing, without any prior consent, but giving them a previous notice that mentions the results of the assessment¹² and providing them the opt-out option.

Obviously the entire system works only if the political and financial autonomy of data protection authorities, both from governments and corporations, is guaranteed. For this reason, it would be preferable if a model based on mandatory fees, paid by companies when they submit their requests of authorization to data protection authorities, could be adopted. This will give autonomous resources to authorities, related to their activities, without being influenced by the entities under their surveillance.

At the same time, in this model, independent authorities assume an important role in balancing all the different implications of data processing, not only in terms of data security but also in terms of social impact and ethical use of data. Conversely, a different assessment exclusively based on the adoption of security standards or corporate self-regulation would not have the same extent and independency. This does not mean that forms of standardization or co-regulation cannot be adopted [41]; nevertheless, the proposed reduction of the role of user's self-determination should have a necessary counterbalance in the active role of public and independent authorities acting in the interest of the whole society.

This model should offer clear and public procedures for assessment. These, undoubtedly, represent an economic burden for companies; nevertheless, in case of positive evaluation of data processing plans, these procedures allow companies to use data for complex and multiple purposes, without the inconvenience of acquiring a specific opt-in choice every time data are used for new purposes. Companies should only inform users about any changes and give them the chance to opt-out.

¹² The notice should also describe how to access to the impact assessment report. This report is a short version of the documentation related to the assessment and it does not contain corporate sensitive information, in order to balance trade secrets and publicity of the assessment. Nevertheless, in presence of litigations, courts or data protection authorities may have access to the complete documentation and may disclose it to the compliant.

From the user's point of view, on the one hand, the assessment conducted by the data protection authorities gives them a guarantee of an effective evaluation of the risks related to data processing and, on the other hand, the opt-out allows them to receive information about data processing and to decide if they do not want to be part of the data collection.

6. Conclusions

All the ongoing proposals for a reform of data protection regulations, both in the U.S. and Europe, are still focused on the traditional main pillars of data protection laws, which are represented by the purpose limitation principle and the "notice and choice" model. This approach is inadequate in the present Big Data context, where the complexity of data processing and the power of modern analytics drastically limit the awareness of data subjects, their capability to evaluate the consequences of their choices and their free and informed consent. Moreover, the "transformative" use of personal information (e.g. Big Data) often makes it impossible to give the description of all the possible uses of the data at the time of its initial collection.

For these reasons, a revision of the "notice and choice" model, which is focused on the opt-in, is necessary. In this light, this paper proposes the adoption of a different approach when, such as in Big Data context, the data subject cannot be totally aware of the tools of analysis and their potential output.

In the proposed model, companies that intend to adopt strategies based on Big Data with regard to personal information should conduct an assessment of the impact of these strategies on data protection, in order to adopt all the adequate measures and standards to reduce the potential negative effects on individuals and the risks of social surveillance. Once the assessment is approved, the data processing should be considered secure in terms of protection of personal information and risks of social surveillance. For this reason, companies can subsequently enroll their users in the data processing, giving them the opt-out option.

In this model, data protection authorities play a central role in considering all the different implications of data processing, not only in terms of data security but also of social impact and ethical use of information, since the proposed reduction of the role played by user's self-determination should have a counterbalance in the active role played by public and independent authorities.

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