The Responsible Adoption of (Highly) Automated Decision-Making Systems

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Abstract

The next-generation technological era will be marked by the prevalence of highly automated decision-making systems (ADMS), which promote technological autonomy at the expense of human agency. In this paper, we examine the role and importance of socio-ethical factors in the responsible adoption of ADMS by organizations. In doing so, we draw on the unique characteristics of ADMS and leverage the literature on social responsibility to conceptualize what a responsible adoption process and a responsible adoption decision involve. The resulting framework makes a much-needed connection between technology adoption and social responsibility and offers a progressive foundation to study ADMS adoption.

1. Introduction

A number of pundits have started to observe a role reversal whereby humans are becoming used and shaped by technologies. For example, Demetis and Lee [1] claim that "human agency is becoming subordinate to automatic executions…" (p. 930) and that "technology is overtaking not only human decisions and the context of their embeddedness, but also entire subsystems of society" (p. 932). We refer to this development as the rise of highly automated decision-making systems (ADMS). ADMS have several benefits that make their adoption by organizations attractive. They are consistent, efficient, scalable, and can manage a much greater level of complexity than humans can. Yet, they are fallible and can yield (intentionally or not) harmful consequences such as privacy violations, unwarranted surveillance, uninformed control, or unfair discrimination [2], [3]. They can also have second-hand effects, often detrimental, on those subject to their use by others. In sum, ADMS have become quite controversial especially given that the activities and contexts to which they are increasingly being applied involve socially sensitive situations that have high ethical content; for example, social ranking [4], crime prediction [5], [6], and bail, parole, and criminal sentencing [7].

Our goal in this paper is to develop a theoretical framework that emphasizes the socio-ethical factors surrounding the decision made by organizations to deploy an ADMS. This endeavour, which echoes contemporary callings like critical technological citizenship [8] and critical digital capitalism [9], as well as early writings on the diffusion of new technology e.g., [10], [11]–[13], is intended to move researchers' attention beyond the rather instrumentalist perspective espoused by existing information technology (IT) adoption theories [14], [15]. This literature focuses on the questions of why, when, and how prospective organizations and individuals adopt or intend to adopt an IT for their own use and benefits, without inquiring whether the adoption decision or the process leading to the decision is *socially responsible* [16], [17].

In developing the framework, we specify a new set of constructs to capture the gist of the phenomenon and we introduce the theoretical logic underlying their relationships. We follow a deductive approach whereby we develop a conceptualization of ADMS that considers their unique characteristics and we combine it with contextualized insights from social responsibility theory. The resulting theoretical framework aims to make a three-fold contribution: clarifying our understanding of what the responsible adoption of ADMS by organizations entails, offering a platform for future research on the topic, and opening the door to a paradigm change in the study of IT adoption that is likely to yield important new insights into how organisations engage with the decision to deploy (or to restrain from deploying) increasingly autonomous and value-laden technologies. In the remainder of this paper, we specify the theoretical boundaries of our inquiry, we present the theoretical framework, and we discuss the research's contributions and its limitations.

2. Theoretical Boundaries

2.1. What is an ADMS?

We define ADMS as software products or software-enabled objects that bring a significant level of automation into decision making processes.

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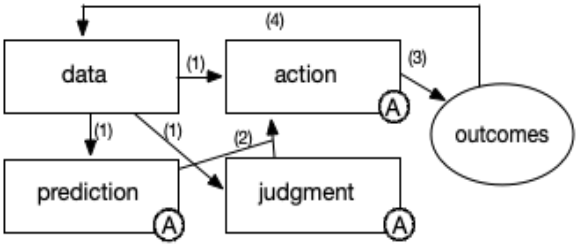
Importantly, very high levels of automation pave the way to technological autonomy, a situation where "humans find themselves outside, i.e., cast out to the environment, outside of these decisions, and (…) human agency—acting on behalf of another, or providing a particular service—is being replaced by technologized agency" [1], p. 933. As an example of the link between automation and autonomy, think of motor vehicles. The US Department of Transportation defines six stages of automation ranging from level 0 (no automation, i.e., the driver performs all the driving task) to level 5 (full automation, i.e., the vehicle is autonomous, driverless), with intermediary stages where the driver and the automated-driving system share control and responsibilities.

