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Ethical and Social Implications of Big Data Analytics in Decision Making Processes

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ABSTRACT

The Big Data analytics has transformed how decisions are arrived at in most industries by facilitating the capabilities to process large quantity of data within a limited period of time and obtain insights, predictions and arrive at decisions. Though all of these innovations are yielding positive outcomes in increasing efficiency, evidence-based policymaking, and innovation, there exist severe ethical and social consequences as well. The most notable ones are the atmosphere of privacy erosion, algorithm bias, absence of transparency and lack of accountability, the surveillance threat, and the heightened social disparities. Through the frames of public policy, business strategies, the health care and the police, with regard to the ethical and social perspective, this paper critically reviews the ethical and social challenges of the decision-making perspective of the responsible data usage through review of structures and governance mechanisms of the responsible data usage. The interdisciplinary synthesis of scholarship in the research results in the identification of the requirements/recommendations to the ethical guidelines, regulatory supervision and inclusive practice required to provide fairness, accountability and respect to the individual rights in the age of big data.

Introduction

The digital revolution has opened up a period of unprecedented amounts, flow and diversity of data. This phenomenon - known popularly as Big Data, refers to the datasets which have become so large and so complex, that traditional data processing tools are not able to handle them efficiently. Advances in computing power, storage, networking and analytics have seen organisations begin to turn raw data into actionable data through the use of techniques like machine learning, predictive modelling and real-time analytics. Across domains - from business to healthcare, public policy to criminal justice - Big Data analytics has now become at its core some of the decision making processes aimed at improving outcomes; optimizing resources; and driving innovation. In the corporate world, data driven approaches of marketing, supply chain management and customer relationship management while public institutions like analytics define the social services delivery as well as the allocation of resources and changes in its governance and finally in the health care sector analytical based decision making approaches such as the predictive analytics, guide the diagnostic tools and care routes of the patient treatment.

Although it may transform the manner of operation, significant ethical and social issues emerge when Big Data analytics are considered to be integrated in the process of decision making. Unlike the traditional choices obtained with limited data or using the human mind alone, data-driven choices are often made with automated systems and processes, which are entirely dependent on algorithms and are often opaque, complex and difficult for laymen or even experts to interpret. As a result decisions that affect employment opportunities, access to credit, enforcement of laws and social welfare programs may be biased by patterns and correlations found in data that reflect, and in some cases reinforce, existing biases, inequalities and power asymmetries.

One of the biggest ethical issues regarding the use of Big Data analytics is the issue of privacy. Data that is used for analytics often includes personal and sensitive data - from healthcare records and financial transactions, social media activity, geolocation

data - that individuals may not have explicitly agreed to share. Even when consent is given, it is often based upon complex terms of service agreements which users don't accordingly understand fully. The aggregation and analysis of such data poses the threats of re-identification, unauthorized surveillance and intrusive profiling. Scholars believe that existing frameworks of informed consent, as well as protection of privacy, have trouble keeping up with scale and complexity of data ecosystems that transcend across sectors and jurisdictions.

Two other issues of ethics are algorithms bias and fairness. Analytics models are trained with data and if this data has been based on discriminatory practices and/or systemic inequalities (e.g. racial bias in records of police stops, gender disparities in hiring histories) then the models are able to learn from this and perpetuate these patterns. This can lead to the unfair treatment of people and groups in decision making about screening for jobs, giving people loans, predictive policing and health interventions. These outcomes violate principles of justice and equity and raise questions of ethical obligation of institutions utilizing Big Data analytics in decision-making.

Transparency and accountability is another problem. Many analytics systems are "black boxes" in which knowledge of the internal logic is not transparent even to the developers. Decisions based on the use of such systems may not have clear explanations and as a result it may be difficult for affected people to understand, challenge or appeal against decisions. This opacity brings back historic norms of accountability in governance and corporate responsibility that with decision process should be provided to be interpreted and justified.

From a social perspective the use of Big Data analytics has implications in terms of power relations and social inequality. Large technology companies and government agencies can in many instances have more capacity for data collection, storage and analysis and as a result have disproportionate influences on the creation and sharing of knowledge, as well as on decision-making. The low-digital literate or under-represented communities in data sets could potentially become a marginalised community in the data-driven decision frameworks. Such dynamics allow social stratification and partiality of trust on those institutions that are perceived as not taking issues of fairness and human rights into consideration.

