Revisiting the Problem of Technological and Social Determinism: Reflections for Digital Government Scholars

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Abstract. There has been a long-standing debate over the best way to understand the relationships between technology, organizations, individuals, and the contexts in which they are embedded. One point of view proposes that technology can transform organizations and the way individuals behave in society. In contrast, another perspective argues that organizational and social variables influence the way technology is selected, managed, and used. These two perspectives are present in digital government research and both of them have important limitations that affect our understanding of government information technology initiatives. We argue that a more integrative perspective is needed. Moreover, some terms already available in the literature such as ensemble view, structuration, technology enactment, or socio-technical perspective could serve as starting points in this conversation. However, we also argue that a more integrative approach might not be enough and the development of new theoretical lenses based on concepts and variables from different disciplines should be a necessary next step in this process.

Keywords. Electronic government, social determinism, technological determinism, digital government, ensemble view, integrative approaches

Introduction

Governments depend on the collection, storage, and processing of information to fulfill their mission [1]. Thus, the use of information and communication technologies (ICTs), including knowledge, skills and techniques, have always been important for governments to achieve their objectives [2]. The application of ICTs to government settings has led the research field of digital government to important conceptualizations and problematic boundary definitions. Much research in digital government has shown how ICTs have the potential to transform government organizations [3,4]. On the other hand, there are many other studies that show how organizational structures and institutional arrangements affect both implementation and final results of digital government applications [5,6]. Despite advances in the social sciences, overcoming certain forms of mechanistic determinism based on linear causal relationships has not been possible. Further, these same advances suggest the need to overcome epistemological limita-

tions, such as some forms of reality segmentation that result from difficulties in operationalizing complex theoretical models. Sometimes, however, these possibilities are unknown or ignored.

In the field of digital government, although researchers generally recognize the importance of both the technical and social aspects involved in the phenomenon, when they talk about change, whether technological or social, one aspect is privileged over another [7]. The problem seems to be that the epistemological and ontological nature of the socio-technological relationship continues to be unclear [8], or at least without having a consistent theoretical treatment in its empirical applications. Thus, much of the research on digital government ends up falling into one form of determinism: *technological determinism* or *social determinism*. Of course, studies that fall into one of these categories do not assume it explicitly, but simply present their findings in a way that privileges either technology or social factors in the causal relationships. Some studies attempt to show that there is at least a bi-directional relationship between social structures and ICTs. They argue that information systems and ICTs in general, as well as organizational and other social factors affect each other and have mutual impact on their design, implementation, and use [9]. And even though there are now different theoretical developments of this type offering analytical tools to study this mutual impact, it seems possible and necessary to analyze the conceptual scope of those theories and tools to understand the phenomenon in a better way and, if necessary, refine or improve them. It should not be forgotten that, although applied to digital government as a specific field of study, the problem at the core of this discussion is social change and the role of technology in it, which may have implications for research in other domains.

In this way, the purpose of this study is to identify some of the key elements that define both technological and social determinism in the context of government transformation and digital government. Our ultimate goal is to contribute to the construction of a less deterministic view in the digital government field and we think the reflections provided in this paper are a good step in that direction. The paper is divided into four sections, including this introduction. The second section describes technological determinism in general and some of the forms it has taken in digital government. Similarly, the third section addresses the theoretical elements of social determinism and some of the forms that can take in the field of digital government. In the final section we briefly discuss some of the characteristics and limitations of current visions and provide some reflections for digital government scholars.

1. Technological Determinism

Technological determinism can be traced to the school of classical economics and, later, to the origins of sociology with Marx, Weber, and the Frankfurt School, although there are different positions about what theories belong in this category [10,11]. All these authors respond to the changes that arose in modern society as a cause of the trend of scientific-technical rationalization and one of its objectifications, technology, which forms the basis of that society's identity. This type of position supports the reification of technology (especially in the late nineteenth and early twentieth centuries), which attributes metaphysical powers to technology, making it an autonomous agent of social change [12]. Although these authors are not specifically technological determinists in a "strong" sense, technology plays a central role in their theory of modern society.