ADMS are different from decision-support systems (DSS). A DSS is an interactive system aimed at *helping* people (e.g., managers, consumers) make decisions (often characterized as ill-structured problems) [18]. In turn, an expert systems is a computer program (often based on artificial intelligence techniques) that aims to *mimic* experts at making complex, non-algorithmic decisions [19][20]. The goal of an expert systems can thus include automation, making it similar to an ADMS; yet as we will explain, the scope of automation in an ADMS can go much further than that of an expert system. Because the notions of decision-making and automation are complex and central to our conceptualization of ADMS, illustrated in Figure 1, we describe them in more details in the rest of this section.



Keys:
(1) Prediction needs data, and so do judgment and actions;
(2) A decision-making agent (human or machine) takes actions relying on both prediction and judgment;
(3) Actions lead to outcome (consequences)
(4) Outcomes generate data that can be used as an input to other/future decisions;
A: Prediction is automated, and so could judgment and action

Figure 1. Conceptual Representation of an ADMS (based on [21])

Decision making plays an equally critical role in everyday life [21] and in organizations [22]. Figure 1 highlights a fundamental assumption in our work: decision making requires applying *judgment* to *predictions* and then *acting* [21], all of which may be conducted by either a human and/or a machine. Prediction is an important input to decision-making "the process of filling in missing information… (taking) information you have, often called *data*, and (using) it to generate information you don't have," ([21], p. 24). Note that some decision-making situations can be formalized, thus automated, fairly easily. These do not rely on prediction and data, but on a set of pre-established rules accounting for known contingencies. Yet, in many complex real-life situations, it is virtually impossible to specify and formalize all the rules that would be necessary to faithfully capture a situation (e.g., hiring a new CEO, driving a vehicle in an urban area). Such situations require prediction, thus data. In sum, a*utomated prediction* is at the core of ADMS

Note that a predictive engine designed into an ADMS may also derive its own rules from data itself (i.e., by "learning")—this is the domain of machine learning (ML), a technology at the core of AI applications. AI is an umbrella term that is commonly used to refer to data-driven algorithms that enable computing engines to learn how to perform tasks which would be virtually impossible to automate based on formal rules (e.g., object identification, language processing). Similar to Demetis and Lee ([1], p. 944), we consider such applications as representative examples of extreme cases of sophisticated ADMS, where predictive models can recalibrate themselves automatically based on data. These applications require different data sets: a training data set is used to create the predictive model, an input data set enables running it, and a feedback data set serves as a basis to improve the model.

In the healthcare context an ADMS could automate *prediction* (e.g., estimate the most likely outcomes of applying treatments A or B based on X-rays, blood tests, and monitoring data) so as to inform a doctor who could then apply his or her *judgment* (e.g., considering other criteria such as patients' age, lifestyle, and sensitivity to potential risks and side effects) and *enact* the decision (e.g., administer treatment A). But as Figure 1 also stresses, prediction is not the only component of an ADMS that might be automated. As with motor vehicles, the trend is toward more extensive automation, thus full technological autonomy [1], which happens when a machine undertakes an entire task, not just the prediction component of it. For example, a fully autonomous vehicle automates *prediction* (e.g., anticipating vehicles' trajectory), *judgment* (e.g., evaluating whether the vehicle should hit what would appear to be a pedestrian or risk killing the driver), and *action* (e.g., braking or changing direction).