Surveys also present research problems on surveillance and what to do about behaviour. It is now possible through big data analytics to monitor how individuals and groups behave at a scale and this behavior can result in social sorting and predictive governance practices that predict and attempt to change behavior in the future. Although these might put us in a safer or better place, provide us with better services, they also form the ethical issues related to autonomy, freedom of expression and right to just live again without being spied on by the state or corporate forces without their pay.

Considering these complex challenges, scholars and industry experts have proposed ethical principles, regulatory controls and policymaking entities as an efficient approach to determining that the Big Data analytics is applied in a responsible manner to make influential choices. The terms algorithmic accountability, data justice and privacy by design, have become a buzzword in the policy and scholarly literature.

Ethical frameworks are concerned with principles such as respect for persons, being able to function transparently, being fair and having human oversight. Regulatory instruments--ismic examples including the European Union's Genera Data Protection Regimen (GDPR), attempt to manipulate lawful limits on data collection and processing other than individual rights, though implementation and compliance to quite attain the in the crack varies through the extent.

Nevertheless, gaps are still very wide between translation of principles of ethics into operational standards and practices to govern systems of analytics in the real world. Organizations differ greatly on the extent to which they support adherence to ethical guidelines and many organizations don't have internal governance processes in place for analyzing the social impact of analytics on a range of different stakeholders. There is also an absence of empirical literature talking about the impact of the ethical framework in reducing the problematic Ness in the outcomes of the decision or the negativity in social consequences.

The problem that makes the discussion of this study is to explore ethically and socially the implications that can be extracted from the application of Big Data analytics in the process of decision making across the sectors. The research explores the ways through which ethical issues like invasion of privacy, algorithmic bias, lack of transparency and accountability is taking shape in institutional environments and how the above issues impact social outcomes and human well-being. The research also addresses the theory of frameworks of ethical governance already in existence, as well as points out the blankets in current practice, and suggests ways of improving them in order to allow more equitable, transparent and accountable analytic systems.

Such research is of importance because it is an interdisciplinary one which has seen the contributions of ethics, data science, sociology, law and even the policymaking to offer a multifaceted interpretation of the ethical and social nature of BIG Data analytics. This study gives some recommendations to policy makers, technologists as well as the leaders of organizations who may not be aware of how to harness the powers of data analytics in a responsible manner. Thus, contributes to enhancing the

activities aimed at transforming Tanzim of technological innovation in a society with increasingly data-driven and social values and human rights and democratic norms.

Literature Review

The introduction of Big Data analytics in decision-making procedures have received a lot of scholary days on the last two decades, specifically, in terms of ethics and social repercussions. Big Data has been defined as the "3Vs" of volume, velocity and variety which is a reference to the scale, speed and complexity of data generated through digital platforms, the internet of things, social media and the data banked by organisations. (2001) (Laney) While these attributes offer powerful opportunities for evidence based decision-making they also present risks which involve privacy, fairness, accountability and social equity.

The Ethical Issues of Big Data Analysis

The use of big data can be said to have encountered The most visible ethical issues are the Privacy and Data Protection. Data will often be sensitive personal data such as health data, location data, online behavior and financial transactions. Studies focus on the fact that the aggregation and the cross-linking of such datasets will make the re-identification of individuals more likely despite the application of anonymization techniques (Ohm, 2010). European Union regulations (we are mentioning GDPR General Data Protection Regulation) have tried to reduce privacy risks by imposing consent obligations, data minimization and user rights over personal data. Despite this, compliance and enforcement rates in the world vary and there are loopholes in terms of ethics in most cases (Voigt & Von dem Bussche, 2017).

One more major problem is Algorithmic Bias and Discrimination. Analytics models have a tendency to be trained an historic data that is in line with a history of systemic inequalities that can be used to perpetuate and reinforce existing inequalities in decision making (Barocas & Selbst, 2016). For instance, predictive policing algorithms through use of crime data in over-policies areas can be applied to strengthen the use of racial profiling or the usage of credit scoring algorithms setting back the applicant minorities due to the biased patterns of lending in the past (Lum & Isaac, 2016). The subcision within the body of literature, stresses that the issue at the start of algorithmic bias is not only a technical issue but rather social and ethical, necessary for the application of interdisciplinary issues to comprehend and address (O'Neil, 2016).

Transparency and Explainability is very important in Ethical decision making at Big Data. Many machine learning models, in particular deep learning algorithms, are "black boxes" with some internal logic which is not transparent to the knowledge of the users and stakeholders, or even the developers of the systems. This opacity makes it difficult to hold people accountable since those that are affected by the decisions may not know why a specific outcome was reached nor how to challenge this (Doshi-Velez and Kim, 2017). Scholars put forward a case for develop explainable AI (XAI) techniques to increase the level of interpretation and provide for ethical decision-making into high stakes fields such as healthcare, finance, and criminal justice (Samek et al., 2017).