Technological determinism, like any other form of determinism, has an opposite: voluntarism. Determinism and voluntarism are the two sides of a distinction that occurs in order to explain human action, the state of society, and social change. While determinism assumes that human action is caused by technology, culture or other structural factors, voluntarism holds that human action is the product of individuals having free-will to decide and govern themselves, and thereby social structures.[1] Although determinism is usually linked with materialism and voluntarism with idealism, those are not the only possibilities [13]. Technological determinism supposes a linear cause-effect relationship between technology and one or more social entities or human capabilities [7]. Moreover, like other types of determinism, it is a form of reductionism, reducing the complexity to explain social processes to a single independent variable [11]. This definition applies of course to the most radical technological determinism; other deterministic positions can include additional variables, but assume that technology plays a primary role.

Technological determinism has had various forms within the twentieth-century social sciences, remaining as one of the main lines of explanation of social change. Maintaining generally an optimistic attitude towards the direction of social change, theories imply a sense of "progress" based on the introduction of technology. We can distinguish several types of technological determinism. One of the most basic and important forms of distinction is between "strong" technological determinism and "soft" technological determinism, although there is a whole spectrum of possibilities of location between the two sides of the distinction [14].

Strong technological determinism assumes technology has its own agency, having the power to enact social change and leading to a situation of inescapable evolutionary necessity. Soft technological determinism, on the other hand, assumes that human actors have their own agency and create their own history. In this sense, soft technological determinism considers technology as an element in a multi-causal matrix with other social, political, economic and cultural factors, but keeps the power of technology for change as the main variable, and just rearranges the source of that power.[2] Statements that characterize strong determinism argue that machines eliminate the anthropomorphic habits of thought [15].

Katz [11] identifies three types of technological determinism: the basic, the mystic, and the postindustrial. The basic type of technological determinism is comparable to the strong determinism. Authors like W. Ogburn from the Chicago school argued that technological innovations were generating cultural and institutional changes and that machines make history and impose patterns that guide social relations. The mystic type may be illustrated with statements like those of J. Ellul, who argues that humanity renounces spiritual values, with utilitarian consequences; human beings surrender themselves to the dictatorship of the artifacts in exchange for the benefits of modernity. Ellul argued that the only way to reverse this trend is a return to faith and religion. In contrast, the postindustrial determinism refers to the new technological items: ICTs. Brzezinski and Toffler consider the new technology transformative for both individuals and organizations. For instance, there is a direct relationship between ICTs and development.

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[1] There are a wide variety of authors and schools that would serve as examples of voluntarism. It is enough here to mention the classic works of Isaiah Berlin and Sartre, and works in the field of rational choice and methodological individualism.

[2] This form of technological determinism can be matched with various forms of social determinism, which have emerged as a reaction to the strong type, as will be seen later.

Bimber [10] distinguishes three versions of technological determinism. The first version includes norm-based accounts. The main references to this version are Habermas, for whom technology acquires its own normativity based on the logic of efficiency and productivity, and Ellul, for whom technology is a phenomenon that dominates the social, political, and economical areas. The second type is the logical sequence account, which establishes a cause-consequence of facts that are culturally independent. One of the authors in this kind of determinism is Miller, who argues that technological changes result in the evolution of society, and that people must adapt to those changes, regardless of their will: technological change has its own dynamic that generate more technology, with the result of social adaptation and evolution. The third category is the unintended consequences account, which refers to unanticipated results. The uncertainty derived from unintended consequences gives technology autonomy and some level of control over humans.

Although the idea of progress based on the promises of social technologization diminished after World War II and the Cold War, they have resurfaced in contemporary views [12]. For example, Castells [16] argues that the era of industrialization has led to the era of an information and network society based on ICTs. Technology is understood as "material culture" and is a fundamental dimension of social structure and social change. In this sense, contemporary society is located in the "informacionalist technological paradigm," which is based on increasing information and communication processing capabilities through ICTs [16]. According to Katz [11], information becomes the new fetish of society, an intangible asset that acquires its own dynamics that may rule the fate of society. Thus, technological determinism in modern society includes or implies an *informational determinism*, which could be considered as another form of technological determinism.