2.2 From Adoption to Responsible Adoption

What does adoption refer to in the context of the present research? Information Technology (IT) adoption (or acceptance) research offers a large variety of models explaining how, why, and when individuals or collectives decide to adopt a new technology. Some studies have focused on *users'* adoption decision e.g., [23] while others have examined on *organizations'* decisions e.g., [24]. Altogether, this research suggests that adoption is an information-intensive process wherein potential adopters consider a set of relevant factors (e.g., about the context into which they situate, the innovation per se, its consequences) so as to inform a decision about the commitment (of resources) to deploy a new IT. We follow this overall view of adoption, and we proceed by further asking what *responsible* adoption involves from the perspective of an organization.

In its contemporary usage in a business context, the concept of social responsibility (SR) is often associated with that of corporate social responsibility (CSR), and its application to different business functions such as marketing [26], [27], finance [28], and logistics [29]. The content covered by CSR has varied over the years. For example, in Carroll's [30] view, CSR touches upon economic, legal, ethical, and philanthropical aspects, while the European Commission [31] only points to social and environmental concerns and the triple bottom-line proponents consider economic, social, and environmental targets [25], [32]. Despite divergences in content, all views concur on the fact that CSR aims to promote the accountability of profit-seeking business entities in a market environment. Hence, SR is closely linked to CSR, but it applies more widely outside of a corporate context and in both individual and group capacities. Because ADMS adoption decisions are not restricted to private corporations, SR appears to be a more suitable lens to inform a working definition of responsible adoption. In its most generic portrayal, SR implies caring for societal values and for needs and effects that go beyond narrowly defined indicators and self-centered points of reference. On that basis, we define responsible adoption in terms of both the decision-making process and the decision that take into consideration the socio-ethical implications of putting an ADMS into use.

A couple of points in this definition need to be highlighted. First, similar to Van der Duin [33] in the context of responsible innovation, we choose a broad perspective that enables examining responsible adoption both as a means (the process) and as an end (the decision). Second, while the process and the decisions are our two focal units of analysis, some entity, at the end, makes a decision and is responsible for it. In our context, the entity or entities involved in the adoption decision can be viewed as those having moral agency. That is, any collective making a moral decision, where the later refers to a volitional decision that has a moral component given its possible harm on or benefit to others [34].

3. Framework Development

3.1. Responsible Adoption Decision (RAD)

We start by specifying three constructs to capture the extent of *responsibility* of an ADMS adoption decision. Altogether, these constructs imply that a RAD (i) takes into account the moral implications of the technology on the community concerned by it (*civic-mindedness*), (ii) is sensible to its impacts in the long haul (*foresightedness*), and (iii) is accessible and understandable by the community (*transparency*).

First, social responsibility theory emphasizes the idea that decision-makers have moral obligations. Indeed, the primary concern of SR involves the consideration of a socio-ethical dimension when acting and making decisions; in other words, it requires caring for others who might be impacted by one's actions and decisions [34]. This is especially relevant in the technological context in general [35]–[37] and in the ADMS context in particular, as the range of applications that ADMS enable cover highly socially-sensitive domains. For example, hiring, evaluating, monitoring, censoring, arresting, and judging people are all susceptible to being governed by ADMS, and this triggers complex risks such as the potential for systematic, large-scale discrimination [38] and for geopolitical instability [39]. Balancing the benefits and risks when it comes to making decisions and innovating is not a trivial endeavor, and for ADMS it might require weighting conflicting moral values such as security and privacy, or freedom and control [3] and considering a larger set of ethical principles [40], all of which cannot be done unobservant to situational value standards—we will discuss this further in section 3.2. Thus, we define as first dimension of RAD, ***civic-mindedness***, as the degree to which the adoption decision adheres to the values and moral expectations of the community that is relevant in the considered context.

Second, the more recent applications of SR to the technological innovation context emphasize the need to be prepared and care for the future, that is, make decisions that are sensitive to time and forward-looking. Technological changes are inherently uncertain, and their social consequences are powerful but also hard to predict beforehand [41], [42]. However, the difficulty to examine an uncertain future, with its multiple causal chains and dependencies, does not preclude from taking

decisions that are mindful of it [33], [43]. On the other hand, it may stress "our ability to act responsibly in the present on behalf of future generations" [44], p. 1880. ADMS adoption decisions that are responsible should be particularly sensitive to this need for anticipation because they have substantial societal ramifications that make adopters morally accountable to others now but also in the future [16], [17]. Thus, we define as second dimension of RAP, ***foresightedness***, as the degree to which the adoption decision is sensible to the long-run implications of using the ADMS on the community that is relevant in the considered context.