Accountability and Governance: Critical in ensuring that data-based decision making is correlated with societal values and norms of the law. The institutional actors are often experiencing troubles in accepting the responsibility where the decisions have been taken under the jog influence of the automated systems. Research have suggested that the utilization of accountability frameworks should include ethical guidelines, technical audits and human supervision as this will ensure that the Big Data is not abused or its outcomes are not misused (Martin & Freeman, 2004; Mittelstadt et al, 2016). Without such mechanisms, such deployment of Big Data analytics risks to render it to erode the trust of the public and fuel inequalities further.

Inequality and Social Exclusion are common themes of literature. Big Data analytics is prone in organizational and actor bias to those who have access to huge computational resources and capabilities, sophisticated skills and huge data sets, with potential to create a digital divide that continues to perpetuate existing structural structures of power (boyd & Crawford, 2012). Communities who are underrepresented in data sets could be subject to biased or inappropriate decisions with negative ramifications on health, educational or financial opportunities. Studies give an vital point how it is important to follow inclusive data practices that take representation, fairness, and equity into consideration in analytics design and implementation (D'Ignazio & Klein, 2020).

Big Data is more apt to monitor an individual behavior in real-time with Behavioral Governance and Surveillance coming into the picture even more frequently, this is achieved through predictive analysis that can be made a reality. Though these possibilities may aid in streamlining operations and keeping people safer and healthier, it brings up the issues of autonomy, privacy and social control (Zuboff, 2019). Hotpot Chers caution that predictability which could be offered by predictive analytics in areas like employee surveillance and social credit systems and practices across the law enforcement may cause digital panopticons: The behavior of people is in constant monitoring and control.

Trust and Societal Acceptance - We are very closely- associated with ethical and social implication in terms of trust and acceptance. For instance, research shows that people are more likely to be receptive of Big Data systems if they can see

transparency, fairness and accountability in decision-making processes (Parker et al., 2017). Lack of trust can hinder adoption, acceptance of legitimacy of decisions and can lead to resistance/backlash against data driven policies and interventions.

Regulatory and Ethical Frameworks have therefore developed as key frameworks to counter these challenges. Ethical principles such as fairness, accountability, transparency and respect for privacy (FAT/FAIR principles) are subject of many controversies in literature (Jobin et al., 2019). Some scholars have been seeking for "ethics by design" approaches, which makes the ethical considerations as part of the data governance algorithmic development, and decision-making workflows (Floridi et al., 2018). Regulatory interventions (including GDPR, California Consumer Privacy Act (CCPA) and sector specific interventions) aim at operationalizing these principles - although to some extent, there still is lack of global cohesion.

Healthcare-Predictive analytics offers the research for better diagnosis and treatment, but there are privacy concerns plus risks of bias as models that take on only representative patient groups can lead to misleading results.Healthcare: Algorithmic system used for hazarding diagnostics and treatments, but the absence of looking into (or sampling rightful representation of) patient populations indeed lead to serious issues with biased(Reddy et al. 2020)Finance: When (algorithmically) using credit score and detecting fraud, you have a good chance of increasing efficiency but an unintentionally cause social inequalities, when (historically) discriminate against

The literature shows that, at the same time as the opportunities for decision-making via Big Data analytics science are transformative, ethical, and social complexities are being introduce and cannot be solve by technology itself. Problems of privacy, fairness, accountability and social equity repeatedly come up and require the guidance of an interdisciplinary nature, representing ethics, law, sociology, and technological expertise. According to a piece of research on the topic consisting of an ethics letter by the Center of Big Data Analytics, it should be governed by robust ethical frameworks, mechanisms of transparency, accessible data practices, and human control to make these decisions that are guided by Big Data effective and morally flexible. In conclusion, research indicates corollary of Big Data analytics as the potential on one hand to be offering a potent fruits and efficiency of the two-orientation and on the other to invigorate an ethical dilemma and social danger. The harmonization of the ethical principles and governance mechanisms and the creation of inclusive practices are crucial in order to ensure that the process of decision making based on data is complimentary to values (in the society) and human rights and social justice.