In the field of digital government, technological determinism has been common, though the position is usually not often taken openly or clearly attributable. Heeks and Bailur [17], for example, point out that much of the work on digital government has a more optimistic attitude about technological determinism than other possible positions, but not necessarily a "strong" form of determinism. One first form of technological determinism in digital government distinguishes the relationship between ICTs and government in terms of the potential for change, leading to improvements in the results of government organizations. Technology, among other things, is viewed to help ensure the most efficient use of resources, increase productivity, improve the quality of services, establish greater convenience for users, improve accountability, and increase citizen participation [18,19]. Moreover, it is assumed that having an integrated information system has the potential to improve the processes of planning and decision-making by government managers and provide easier access to information for citizens and other stakeholders [3]. This kind of causal relationship, in which ICTs are anticipated to have the power to directly transform government organizations and enhance the benefits they give to society is what can be characterized as technological determinism in the field of digital government [17,20].

Therefore, technological determinism in digital government could be characterized as ICTs-induced positive changes in governmental organizations. From this perspective, technology is a sufficient cause for improvements in the internal operation of these organizations [13]. According to Jackson and Philip [19], technological determinism in the field of e-government assumes, for example, that changing the shape of the practices, relationships, and logic of the organization can be calculated and planned as a result of the introduction of certain ICTs, establishing a linear causal relationship where

technology is the cause and change is the predictable and predetermined effect. Problems with obtaining the desired results, e.g. resistance to change, are attributed to problems with existing technology, to its ineffectiveness or lack of functionality.

A second form of technological determinism identifiable in the field of digital government emphasizes the operation of government organizations and their relationship with external stakeholders. This position assumes that digital government can contribute, based on better service provision, to the formation of societal structures and social development in general. The government, as a central actor for social change, has greater power through technology to achieve its objectives for social development through public policies that are powered by ICTs [16]. These two approaches are clearly intertwined, since the internal operation of government is in most cases oriented to services and other external benefits, which in turn act as an indicator of the performance of internal operations.

2. Social Determinism

As seen in the previous section, there are a significant number of attributions made to the power of ICTs in terms of their ability to make significant changes and provide benefits to government, but also to society at large. However, on the other hand, many studies raise a number of factors that can hinder progress and need to be solved in order to access the benefits of the use of new ICTs. The limiting factors to which we refer are of a social nature, which may involve, for example, organizational and administrative processes, the nature of public organizations, the legal and regulatory framework, and, of course, the societal conditions external to the government agencies: economic, political, and cultural factors. These limitations on the use of ICTs by the government, which are then seen to dictate the possible results and the causes of both success and failure, then serve as the dominant form of social determinism in the field of e-government.

Social determinism, much like technological determinism, is not really a strictly defined term. It is an analytical category allowing distinctions and classifications according to the privilege given to a particular causality and its directionality. Therefore, many of the authors or schools of thought mentioned here may even propose a neutral position with respect to such causation; however, since those cases seem to favor social factors over the inherent powers of technology, we believe it is possible to locate them in this way. The ultimate goal is not really to classify authors or streams of thought, but exposing approaches that illustrate what can be understood as social determinism.

Social determinism in general can be observed as a reaction to the strong technological determinism of the late nineteenth century and in much of the twentieth [11]. In this sense, it represents a causal link going in the opposite direction of technological determinism: social factors are what determine how technology is used, especially in the results from its incorporation into society. Technology, according to this position, has no power by itself that can generate a change. Human action is always what builds, implements, and uses technology, and thereby what produces social change. In this sense, technology is, and always has been, a social product [7]. Human skills and abilities to make decisions about and implement technology are what enable its impact. From this viewpoint, technology by itself does not give greater access to public information or encourage citizen participation [18].

As in the case of positions that may fall into some form of technological determinism, there are several ways to approach social determinism. For example, Katz [11] proposed that technological innovation is social. Technology would be the application of scientific knowledge to production under capital standards, therefore, it would not determine, but is determined by the process of accumulation and market rules. For Katz it is necessary for the social sciences to assume a determinism that allows access to the explanatory level, and the necessary determinism is social determinism. As an economist, Katz argues that there are the forces of capitalism and market logic, which determine how technological innovation unfolds. He proposes social determination at a macro or societal level based on Marxism, wherein historical determinisms explains the socio-technological relationship, unlike micro-level determinations of agents or groups that others propose [11].