A third important notion that links social responsibility to ADMS adoption is transparency [45]–[47]. In general terms, transparency can be viewed as a "right to know", which is a principle that individuals have the right to know about the decisions (and possible ensuing risks) to which they may be subject [48]. In a technology context, transparency has two key components, accessibility and comprehensibility [49], and has sometimes been translated into regulation. For example, the new European General Data Protection Regulation ("GDPR") mentions that "the data subject shall have the right to [know about] the existence of automated decision-making." Accessibility and comprehensibility are particularly salient characteristics in the context of ADMS adoption because ADMS tend to be concealed and have indirect, second-hand effects. Thus, the socio-ethical quandaries that they produce may not be easily resolved, but at minimum, they could be open to scrutiny. As reminded by Florini ([48], p.viii), it is sometimes the case that "sunshine is the strongest antiseptic." Thus, we define as third dimension of RAP, ***transparency***, as the degree to which the adoption decision is inspectable and understandable by the community that is relevant in the considered context.

3.2. Responsible Adoption Process (RAP)

Because ADMS are quite unique, a responsible adoption *process* will need to account for their idiosyncratic characteristics. Given the absence of theory on ADMS, we specify RAP by two means. First, we draw on explicit premises about the differentiating characteristics of ADMS (i.e., they are opaque, value-laden, and can have side and systemic effects) to identify four constructs that capture the responsibility of an adoption process in the context of ADMS. Second, we specify (for each four constructs) how they would manifest with respect to each conceptual building block of an ADMS (data, prediction, judgment, and action – see Figure 1)

A starting premise is that the functioning of an ADMS can be quite opaque [50][46][45][50]–[52]. Burrel [50] explains that software code can generate three types of opacity. One (intentional secrecy) results from a decision to keep software code proprietary (e.g., the google search engine algorithm). Another (technical illiteracy) is a consequence of the specialized skills required to write (and read) code and of the fact that such skills are not widespread among the population. A third type (interpretability) is more specific to ADMS as it is a consequence of the complexification of algorithmic, often data-driven, systems and the resulting difficulty of "understanding the algorithms in action, operating on data" (p. 5). Despite some progress e.g., [53], [54], explaining the decisions generated by highly-sophisticated ADMS remains difficult, an issue sometimes known as the interpretability problem [55]. ADMS can be quite complex and more or less autonomous based on whether and how prediction, judgment, and action are automatized. To be able to evaluate the possibilities and risks associated with adopting an ADMS, a clear understanding of its functioning mechanisms and assumptions is needed. Thus, we define a first dimension of RAP, ***functional scrutiny***, as the degree to which the adoption process includes a thorough analysis of the key components and operational logic of a focal ADMS. A more specific coverage of functional scrutiny can be derived from the key components of an ADMS (see Figure 1) and is presented in Table 1.

Table 1. The Scope of Functional Scrutiny

DATA. Analyzing the data that is being used in the prediction: its origin, its quality (e.g., accuracy, reliability, completeness), and its role (e.g., training, feedback, operation) in the ADMS.
PREDICTION. Analyzing what is being predicted by the ADMS, what factors are used to derive the prediction as well as their weight in the prediction, and how accurate the result of the prediction is expected to be.
JUDGMENT. Analyzing the potential outcomes (what may happen as a result of a potential action), the value that is assigned to each outcome, their prioritization, and whether the ADMS automatizes judgment or leaves it to humans' responsibility.
ACTION. Analyzing the decision that is at stake, the possible actions associated with this decision, and whether the ADMS automatizes actions or leaves it to humans' responsibility.