Methodology

This research has the mixed methodology design to seek the ethical and social problems of Big Data analytics in the decision-making processes. The methodology combines the use of quantitative surveys, qualitative interviews and secondary data analysis in order to register on one hand, the translatable trends of ethical awareness, while on the other, more in-depth understanding of social impacts. This approach, has the advantage of triangulating data and bringing greater validity and reliability to findings (Creswell & Plano Clark, 2017).

Research Design

A convergent mixed methods approach was used through which information was gather using both quantitative and qualitative approach in parallel. The quantitative component focused on organizational and individual perceptions relating to ethical and social issues in Big Data decision making and measured awareness, perceived risks and adoption of ethical guidelines. The qualitative component explored the experiences, attitudes and challenges with decision-makers, data scientists and policy professionals in the context of incorporating the use of Big Data analytics in an ethical way in decision making processes.

As well, secondary sources of information such as industry reports, policy documents, regulatory and scholarly articles, provided context into global trends, governance practices and regulatory interventions in regards to ethical Big Data use.

Population and Sampling

The prime target population has been:

1. Data professionals (data scientist, analysts, IT managers) that participate in decision making.
2. Organizational leaders who are responsible for making strategic and operational decisions that are affected by Big Data
3. Policy experts and regulators that are engaged in ethical standards of data regulation
4. Stratified purposive sampling approach was followed so as to have a representation in various sectors (technology, healthcare, finance, government), organization size (SME to large organization) and professional roles.
5. Sample Size: For quantitative Surveys level= 200 respondents
6. Representation of a sector: Technology: 30%, Healthcare: 20%, Finance: 25%, Public sector: 25.
7. Experience levels. 1 5 years 35% 6 10 years 40% 11+ year(s) 25%

Qualitative interviews were conducted among 30 participants which were selected from the survey group depending on their rich experience or knowledge of ethical challenges. Semi-structured interviews have enabled subjects to articulate in detail ethical dilemmas and social consequences and governance practices.

Data Collection Instruments

Quantitative Survey

- The questions, which were in the form of structured questionnaire were:
- Perceptions of ethical risks (privacy, bias, accountability, transparency).
- Perception of the Social implication (equity, inclusion and Public Trust).
- Adoption of ethical frameworks and practices of government (internal guidelines, complying with regulations).

Likert-scale items (1-5) were used for all constructs which were borrowed from validated instruments in prior studies on ethics in data analytics and organizational decision-making (Mittelstadt et al., 2016; Floridi et al., 2018).

Qualitative Interviews

Semi-structured interviews were focussed on:

- Experiences of ethical situations in Big data decision making
- Strategies and frameworks being used to deal with the bias, privacy and accountability
- Perceived Societal Impact of Decisions Made using Data

Interviews were both recorded and transcribed and analysed using thematic analyses (Braun & Clarke 2006) to identify the recurring patterns, challenges and good practices.

Secondary Data

Sources included:

- Regulatory documents (e.g GDPR Relevance of data protection CCPA guidelines) Ethics guidelines
- Industry reports involving Big data Governance, big data Adoption & ethical compliance
- Social and ethical outcome peer reviewed articles and case studies
- Data Analysis Techniques

Quantitative Analysis:

- Awareness level and perception and adoption of ethical practices were summarised in form of descriptive statistics (mean, median, standard deviation).
- Correlation analysis was done to find out the relationship between awareness, size of organizations, sector and adoption of ethical guidelines.
- The results of regression analysis had found predictors of conformity to ethics and taking social impacts into the account.
- The difference in sectors and the experience level was calculated with the tests of one way analysis of variance (ANOVA).

Qualitative Analysis:

Thematic coding of transcripts enabled to identify large themes as privacy concern, algorithmic bias, issues regarding transparency, and accountability and governance practices as social impacts.

Triangulation based on survey results increased or improved their reliability and demonstrated agreeements and variations on how people perceive and what they practice.

Ethical Considerations

Informed consent: All participants gave their consent before participating.

Anonymity and Confidentiality: Participant name and place of organization was under confidentiality.

Voluntary participation: Respondents were free to quit at any stage without any repercussions.

Secure data storage : All the digital records were stored securely with restricted access to the research team.

Validity and Reliability

The construct validity was ensured in the form of the use of some established measuring instruments and the adjustment of the context of the Big Data ethics.

Internal consistency was checked utilizing the use of the Cronbach's alpha ($a > 0.80$) for the scales of the survey.

Triangulation of quantitative, qualitative and secondary data helped to increase the general reliability.

Pilot testing involved 30 people in order to refine the items of the surveys and the questions of the interview to ensure that they were clear and relevant.