From the distinction between strong and soft technological determinism, made by authors such as Marx and M.L. Smith [14] and Heilbroner [15], it is possible to find a kind of equivalence between soft technological determinism and social determinism. However, technological determinism seems to establish a chain of positive determination that places technology as a direct causal link to social change, which is preceded by social determination: Social factors → technology → social change. While social determinism would distinguish a relation of negative determination. Soft technological determinism addresses the cause of social change, which is the end result of the technology's power once created. Social determinism observes technology not as a cause, but as an effect of social factors and in a parallel relationship with social change. It is complicated to draw clear and precise limits as to when these distinctions are made.

Authors like Williams [21] seem to agree with the previous position. She argues that research in the field of history, along with work from other researchers in sociology, informally contribute to the "social construction of technology." The auto-named theory of social construction of technology proposes that social groups (and possible subgroups), formal or informal, which are linked by a set of meanings, define the final form of technology. The various social groups are the product of previous cultural, political, and economic influences that shape their position with regard to technology. That is, together with technology, these influences shape the technology that ultimately emerges [22]. With all the nuances and differences that exist between parallel models [23], the work continued by Bijker and colleagues [24] maintains the "non-naturalness" or purity of the technology, affirming its social character, its socialized form, and the human agency as the promoter of social change. And though this theory aims in some cases to go beyond of any form of determinism [11], it appears that, as Jackson, Poole and Kuhn [13] argue, it ends up falling in favor of one of the two sides of the distinction: in this case, toward the social factors of technology, which is distinguished here as social determinism.

For Castells, the studies on information and communication technologies reveal what historians of technology have known for a long time: that technology can only yield its promises under cultural, organizational, and institutional transformations [21]. These perspectives have shown ICTs as dynamic human constructions, both in how they are developed and interpreted, and these constructions reflect the interests and social motivations that gave rise to them [25]. In this sense, positions that fall into social determinism in the field of e-government have the same characteristics. That is, these theories assume that human decisions and human agency, within certain social structures, is what determine the results of technology and the derived social change [17]. Social determinism in the study of digital government, which also contains a "cul-

tural determinism" [19], refers to factors that relate to the practices of individuals and groups, whether in organizations or in society in general, which are the cause of an ICT project's failure in government. According to this position, these social and cultural forms generate resistance to the change that is sought through the introduction of ICTs. Change that, as with technological determinism, can be obtained via planned changes to the organizational structures and culture prior to the implementation of ICTs. According to Jackson and Philip [19], these social and cultural variables can be isolated and manipulated in terms of the supposed requirements for the success of ICT projects.

The problem then, for this and the other forms of determinism, is to assume that there is a linear relationship of causality between the factors involved that in this case goes from organizational, institutional, cultural, societal, to technology. That way of understanding the causal relationships implies that by manipulating some or all of these inputs to digital government projects, the results can be successfully obtained. However, the results of some studies that try to observe these relations in a more complex way show that technology characteristics and social factors affect each other in bidirectional and circular causal relationships that make their study complicated.

3. Preliminary Results: Some Reflections

Deterministic positions have been common in all fields of knowledge. All determinism cannot be dismissed or completely rejected, because to a large degree Western science has been built on the basis of forms, sometimes more lax and sometimes stronger, of determinism. In the social sciences, as Katz [11] suggests, the recurring problem of purely descriptive conceptions is the omission of a deterministic principle. The comprehension of a phenomenon from simple narration as an account of its form under the influences around it would be insufficient for a full understanding of that phenomenon. It is necessary to take the next step of explanation for the best comprehension of the problem.

However, overcoming determinism in all its forms has been a constant search in some fields of scientific research. It is no different with technological determinism and social determinism. These epistemic positions are increasingly rejected due to the criticism made on its partial way of explaining social change in which technology is involved. The main criticism of technological determinism is the lack of consideration of the factors involved at the societal, organizational, individual, and cultural level. Social determinism, on the other hand, is similarly criticized for the high weight given to social factors in the causal link; downplaying the potential transformational power of technology [11,19].