A second premise is that ADMS embed moral values [3], [49], [52], [56]–[58]. The idea that information technologies are not value-neutral dates back several decades e.g., [59] and is at the core of a

number of fields of research such as value-sensitive design [35], [60]–[62] and engineering and computer ethics [37], [63], [64]. As Van den Hoven [17] puts it, our social world is "shaped by the algorithms that determine how far our messages reach into our networks, what is recommended to us on the basis of what the system has learned about our search history and preferences, what is filtered out and how our reputation is built." (p. 66) Although all technological design decisions may be viewed as morally loaded as they represent (intentionally or not) the value system of designers, the automatization and scalability of data-driven predictions make that statement much more salient in the ADMS context. In essence, ADMS rate and rank things, events, and also individuals [65], [66], and this can be particularly problematic when predictions are based on sensitive categorizations such as race or gender [67]. For O'Neil [38], such algorithmic intelligence is nothing else than "opinions embedded in math" (p. 19). To be able to examine what is at stake from a moral standpoint if an ADMS is to be deployed, a clear understanding of the nature and magnitude of the ethical challenges it involves is needed. Thus, we define a second dimension of RAP, ***ethical reflexivity***, as the degree to which the adoption process involves the careful deciphering of the moral values embedded in or promoted by a focal ADMS. The key components of an ADMS (see Figure 1) help further circumscribe the scope of ethical reflexivity (Table 2).

Table 2. The Scope of Ethical Reflexivity

DATA. Inspecting the ADMS in function of ethical considerations associated with the use of data (e.g., privacy, anonymity, security.)
PREDICTION. Inspecting the ADMS in function of ethical considerations associated with operating the predictive engine (e.g., transparency, fairness, justice.)
JUDGMENT. Inspecting the ADMS in function of ethical considerations associated with the making of judgments (e.g., autonomy, accountability.)
ACTION. Inspecting the ADMS in function of ethical considerations associated with the conduct of actions (e.g., control, accountability.)

A third premise is that ADMS have indirect and systemic effects [68]. By this we mean that a (sometimes) large range of people may be involved in operating the ADMS as well as be subject to its consequences. For example, the data used in a prediction engine may not belong to a direct user, and the outcomes may include effects on non-direct users, a phenomenon that Leidner et al. [69] refer to as second-hand effects and that Doorn and Van de Poel [37] characterize as indirect causation. The planned or emergent consequences of ADMS can thus ripple out to a wide range of individuals who may not be directly using the technology. Therefore, in order to examine the set of potential impacts of an ADMS, the individuals who are involved, directly or indirectly, in its operation need to be included in the evaluation process. In fact, the value of an inclusive approach and the need for all relevant agents to exert their influence in a technology-related decision-making process has long been known to facilitate the achievement better results for the relevant community as a whole [11]. Thus, we define a third dimension of RAP, ***stakeholder inclusiveness***, as the degree to which the adoption process involves the participation of a representative set of stakeholders relevant to the particular context of application of a focal ADMS. The key components of an ADMS (see Figure 1) can help specify the scope of stakeholder inclusiveness (Table 3).

Table 3. The Scope of Stakeholder Inclusiveness

DATA. Participation of those whose data is used in the ADMS and/or those who generate, collect, and own the data.
PREDICTION. Participation of those for whom the prediction is made or who are subject to its outcome, as well as those who are involved in designing the prediction engine
JUDGMENT. Participation of those who make the judgments or who are subject to its outcome, and if relevant, those involved in designing the rules underlying the automatized judgment.
ACTION. Participation of those who conduct the actions or who are subject to its outcome, and if relevant, those involved in designing the rules underlying the automatized action.