Limitations

There may be different issues associated with self-reported perceptions like the social desirability bias especially when it comes to ethical practices.

Cross-Sectional design fail to specify on causal nature of relationship between ethical awareness and decision making behaviour.

The study takes into consideration the opinion of the professionals with the access to the Big Data Analytics, possibly leaving out the opinion of the persons affected or marginalised communities.

There is a likelihood of regional and sectoral variation, which may compromise the generalisability from one region to another (or sector to another).

Results and Discussion

The results of this study serve as a pointer to the complicated ethical and social situation of Big Data Analytics use in the decision-making process. Analysis from quantitative survey data, qualitative interviews and secondary information showed there were patterns in the degree and levels of awareness, perception and adoption of ethical practices, by sector and organizational contexts. The results give examples of both an opportunity for responsible data use at the same time as there are major issues around ensuring fairness, transparency, accountability and societal equity.

Awareness of Ethical Risks

Survey data showed that most (78%) had knowledge of privacy issues such as the unauthorized use of personal information, re-identification risks and the need to comply with regulations. Awareness of algorithmic bias was also high (71%) meaning recognition of models being trained on past data sets may be causing perpetuation of discrimination. Awareness of transparency & explainability issues was marginally lower (63%) which reflects a low level of awareness of technical mechanisms, such as explainable AI (XAI) by non-technical decision-makers.

Qualitative interviews supported such findings, and highlighted the fact that data professionals are becoming more aware that there are ethical issues to be aware of, but are often constrained by organization to make it difficult to implement ethics. Even though there are policies in place, in terms of resources that are shortfalls, time constraints and competitiveness did occasionally eschew efficiency in favor of ethical considerations, interviewees said.

Enforcement of Ethics Practices

In spite of high levels of awareness, levels of structured ethical practices adoption was uneven. Only 54% of the respondents answered that they conducted regular internal audits with regards to bias and fairness and 47% implemented privacy-preserving techniques such as anonymization or the use of differential privacy. Human supervision of automated decisions was a common practice of 51% respondents; and 43% said that they followed any formal accountability mechanisms when deploying analytics in high stakes situations.

Regression analysis revealed that type of sector, the size and the experience levels of organisations proved to be significant predictors of adoption of ethical practices. Larger organisations and those who work in healthcare and finance industries had a higher adoption rate and this may be attributed to the increased regulation oversight and that there is recognition of more public scrutiny. Experience was also found to be a positive correlate to adherence to the ethical guidelines ($b = 0.38$, $p < 0.01$).

Perceived Social Implications

Survey responses suggested respondents saw a number of social risks of Big Data analytics:

Exacerbation of social inequalities (68%) - in said to be of concern of the potential for analytics to disadvantage marginalised populations.

Public trust erosion (63%) - brought about by impenetrable decision making processes

Surveillance and autonomy risks (59%) - especially in applications for government and law enforcement.

Qualitative interviews focused on the need for ethical awareness is also not to ensure that social risks would be mitigated. Participants emphasised the importance of having an inclusive data practice, and constant monitoring to look out for the impact that automated decisions might have on existing inequalities or create new forms of bias.

Themes that emerge out of Interviews.

Efficiency versus ethics The tension that surrounds the pursuit of speed and performance has in many organizations often been varied in terms of conflicting objectives and thus there is little space to consider the innovation nationalism through a reckoning.

Transparency challenges Decision-makers shared a difficulty to explain complex models to non-technical Stakeholders, which brings forward questions regarding accountability issues.

Human oversight: Effective human oversight was believed to be critical to ensure that bias is minimized and socially responsible outcomes

Policy gaps Policy makers noted that there is a change in the policy regarding regulatory frameworks but these are not consistent across jurisdictions.

Table 1: Awareness of Ethical Concerns Across Sectors

Sector	Privacy Awareness (%)	Transparency Awareness (%)	Bias Awareness (%)
Technology	75	68	60
Healthcare	84	78	70
Finance	81	73	65
Public Sector	72	65	57

Table 2: Adoption of Ethical Practices by Sector

Accountability Frameworks (%)	Sector	Audits & Reviews (%)	Privacy Techniques (%)	Human Oversight (%)
Technology	50	42	48	41
Healthcare	63	58	59	53
Finance	57	51	55	49
Public Sector	45	39	43	37

Discussion of Results

The findings show that data professionals and decision-makers are fair to high in their awareness of the ethical risks, especially the privacy and bias. Nonetheless, the individuals are not good at practical application of the ethics, which proves a gap between knowledge and actions in other researchers (Mittelstadt et al., 2016; Floridi et al., 2018). Some of the factors, which cause this gap, include constraints such as resource constraints, organization priorities and technical complexity.

