Extending the Technology Enactment Framework

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PNG Working paper No. PNG07-003
John F. Kennedy School of Government, Harvard University

Keywords:
Digital government, electronic government, technology enactment, information technology, organizations, theory

Abstract:
Fountain’s book “Building the Virtual State” introduced social science researchers to the technology enactment framework (TEF). This paper presents further modifications to the revised TEF by Okumura who introduced key actors that influence technology enactment. I propose a fourth actor group, the citizen and further causal relations between existing actors and the organisational setting. The revisions towards a more hybrid TEF between an actor-centric and institutional approach allows overcoming some of the limitations brought up by critics such as the absence of socio-technical systems theory.
1. Introduction

When governments implement technology outcomes vary. Online portals and online based income tax collection have been very successful throughout the world. On the other hand, projects that aimed to introduce new ICT systems to improve processes, data or knowledge sharing sometimes failed completely. Understanding these complexities is often of interest to researchers and practitioners alike.

The technology enactment framework (TEF) might be able to help them (Fountain, 2001). Jane Fountain’s book “Building the Virtual state” focuses on use and effects of ICT on organizations (government) from an institutional perspective. Drawing from literature on bureaucracy, neo institutionalism, networks and governance, Fountain presents the technology enactment framework. From her point of view it offers a more complete and powerful explanatory framework than the partial theories she reviewed. It is supposed to allow a thorough analysis of the influence of organizational structure and institutional arrangements on the use of technology for theory building. One key aspect of Fountains framework is the theoretical distinction between the ICT elements and the actors’ perception and use of these elements. When referring to technology, Fountains particular interest is in the internet which aspects were broadly communicated as a solution to many problems in governance and administration. Furthermore, technology has three roles. It is a management tool, part of the infrastructure once it is embedded within the organization and finally a catalyst for organizational change. States that heavily utilize ICT are called “virtual states” by Fountain which is actually to be understood as a metaphor to draw attention to its impact on the system of state, citizens and corporations.

The TEF is applied and tested in three case studies. The International Trade Data System (ITDS) was set out to integrate and standardize trade information and work processes across a large number of federal agencies, including the U.S. Customs Service. The second case is about the creation of a web portal called “U.S. Business Advisor” which was one of the first efforts to create a virtual agency to improve services for the growing number of small businesses. While the first two cases concentrated on interagency aspects, Fountains third case on the U.S. Army Ninth Infantry Division at Fort Lewis, Washington focuses on intra-organizational aspects. Fountain presents the impact of a Maneuver Control System on the highly developed command and control structure of the military after the end of the Cold War.

In Fountain’s view, both bureaucratic structure and the behavior of key actors will determine technology enactment and outcomes. However, this assumption was not visible in her framework.
Therefore, the TEF was extended by Okumura to include the multiple roles played by career civil servants, IT decision makers and consultants in government technology enactment (2004).

The framework’s critique can be grouped around three areas. First, Fountain misses to consider existing theories (i.e. socio-technical systems theory (STS)) in social science and therefore lacks the claimed originality (Norris, 2003, Grafton, 2003). STS is grounded in general systems theory. Organizations are seen as consisting of two independent, but linked, systems: a technical system and a social system. The technical system is composed of equipment and process, while the social system consists of people and relationships which are relative more important. Another body of research has long focused on the relative importance of political factors (Kraemer and King, 1986). Second, the U.S. based cases do not give enough evidence to support the TEF or its application on a global scale (Norris, 2003, Dawes, 2002). Lastly, conclusions delivered by TEF depend ones micro- or macro perspective (Garson, 2003). A particular aspect of a technology might fail but the underlying technology could prevail at the same time (VHS vs. BetaMax <> video recorders).

This paper does not intend to offer criticism but rather looks at how TEF could be extended further or is missing components based on critical remarks and various case studies in eGovernment. I will first do a brief summary of the original and revised technology enactment framework before I introduce my proposed revisions. The paper ends with some concluding remarks.

2. The technology enactment framework

In general, the TEF presents a theory of a dynamic process than predictive outcomes (Figure 1). One key aspect of Fountains framework is the theoretical distinction between the ICT elements (“objective IT”) and the actors’ perception and use of these elements (“enacted technology”). Enacted technology has four specific elements: perception, design, implementation, and use. It is distinguished from “objective technology,” which is hardware, software and especially the Internet with their given set of characteristics (i.e. functionality) before people use or customizing it. Take for example the spreadsheet software MS Excel which broad and hidden functionalities are only known and used by a limited number of people.

The most important influences on technology enactment are coming from the context of use; here organizational forms. As an account to complex settings and organizational reforms there is a distinction between bureaucracy and networks. Most administrators still work within one agency or department but there is an increasing need for cross-agency collaboration as Hurricane Kathrina has revealed yet again. Networks can facilitate spanning boundaries in highly
hierarchical (Weberian bureaucratic) orders or can be sources of negative externalities (Nahapiet and Ghoshal, 1998). Network efficiency increases where there are both higher trust and richer social capital among actors and where information sharing is common. The actors’ perception and behaviors of technology is shaped by institutional arrangements. The latter including factors such as culture, socio-structure or legal norms. Cognitive institutions refer to mental habits and cognitive models that influence behavior and decision making. Cultural institutions refer to shared symbols such as narratives or meanings.

The final part of the TEF is outcome. It can take a long or very short period of time until an impact of enacted technology can be recognized. Outcomes can affect organizational forms, institutional arrangements, enacted technology as well as objective technology as seen in the striped causal arrows. Causal arrows which point in both directions stress the recursive effects of variables. As such, outcomes can be direct, indirect, indeterminate, multiple, and unanticipated (Fountain, 2001).