The fourth construct we propose to capture RAP also relates to the systemic nature of ADMS. To be able to execute the socially responsible practice of making an integrative assessment of the impacts of an ADMS on stakeholders with potentially different interests and concerns, prioritization and conflict resolution is likely needed [3]. This requires a holistic effort in unifying insights and points of view in light of the norms and moral standards relevant to a specific societal context into which the ADMS might be deployed. Technology

engineers are often confronted with moral dilemmas in their design work as they need to solve conflicting (value) requirements [70]. In doing so, they need to resolve difficult trade-offs (e.g., safety vs. efficiency, security vs. privacy, control vs. freedom). As Newell and Marabelli [3, p. 10] illustrate : "when algorithms determine that particular categories of people (e.g., based on race, income, job) are more likely to commit a crime and, as a result, those concerned find difficulty in obtaining a loan or changing job … this clearly violates basic privacy rights, but is justified based on the idea that it will increase security in society." Thus, we define a fourth dimension, ***integrative evaluation***, as the degree to which the adoption process involves a systemic evaluation of the consequences of deploying a focal ADMS in light of the moral standards acceptable in the considered context of application. Similar to the previous three constructs, the key components of an ADMS (see Figure 1) help specify the scope of integrative evaluation (Table 4).

Table 4. The Scope of Integrative Evaluation

DATA. Evaluating the possible consequences of deploying an ADMS in light of the moral dilemmas associated with its use of data.
PREDICTION. Evaluating the possible consequences of deploying an ADMS in light of the moral dilemmas associated with the design and operation of its predictive engine.
JUDGMENT. Evaluating the possible consequences of deploying an ADMS in light of the moral dilemmas associated with the judgment process.
ACTION. Evaluating the possible consequences of deploying an ADMS in light of the moral dilemmas associated with the actions resulting from combining prediction and judgment.

3.3. Relationships between the Components of RAP and RAD

In this section, we propose a set of causal relationships that we suspect to exist between the constructs developed to conceptualize RAP (links 1 to 6) and RAP (links 7 to 8), and those between RAP and RAD (links 9 to 11). They are modeled in the research framework illustrated in Figure 2.

RAP (links 1 to 6). Stakeholder inclusiveness, functional scrutiny, ethical reflexivity, and integrative evaluation define the degree of responsibility of an ADMS' adoption decision-making process. We start with the ultimate outcome in a responsible adoption process: integrative evaluation. The difficult integrative assessments that need to be made during an adoption assessment process, such as those involving the comparison and prioritization of different alternatives, are more effective when they are supported by quality informational inputs [71]. Thus. we expect that stakeholder inclusiveness, functional scrutiny, and ethical reflexivity will improve integrative evaluation, In line with this idea, we propose that integrative evaluation will benefit from functional scrutiny (***link 1***) because it will enable the consideration of more accurate inputs about what a focal ADMS can *afford* and *prevent*. Integrative evaluation will also benefit from ethical reflexivity (***link 2)*** because awareness and knowledge of what is at stake from an ethical perspective with respect to a focal ADMS will help generate more complete inputs to assess its possible impacts and "what is right" in a particular context. Stakeholder inclusiveness will enable integrative evaluation (***link 3***) because including a representative set of stakeholders in the decision-making process is likely to yield inputs that are more nuanced, wide-ranging, and thus more reliable. Next, we expect that functional scrutiny will enable ethical reflexivity (***link 4***) by affording a more accurate representation of the ADMS, which will help detect ethical concerns. This could happen via different means such as the provision of a conceptual map of the key components and mechanisms that will facilitate the ethical examination. For example, knowing that the judgment component in an ADMS is automated and knowing its rules and assumptions will help identify ethical concerns that could be associated with it, such as whether the judgment logic is reliable, fair and transparent. Finally, we expect that stakeholder inclusiveness will improve (i) functional scrutiny (***link 5***)—because a more complete set of domain and technical expertise should contribute to a more thorough analysis of an ADMS' structure and operational logic, and (ii) ethical reflexivity (***link 6***)—by providing a more complete view of the ethical considerations relevant for a focal ADMS.