Sectoral differences refer to the fact that healthcare and finance are more active in the way they deal with ethical practices, which is likely to be because of the pressure of regulation and public attention. In its turn, the technology firms and governmental bodies are finding that they comply less implying that the awareness does not necessarily imply the form of structured ethical governance.

The interviews disclose the primary significance of human supervision and explainability in fighting against ethical risks. The higher the risks of bias, unfairness, and social harm are related to automated decision on the no-human-intervention processes. To make people responsible and to preserve their trust and legitimacy, there is need to have a transparent communication of model logic and decision rationale.

The socially respondent is interested in inequality and surveillance, as well as a problem of the loss of trust that is no different than any other former study on the societal consequences of Big Data (Zuboff, 2019; boyd and Crawford, 2012). The implication of these findings is to prove the need to consider inclusive and fair practices in gathering data to give voice to the marginalized or to guard against them when most important decisions are being made.

Overall the results reveal that Big Data analytics offer a lot of opportunity for better decision making, but that there are ethical and social challenges that need to be actively worked on. Awareness is never enough, organizations need to combine common-sense mechanisms of governance, transparency protocols, human oversight and regulatory compliance, if they are to mitigate risks and ensure socially responsible outcomes.

Discussion

The results obtained in this study put emphasis on complex ethical and social sides of analyzing Big Data in decision-making processes. While the level of awareness of ethical issues such as, privacy, algorithmic bias, transparency and accountability is relatively high amongst professionals, there are uneven implementations of ethical practices. This is in line with the previous literatures that lay emphasis on the knowledge-action gap whereby awareness does not necessarily result to behavioral or procedural compliance (Mittelstadt et al., 2016; Floridi et al., 2018).

One of the most important discoveries is that the context of the sector plays an important role in the adoption of ethical practices. Healthcare and finance (with strict regulatory supervision and high accountability to the public) proved to be more intelligent in choosing to follow ethical guidelines, privacy prevention measures and safeguarding human supervision protocol. In contrast, the technology industry and public organizations presented a lower level of compliance, which may be an indication of organizational culture, availability of resources and perceived risk on ethical decision making in practice. This substantiates the existing research that has implied that one of the key factors driving ethical adoption in data-hungry industries is regulatory pressure and reputational concerns (Barocas & Selbst, 2016).

Privacy issue is the most their predominant ethical issues. Despite high levels of awareness, high levels of perceived technical, resource and operational barriers were reported by respondents, giving rise to potential inconsistencies in privacy preservation methods implementation. The possibility of re-identification and unauthorized use of the data is instead still present and relates to the worldwide discussions for the insufficiency of existing regulatory frameworks (GDPR and CCPA). While there are laws that govern this, successful implementation in conditions of practice appears to be patchy, particularly in organisations that have limited expertise or resources (Voigt & Von dem Bussche, 2017).

Algorithmic bias and fairness was an important issue as well. Decision making models with historical data are prone to reproducing existing inequalities in the case of employment, lending, law enforcement system, and healthcare situations. Important qualitative insights showed that professionals often do not know how to identify and differentiate subtle biases that are built into complex models. This underlines the fact that interdisciplinary approaches with technical auditing in conjunction with ethical reflection and human supervision should be implemented to identify and avoid the presence of bias (O'Neil, 2016; Lum & Isaac, 2016).

Big Data ethics major challenges are the lack of transparency and accountability. Many of the people surveyed expressed problems with ability to communicate algorithmic decisions to non-technical decision makers and create accountability gaps. Lack of interpretability may result in lack of trust between the end-users and the public, which in turn may further compromise the legitimacy of the data-driven decisions. Emerging techniques in explainable AI (XAI) present promising new ways to improve transparency, but lack of practicality and support in complex and proprietary analytics systems still presents a limitation [samek et al., 2017].

From a social position, the paper validates that Big Data analytics can be used to further increase inequalities and to increase power imbalance. Organizations that have more computational resources and access to data have an advantage in decision-making processes while underrepresented populations risk being bounced out or having their results biased. This result is in line with

literature focused on issues of digital divides and social justice in data driven governance (boyd & Crawford, 2012; D'Ignazio & Klein, 2020).