Figure 1: Technology Enactment Framework (Fountain, 2001)

3. The revised technology enactment framework

In line with actor-centered institutionalism Hirokazu Okumura added actors to the TEF when translating it into Japanese (Figure 2). Actors like public administrators are not determined
completely by institutional arrangements (Werle, 1998). These actors play different roles depending on their role and position within the institutional setting.

There are three primary groups of importance for technology enactment. Although based on the causal arrows it should be noted that actors in group B and C have a stronger and direct influence on technology enactment. Actors in group A only have an indirect influence. Actors in group A are comprised of consultants and vendors. Their knowledge of objective technology is usually requested by governments. Chief information officers and other key IT decision makers make up group B. Finally, group C includes policymakers, managers, administrators, operators and front line workers which also influence the organizational setting visualized through the box around the aspects of organizational forms and institutional arrangements.

While this actor model is oversimplifying inherent complexities of decision and policy making, it adds potential variables to support Fountains notion that behavior of key actors will determine technology enactment and outcomes. The revised TEF is a more hybrid form between an actor-centered and a strictly institutionalist approach. Yet, institutional factors are outweighing those of actors’ influence.

![Figure 2: Key Actors in Technology Enactment. Revisions by Hirokazu Okumura. (Fountain, 2004)](image-url)
4. **Proposed additions to the technology enactment framework**

While the additional actor perspective in the revised TEF is not able to capture the complexities of technology enactment within government I think my revisions add missing causalities of importance to researchers. Second, it adds citizens as a fourth groups of actors. Third, the grey box around the organizational setting notes that there can be differences of organizational forms and institutional arrangements between agencies as noted by Fountain.

Depending on the individual actors within group B and C they may have the capabilities to assess appropriate IT for a given objective. Policymakers and elected officials could actually be added as another group. New York City’s 311/Citizen Relationship Management initiative was dominated by Mayor Bloomberg and his business technology background. Another notable example to support the causality between objective IT and group C actors comes from Japan. Because senior government officials are not technology savvy they leave assessment, strategies and implementation to younger, lower level employees. The idea, assessment and implementation of local social networking services (SNS) to governments throughout Japan started with Mr. Kobayashi, a young member of Yatsushiro cities IT section.

![Proposed additions to the revised Technology Enactment Framework.](image-url)

**Figure 3:** Proposed additions to the revised Technology Enactment Framework.
Consultants (group A) are not only influenced by group B actors but also indirectly (striped line) influenced by their understanding of the organizational setting and interviews with group C actors in order to understand that setting. Consultants usually roughly try to understand the organizational setting (i.e. business processes, security requirements) when asked for objective IT recommendations. Many times they just adopt a private sector approach (Fountain, 2004). This has a direct influence on how technology is enacted once set in place. For example when Gartner, a consultancy, was asked to give an assessment on public sector CRM systems they were not aware of combined work order knowledge management systems which fulfilled many of the requirements. This is part of the reason why they recommend Siebel CRM and not Motorola CSR to New York City.

Communication matters for technology enactment. Perception, use and adoption of technology depend on the way (how, who, time, framing/unique selling point) the objective factors and goals are communicated. This is why it needs to be added to the elements that help us analyzing technology enactment.

Actors in group D are comprised of citizens and businesses. Their enactment of technology influences the success of eGovernment services, organizational forms and institutional arrangements. With the exception of a few highly popular services, most of Hong Kong’s eGovernment services had low usage rates. The e-channel had become an additional service option, in parallel to conventional channels, thereby increasing operating costs and reducing tangible benefits (Smith, 2005). Hong Kong is now trying to lead citizens and business to use lower cost channels through various measures (i.e. changing office hours or closing down contact points). Additionally, before those changes government departments had previously viewed IT as a means of reducing costs – but not as a means to transforming their processes and reform inter-agency issues. Origins or motivations of government ICT projects can come from internal and external actors or trends. The latter case is exemplified through the striped line from group D to group C. Especially businesses might lobby policymakers to adopt ICT to keep their competitive advantage (i.e. transportation and customs).

As a final point, I think that the additional revision, especially the introduction of the fourth citizen actor group allow researchers to overcome the limitations mentioned by Hoetker (2002). The revised TEF should now be able to identify factors that allow us to answer how elected
officials, public managers, vendors, and citizens can work together to overcome institutional obstacles

5. Conclusion

Jane Fountains (2001) TEF is an important contribution to gain a well structured understanding of ICT projects in public administration. Fountains embedded technological determinism with regard to the potential of the web to transform governments can easily be rejected through case evidence at the moment. Bill Gates once said that we always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten. Although I am agreeing that there is no strong support for Fountains argument at the moment, researchers need be careful with such an early judgment. The presented revisions towards a more hybrid framework between an actor-centric and institutional approach allows overcoming some of the limitations brought up by her critics. The introduction of multiple actors and their influences in technology enactment brings TEF closer to socio-technical systems theory and thus acknowledges its existence in social science research. Of course, the presented revisions are constrained by the lack of stronger case evidence. The hybrid TEF model should be tested and explored further by researchers.

Acknowledgements

The paper was written during the authors visit to Japan which was organized by Prof. Hideaki Shiyoyama and Prof. Hirokazu Okumura. This research project was funded by The University of Tokyo, 21st COE Program and a grant (Monbukagakusho) in aid for scientific research B: “Network Governance, Consensus Building and its Management”. The researcher is sponsored by a Johann Wolfgang Goethe- University, Frankfurt am Main Doctoral Scholarship. Any opinions, findings, and conclusions or recommendations expressed in this paper are those of the author and do not necessarily reflect the views of the University of Tokyo, 21st COE Program or any other University.
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