RAD (links 7 and 8). Our conceptualization of RAD indicates that civic-mindedness, foresightedness, and transparency define an ADMS adoption decision' degree of responsibility. We expect that both civic-mindedness and foresightedness will enable transparency because the opening and explaining of a decision is easier and less risky when the content of a decision is more sensitive to socio-ethical matters. Thus, a civic-minded decision is likely to facilitate transparency by making the decision more socially legitimate, thus less risky to communicate (***link 7***). In a similar vein, we expect that foresightedness will encourage transparency because foresightedness

involves anticipation and caution, two attributes that also favor social legitimacy (***link 8***).

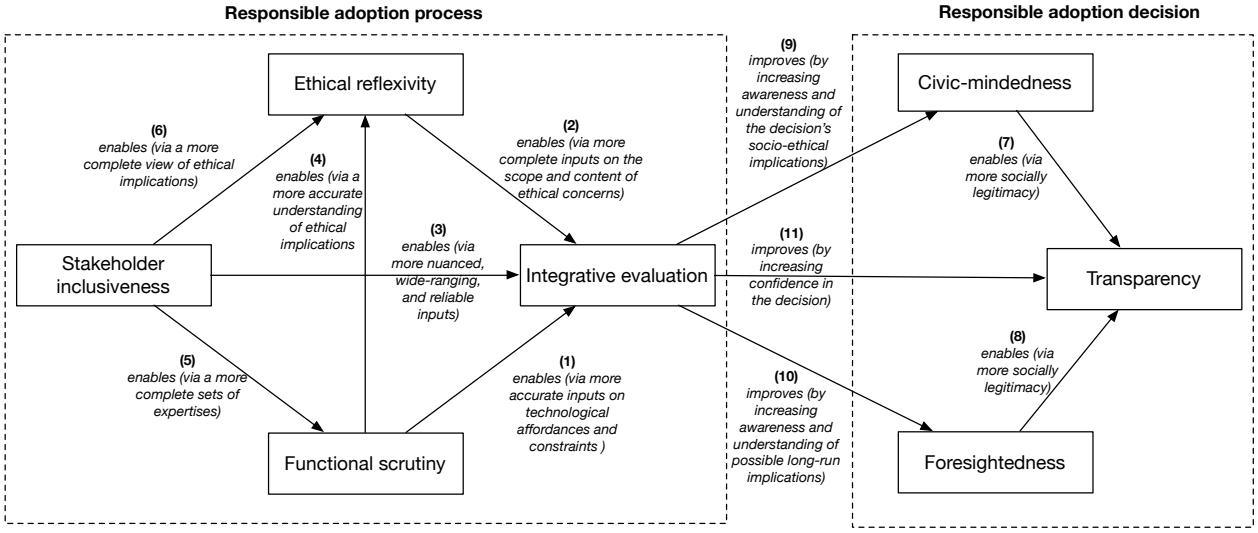


Figure 2. Research Framework

Relationships between RAP and RAD (links 8, 9, and 10). Responsible decisions are not likely to just happen; instead, they are likely to result from a proactive responsible process [35]. Thus, we expect RAP and RAD to be related. Integrative evaluation is a particularly important component of RAP because it involves building on the insights generated by both technological and ethical assessments. As such, we expect that it will be the key driver of RAD. The three resulting relationships can be explained as follows. First, we expect that integrative evaluation will improve civic-mindedness because it will increase decision-makers' awareness and understanding of the socio-ethical implications of adopting a focal ADMS (***link 9***). Second, we expect that integrative evaluation will improve foresightedness because a thorough holistic contextual assessment is likely to help better anticipate longer-run implications of ADMS (***link 10***). Third, we expect that integrative judgement will also improve transparency because it will increase decision-makers' confidence, thus their willingness to make the adoption decision available for public scrutiny (***link 11***).