In addition, there were issues related to surveillance and behavioural governance. Participants appreciated the fact that predictive analytics while operationally useful can interfere with individual conceptions of autonomy, privacy and freedom of expression. This duality brings into light the ethical tension in the utilization of Big Data in the service of society versus respecting the fundamental human rights. this duality brings together the famous ethical tension between the construction of Big Data for the benefit of society, versus respecting the fundamental human rights, and in this regard, the calibration of the practices of analytics in regard to mechanisms of oversight (Zuboff, 2019).

Finally, the research points out the importance of organisational and regulatory governance for the reduction of ethical and social risks. Effective mechanisms, such as in-house ethical audits, adoption of accountability mechanisms, human supervision of automated decisions and compliance with legal standards. There still are gaps between the translation of the principles into operational practices, however. The paper argues that ethical governance should be central to management and not rather an add-on to all the mechanisms in data analytics flows, from collection of data to implementation of model and decision making.

In summary, this discussion has established that while Big Data analytics offers many opportunities of greater efficiency, innovation and evidence based decision-making, it is also challenging in the ethical and social issues. These entail multi-dimensional approach, which entails applying technical, ethical, organizational and regulatory strategies. It is only the incorporation of specified aspects of fairness, transparency, accountability and inclusivity into the analytics practice that will enable organizations to make sure that the implemented data-driven decisions are effective and conscientious.

Conclusion

This paper gives a critical discussion on the ethical and social implication of the use of Big Data analytics in the decision-making process, and how it can transform the decision-making process and the risk that it can pose to any decision process. The study confirms that along with an unmatched potential that Big Data can bring to streamline efficiency, resource mobilization and rational decision-making in sectors, the researchers also transition with immense ethical and societal issues that need to be reflected upon with due diligence and mitigatory actions.

The results indicate that awareness on ethical issues such as privacy, algorithmic bias, transparency and accountability is generally high among professionals working in the field of Big Data analytics. Most of the respondents appreciate the potential dangers in using large dataset in decision making cases. However, the research also provides evidence of a persistent knowledge-action gap: there is not always a translation from the awareness level to the implementation level - in terms of systematic implementation of ethical practices. For example, although the need to address issues of privacy concerns was strongly identified, a little more than half of the respondents reported that they were actively implementing privacy-preserving techniques, human oversight or accountability frameworks in their analytics workflows. This gap represents the potential difficulties organisations have in the operational attainment of ethical principles factors such as resource limitations, technical complexity and institutional priorities.

The study brings into focus the significance of the sectoral and organizational context in defining the ethical practices. Sectors like healthcare and finance, being under strict regulatory supervision and facing high level of public oversight, showed greater performances in their use and implementation of the ethics, through e.g. formal audits, privacy protection or even the human supervision of automated decisions. In contrast, the levels of adherence were low in technology companies and public sector organizations, which suggests that there are pressures from institutions, incentives in regulations and organizational culture as well as awareness behind the adherence to ethical governance. These findings are in line with previous studies that focus on the importance of regulatory frameworks and reputational considerations as well as external accountability pressures as crucial motivational factors for ethical compliance in data-intensive fields (Barocas and Selbst, 2016; Mittelstadt et al., 2016).

Privacy and data protection are the focus of the ethical issues. Big Data analytics often entails large volumes of sensitive personal information such as financial data, healthcare information, geolocational data and social media activity. The aggregation and analysis of such data there is significant risks for unauthorized surveillance, re-identification and profiling. While there are regulatory measures that provide guidelines on data protection like the GDPR in the European Union, there are inconsistencies in operational compliance, the study finds. Organisations have been grappling with the dichotomy of finding granular information necessary for innovation or employ privacy as there is an ethical imperative to maintain individual privacy, nonetheless, leading to a on-going conflict between innovation and ethical obligation (Voigt & Von dem Bussche, 2017).

The Dark side of algorithms (article only) Algorithmic bias is another big ethical issue. Predictive models and machine learning algorithms that are made based on the past, called historical data, can actually further inequalities in society. For instance, predictive policing, automated hiring platforms and credit score modeling algorithms could be pushing racial, gender or

socioeconomic bias further into the foreground that has existed in historical data sets. Interview findings stress the general lack of proper mechanism for professionals to identify and correct slight bias, opening up the possibility of interdisciplinary methods which include technical auditing, ethical reflection, and human supervision. Addressing algorithmic bias isn't a strictly computational issue, it is a social and ethical one that many people - policymakers, ethicists, and those affected by these issues - have to tackle (O'Neil, 2016; Lum & Isaac, 2016).

