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Impacts of IS on Capabilities, Interactions, Orientations and values

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Impacts of Information Systems on Capabilities, Interactions, Orientations, and Values[1]

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Executive Summary

A survey of 20 relevant scholarly journals between 1987 and 1996 assesses the extent to which recent empirical research has identified significant changes in the political world attributable to information systems (IS). IS is defined as those mechanical, conceptual, human and organizational components whose function is the transmission of data-information using microelectronic devices. *The political world* includes the structures, processes, actors, and policies that shape the allocation of values. The *level of analysis* on impacts includes the individual as well as the collective.

The impact categories found through inductive research include: (1) *capabilities* (e.g., work productivity, effectiveness of service provision, policy performance); (2) *interactions* (e.g., responsiveness to citizens, power exercise, interorganizational coordination); (3) *orientations* (e.g., political knowledge, ideological beliefs, cognitive style); and (4) *value distributions* (e.g., power, economic resources, status, privacy, security).

Overall, the body of empirical analyses found presents a mixed, but generally positive characterization of the impacts of information systems on politics and the public sector. The *positive impacts of IS on politics are reported most frequently on capabilities*, especially on the efficiency benefits. Impacts are also generally favorable on the effectiveness measures, although there are some instances where no notable effects of IS are identified. Information quality is also enhanced, according to most of the studies. It is worth noting that negative impacts were always part of a mixed set of effects — that is, every study which reported negative impacts also reported positive impacts in the same category of information quality. And among the few interaction impacts that were identified, about half were positive, while the rest were negative or instances where no notable effects were discerned.

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The most *clearly negative impacts of IS were in values.* In many instances, the empirical studies identified unfavorable impacts of IS on individuals' privacy, legal rights and job enhancement (although positive effects on jobs are considerably more frequent than negative ones). While the impacts on values were not overwhelmingly negative, these studies raised their most serious questions about the role of information systems on politics in their assessment of value distribution at the individual level.

Overall, it is especially evident *that positive impacts of IS are far more frequently identified than negative impacts* for virtually all impact categories. The complexity of IS impacts in actual political settings is also revealed by the substantial proportion of studies reporting "mixed" effects.

As contemporary information systems (IS) have become more pervasive in governmental operations, they have the potential to transform many aspects of the political world. If the imagery of an "information technology revolution" is even partially true, there should be substantial effects on such phenomena as the organization of government, the efficiency and effectiveness of service delivery, the work conditions of public employees and possibly even the policy making process. These potential transformations have important implications for public service in democratic governments at all levels.

Information systems are frequently described as "transforming", or "having the potential to transform" government and society. But many scholars of technological innovations share the view that, while IS is generating revolutionary changes, "cultural systems and human institutions — governmental, legal and the like — tend to lag in responding to new opportunities offered by these technical innovations".

Thus, the central question in the paper is the extent to which recent empirical research has identified significant changes in the political world attributable to information systems. To assess this question, we have surveyed 20 relevant scholarly journals between 1987 and 1996.

Our Approach

Conceptual Framework

Information systems (IS) is defined as those mechanical, conceptual, human and organizational components whose function is the transmission of data-information using microelectronic devices. IS includes computers, office automation, telecommunications and management science techniques. Also, IS embodies many other discrete technologies such as those specific to a particular field, as in transportation, criminal justice and health care. The political world includes the structures, processes, actors, and policies that shape the allocation of values.

Broadly, there are two levels of analysis at which affected units can exist: the individual level and the collective level. In the political world, individual units include such actors as elected officials, public employees, political activists, voters, taxpayers, members of interest groups, and recipients of public goods and services. Collective political actors range from small groups (e.g., a local interest group) to mass organizations (e.g., a political party) to public organizations (e.g., a governmental department) to societal subsystems (e.g., the educational system) to international collectivities (e.g., the United Nations).

Through inductive research we address *four domains of impacts*, each of which reflects classical themes in political science: (1) capabilities denote the manner in which the unit manages its environment, to control the effects of the environment on its behavior and to extract values from the environment (e.g., work productivity, effectiveness of service provision, policy performance); (2) interactions denote the manner in which the political unit organizes its actions and then acts in

relation to other units (e.g., responsiveness to citizens, power exercise, interorganizational coordination); (3) orientations are the configuration of affective, cognitive and evaluative considerations that the unit employs in attributing value, establishing preferences, and making choices (e.g., political knowledge, ideological beliefs, cognitive style); and (4) value distributions denote the extent to which the unit experiences positive and negative allocations of things that are valued (e.g., power, economic resources, status, privacy, security).

Employing these four areas to form our framework for conceptualizing the impacts of IS on the political world, we will be able to assess whether this taxonomy facilitates analysis or whether another taxonomy seems better suited for the actual empirical findings. Most importantly, the review of the articles should add to our understanding of whether patterns of consistent findings are emerging in the empirical research on IS in the political world.

Methodological Approach

A sample of key academic journals from political science/public administration and from management information systems/management science were selected for the analysis. These twenty journals seem representative of the journal-based outlets for relevant empirical work during the period 1987-96. Each article is independently assessed by the two authors of this research regarding both inclusion in the analysis and the nature of the relevant findings. The journals included in our review are listed in Table 1.