4. Discussion

The framework that we have introduced in this paper makes some important contributions. First, it introduces a new concept, responsible adoption, and it clarifies what it involves in the context of automated decision-making systems. ADMS constitute an increasingly prevalent type of technology, which is often deployed to automate socially sensitive processes. The adoption of ADMS by public and private organizations, thus their increased presence in society, implies a growing dependence on automated systems in the making of important decisions affecting people in their everyday life (e.g., should parole be given to a particular individual) and managerial decisions alike (e.g., whom to hire or to promote; which product factory to invest in or decommission). This calls for a certain level of caution on behalf of the adopting entity. Thus, a larger implication of our theoretical model is that future research will need to change paradigm when examining ADMS. The existing paradigm in the IT literature espouses a view that is anchored in premises that are not well-aligned with the reality of ADMS and ADMS adoption. This paradigm is technophile, value-neutral, and it focuses on the assessment of benefits and impacts in the immediate surrounding of the decision-maker. In contrast, we propose a broader, responsible-centric view that considers the socio-ethical and systemic aspects that are so inherently tied to the deployment of ADMS.

Because the present study has focused on laying out the conceptual basis for the study of the responsible adoption of ADMS, it offers substantial opportunities for future research. One important direction to augment the proposed theoretical framework is to account for *contextual* factors., that is, investigate how the model varies across ADMS adoption circumstances [72]. Researchers could start with examining factors that hinder or facilitate the enabling effect of integrative judgement on the components of responsible adoption decisions. These are particularly interesting contingencies to study because we have reasoned that a responsible adoption process enables but does not

guarantee responsible adoption decisions. In other words, other factors and mechanisms might influence the presence and strength of these links. Contextual factors to consider include those capturing differences in the socio-ethical implications that are at stake, such as the extent of moral intensity [73], as well as those about the domain of application of the ADMS (e.g., type of industry), the decision-making setting (e.g., organizational ethical culture, organization size, subjective norms), and the decision-makers (e.g., agency, decision style, education, cognitive moral development, personal values) [74].

In a similar vein, future work could consider how those factors and others—such as technology/ADMS self-efficacy [75] and stakeholder engagement and participation in IT-related decisions [76]—could make stakeholder inclusiveness, functional scrutiny, and ethical reflexivity more effective so as to better support integrative judgement.

Another path consists in examining how different types of ADMS influence responsible adoption. For example, an ADMS in its preliminary stage of development might be perceived as unstable or highly risky and thus it might be evaluated differently (e.g., ethical reflexivity and functional scrutiny might be more salient) than an ADMS that has been used and tested for some time. Pursuing this line of research would require developing a typology of ADMS and group the types along key characteristics and features that are relevant to RAP and RAD (e.g., degree of complexity/opacity of the ADMS, type of dominant values associated with the ADMS, scale of the system affected by the ADMS).

Another avenue consists in identifying important triggers, drivers, and outcomes of RAP and RAD. In relation to triggers and drivers, it is important to stress that ADMS adoption decisions are rarely made in vacuums and that a variety of factors may hinder the process as well as the decision. This calls for studies about how psychological, social and institutional factors may influence responsible adoption including pressures to engage in such initiatives. Researchers may account for such pressures at different levels including individual (e.g., employees), groups (e.g., advocating groups), country (e.g., governments), and supranational (e.g., intergovernmental organizations) [77].

Finally, while we have assumed responsible adoption to be "good", how good is it really and does goodness vary depending on stakeholder perspectives? In other words, what are the consequences of responsible adoption? These questions call for further investigation into the effects of RAP and RAD on different stakeholders and the community in which they operate. There is some evidence that corporate social/environmental investment can have positive effects on financial performance [78], but we do not know whether similar or different kinds of benefits can be achieved in the case of responsible ADMS adoption.

5. Conclusion

Highly automated decision-making systems differ from most ITs studied in the past, making the traditional adoption paradigm less suitable. In this paper, we have leveraged the literature on social responsibility to propose a new focus on *responsible* adoption, conceptualized in terms of both a process and a decision that take into consideration the socio-ethical implications of putting an ADMS into use. The proposed framework connects technology adoption and social responsibility and offers a progressive foundation to study ADMS adoption.

6. References

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