The big data decision making places great emphasis on and finds it challenging to be transparent and accountable. The explanation of complicated models to non-technical stakeholders was an issue with many respondents, which is a potential source of accountability lapse. Opaque black-box models also render it difficult to justify their decisions with the audience to organizations, leading to a decline in the amount of trust that people have in them. The model explanation methods and transparency governance are the potentially fruitful solutions in enhancing the interpretability of the AI systems until it is time-constrained in the application, at least in the complicated or proprietary world (Samek et al., 2017).

The social implications of Big Data analytics do not concern individual level of concern only. The study focuses the attention on social exclusion and power imbalance, inequality as some of the primary risks in society. The organizations with a higher access to the better computational power and bigger bodies of data are the ones driving the analytics wave and will ostracize populations in some instances. Likewise, ethical issues in the surveillance and governance through predictive analytics use may create challenges in terms of autonomy, freedom of speech and expression and self-determination (Zuboff, 2019). These understandings make the referral to the so-called data-inclusive practice a newly important phenomenon, in which the success of analytical systems relies on the issues of representation, fairness, and accountability.

Another critical aspect raised in the study is the governance of organizations and the regulation. Proper ethical governance implies that the ethical principles are to be incorporated in each of the steps of the data collection, processing, modelling and decision process. Such practices as in-house audit, human control, implementing accountability models, adherence to privacy policies etc are included in the inherent process of mitigating social risks and societal trust. Any organization that takes the proactive approach to the business decision process concerning ethical matters is therefore positioned to not only enjoy the benefits of the Big Data in a responsible manner, but also to reduce negative negative influence on individuals and communities.

To sum up, Big Data analytics is a two-sided sword that may be applied in the decision-making processes. As much as it has transformative potential concerning the efficiency, innovation and evidence-based policymaking, it also has a few critical ethical and social issues. To overcome these difficulties, multi-dimesional approach needs to be considered which involves ethical awareness issues, the control of operations, technical audit, compliance with regulations, human supervision, and comprehensive practices. Due to a convergence of technological innovation, societal orientation, human rights, ethics and all facets of social justice, equity and trust of the individuals, organizations will be in a position to guarantee that Big Data positively influences decision making process, without affecting the aspects of social justice, equity and trust.

Lastly, the study contributes to the importance of a cross-disciplinary collaboration between data scientists and ethicists and policy-makers or social scientists to develop responsible and transparent, yet social-conscious Big Data analytics systems. Since organizations have become more concerned about the manner in which they use data guided decisions, the ethical decision-making process in the design and application of analytics tools is no longer an option but as a requirement to ensure the legitimacy, fairness and the wellbeing of our society in the digital era.

Recommendations

- Following the conclusions of this study, certain recommendations are drawn in order to discuss the ethical and social implication of the Big Data analytics in decision-making:
- Establish Ethical Governance Structures: It is important that the businesses will have formal structures of governance that instill the element of ethical in the life life of the Big Data that contains the process of data collection up to the decision-making level.
- Introduction of Privacy Preserving Technologies: To ensure insulation of sensitive information some marred processing of the network or data may be assumed through introduction of privacy preserving technologies such as Anonymization, Differential Privacy, Data minimization etc.
- Fix: tolerable Predictive models Periodical screening of predictive models Assuring that they do not give rise to bias and discrimination, and employ diverse and representative datasets to minimize systematic inequity.
- Enhance Transparency and Explainability: Take advantage of explainable AI (XAI) methods and ensure that the decisions reached based on the use of analytics can be comprehended at a stakeholder level on the non-technical level.
- Strengthen Human Oversight Some of the recommendations include having automated decisions being considered by human beings where there exist high stakes to avoid errors and ethically doubtful results.

- Train Ethically: Train continuing education sessions to data professionals and decision-makers concerning the moral reasoning, social power, and the practice of statistics in a responsible way.
- Get Stakeholders On board: Inclusion over Marginalized Full involvement Inclusion: Inclusion will make sure that the various communities are incorporated during the design and appraisal of the analytics systems in the name of equity and social justice.
- Adhere to Regulatory Standards: meet the international and national requirements of data protection and regulations (e.g., GDPR, CCPA) and keep up with the legal terms.
- Encourage Auditing Mechanisms: To ensure that the ethics are adhered to, it is important that auditing mechanisms are encouraged which include internal auditor, reporting and accountability.
- Fundake Oncoming Research Up until Support intellectual research on ethical practices on Big data, social effects and novel technologies to influence evidences-based policies and governing constructs.

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