Table 1.
Journals Included in the Review

1. Administrative Science Quarterly (ASQ)	11. Management Science
2. American Political Science Review (APSR)	12. MIS Quarterly
3. Communication of the ACM	13. Personnel Management*
4. Computer Personnel*	14. Policy Sciences
5. Human Systems Management*	15. Political Science and Politics(PS)
6. Information and Management	16. Political Science Quarterly
7. Information Systems Research (ISR)	17. Public Administration Review (PAR)
8. Information Infrastructure and Policy	18. Public Productivity & Management Review
9. Journal of Organizational Computing*	19. Social Science Computer Review
10. Local Government Studies	20. State and Local Government Review

Note. *) only included for the period 1992-1996

We did not include conference proceedings in our review, since the nature of research reported in the proceedings often is still research-in-progress. Also, research reported in proceedings, often will be included in journals as well. Although we do acknowledge that the inclusion of new IS might be faster addressed in conference proceedings, numerous studies by us and other scholars show that the impacts of new IS on key organizational features are changing more slowly.

The criterion for inclusion of articles in our review, was that the article was based on first hand empirical research conducted by the author(s) and that impacts of IS on the political system were explicitly identified in the text or the tables. The selection of literature includes only research on industrialized democracies. Thus, studies that were experimental, quasi-experimental, conceptual, or merely a review of literature were not included in this review. For each article meeting these criteria, the author's description of each impact was recorded, as was the overall direction (or directions) of the impact. At the next stage, we combine the individual impact measures into categories (by

induction), whenever such a combination seems valid. Finally, we calculate the frequency and direction of impacts reported in the empirical research.

Our methodology assumes that these journals and the research reported in them are representative of the broader body of empirical research on IS in the political world. At least, other researchers could replicate our analysis using the same journals or expanding the sample of research outlets. Although we do not judge the reliability and validity of the research designs, data collection and analyses of the articles, we also recognize that rapid changes in the technology might be altering the pattern of any given finding. Our categorization focuses on the impacts, treating them as independent of each other and not controlling for either the specific nature of IS or of the environment within which the impacts are occurring. We believe that a fully developed theory of any or all impacts of IS on the political world will include important contingencies regarding both the technology and the environment within which it is embedded.

Preliminary Findings[3]

Epistemological

From an epistemological perspective, the most striking finding of our research is that the major research journals of political science/public administration and of management science/information systems include very few direct, empirical studies of the impacts of information systems on public sector organizations. This is particularly true in the management science journals, which publish less than one article per year in this subject area. In fact, even in the political science journals, most of the articles during this period appeared in special issues (for example, an issue of State and Local Government Review focused on microcomputers in local government).

The study of IS impacts on the public sector has possibly been one of the areas of interdisciplinary research where the establishment of a core set of researchers communicating in the same scholarly journals has slowly developed. There are, of course, other outlets for this research, including books and journals other than those selected for this survey. But we suggest that analysis of the publication pattern in these outlets would further support the conclusion here regarding the fragmentation of published sources on the impacts of IS on politics and the public sector.

There are numerous ways that such a core can encourage additional research, including the greater presence of others' work as a stimulus, the emergence of a greater consensus in the peer review process about the relevance and quality of research, and even a more sympathetic editorial policy. The recently founded journal *Information Infrastructure and Policy* might become the locus around which such a core of researchers will begin to concentrate. At this point, it is the journal with the highest incidence of empirical research on the impacts of IS on politics.

Methodological

Our research suggests that the study of the impacts of IS on politics and the public sector remains a domain that has not developed a widely shared conceptual framework. There is not yet convergence among scholars of IS impacts on either the general taxonomic categories or the specific names of variables. However, many of the impact variables that are measured in the recent empirical research do fit within our proposed taxonomy of capabilities, interactions, orientations and values. Furthermore, the effects of IS on capabilities and values, at both the individual and the collective level, are specified most frequently, and the fewest empirical measures assess orientations.

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[3] Based on the period 1987-1992, since we currently are completing the review of 1992-1996.

While we do not explicitly analyze the analytic frameworks in this paper, it is noticeable that many of the empirical studies do attempt to explain variations in impacts. While the analytic approaches vary, most studies explore the effects of such factors as: (1) the end users' roles and personal characteristics (e.g., computing competency, age, gender); (2) features of the computer package (e.g., mainframe-, mini- or micro-based computing, centralized or departmental provision); and (3) type of information processing task (e.g., record searching, communication, analysis). Nearly all of the survey research based studies are cross-sectional, while most of the case studies consider a multi-year period. Moreover, about one-third of the studies assesses developed countries other than the United States, and about half of the studies focuses primarily on IS in local government.

Substantive

Overall, this recent body of empirical analyses presents a mixed, but generally positive characterization of the impacts of information systems on politics and the public sector. The positive impacts of IS on politics are reported most frequently on capabilities, especially on the efficiency benefits. Impacts are also generally favorable on the effectiveness measures, although there are some instances where no notable effects of IS are identified. Information quality is also enhanced, according to most of the studies, although it is perhaps surprising that negative impacts are reported for about 20 percent of the measures. It is worth noting that these negative impacts were always part of a mixed set of effects — that is, every study which reported negative impacts also reported positive impacts in the same category of information quality. And among the few interaction impacts that were identified, about half were positive, while the rest were negative or instances where no notable effects were discerned.

The most clearly negative impacts of IS were on values. In many instances, the empirical studies identified unfavorable impacts of IS on individuals' privacy, legal rights and job enhancement (although positive effects on jobs are considerably more frequent than negative ones). While the impacts on values were not overwhelmingly negative, these studies raised their most serious questions about the role of information systems on politics in their assessment of value distribution at the individual level.

Overall, these studies offer a sound basis for developing grounded theory. It is especially evident that positive impacts of IS are far more frequently identified than negative impacts for virtually all impact categories. The complexity of IS impacts in actual political settings is also revealed by the substantial proportion of studies reporting "mixed" effects. Clearly, there are many issues where scholars can contribute important empirical research on the impacts of IS on government and politics.