Many recent historical and sociological studies on the relationship between technology and society arose precisely in reaction to technological determinism [24]. However, the intention of overcoming the problem does not solve it. As mentioned before, the remaining difficulty is that, even with attempts to overcome these forms of determinism, it is very difficult to escape any of them in the end. It seems that research models favoring one side of the distinction do not allow for a more integrated way to study the complexity of the phenomenon [7]. Therefore, most of these studies end up in one form of determinism or another.

In the field of digital government, there have been a number of proposals for overcoming the linear determinism and the segmented forms of observation of the phenomenon involving social change in technology/social-structures relationship. It is assumed

that, although technology has the potential to transform the internal operation of government and dramatically improve the delivery of public services [26,27], the relationship between ICTs and social structures is bidirectional and complex [28,29]. ICTs have the ability to transform governmental organizations, but at the same time they are affected by organizational and institutional factors in their selection, design, implementation, and specific use [30,31]. According to Orlikowski and Iacono [32], these theoretical approaches are classified as the *ensemble view* perspective, and they refer to technology as an embedded system. Using different, but related concepts, all of these theories propose that there is a dynamic interaction between organizational structures and ICTs. Within this perspective are, for example, the enacted technology theory [6], the adaptive structuration theory [28], and the structurational model of technology [33], among other perspectives.

These theoretical frameworks constitute a contribution to overcome determinism in the field of digital government, but still are initial developments that require further discussion and refinement. For example, the theory of enacted technology with its immersion of technology in social, cultural, and psychic structures seems to generate a significant emphasis on the impact of the social on the technological. Although there is a theorized effect of technology on social forms (organizational, institutional), the bidirectional relationship does not seem simultaneous, but rather there is first a social determination and then a technological determination, which occur consecutively in time.

Something similar, but in the opposite direction, seems to apply to the theory of adaptive structuration. As with Giddens' original theory [34], it appears that the agency of the actors or groups first affects the structures, including the technology. In any case, the relationship seems to be simultaneous in the case of the structuracional model of technology, also based on Giddens' theory, but its operationalization is not always clear. In these two cases, as in the enacted technology, ultimately what ends up happening is a bi-directional or circular determinism. Linear or segmental partialities seem to be overcome with this type of model. Determinism is depicted in a more sophisticated or complex form in this type of integrative model, but it is still present.

Although as mentioned above, these models offer resources for a better understanding of digital government phenomena, going beyond deterministic views will require experimenting with other theoretical and conceptual resources such as, for example, what Niklas Luhmann introduced in sociology [35]. Concepts such as structural self-determination, operative closure, self-reference, and structural coupling, taken from Maturana [36], can give important insights in the study of digital government as they have done in sociology and other fields. These concepts arise from the effort to answer the problems of causality between a system and its environment. Although cybernetics offered a model that overcame the linear causality by introducing circular causality and the principle of open systems, subsequent advances in systems theory led to a new understanding of causality on the principle of closed systems. Each system can select and integrate different elements with its own internal criteria and operational regulations. This autonomy means, for instance, that the environment cannot determine the system, but rather it is the system that determines its own structure.

What has been attempted in this paper is not to make a simplistic reduction of the research on the relationship between technology and social change based on only two opposing positions, but to emphasize the need for more theoretical and conceptual precision, which involves a greater number of variables and an increased complexity in their relationships. It is clear that many authors who direct their attention to digital government do so in a very optimistic or purely descriptive way. It is necessary to seek

a more analytical discussion on the subject. This discussion should take up some of the problems associated with digital government and clearly articulate the role of the different elements in the system. For better understanding of this socio-technical phenomenon many things are necessary, but clearly one of them is the development of inclusive and comprehensive models that analyze such initiatives in all their complexity and that attempt to go beyond social and technological determinism. We argue that this should mean, at least in part, introducing innovative interdisciplinary theories and concepts to the field of digital government.

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