

Interoperability in e-Government: More than Just Smart Middleware

Hans J. (Jochen) Scholl
The Information School
University of Washington
jscholl@u.washington.edu

Abstract

According to Layne and Lee (2001), electronic Government (e-Government, e-Gov) progresses towards higher levels of integration and interoperability among and between government levels and branches. Interoperability in essence leads to extensive information sharing among and between governmental entities. However, the obstacles, which prevent a rapid progress into that direction, are not merely technical. In fact, the technology side may prove the least difficult to address, while the organizational, legal, political, and social aspects may prove much more of a challenge. The case in point presented in this paper is Washington State's Justice Information Network (JIN), which attempts to share and interoperate criminal and judicial information between state and local governments. Progress towards sustainable information sharing requires many players seeking the same ends in an ongoing fashion, not just a huge upfront and one-time effort as the case illustrates.

1. Introduction

The ultimate goal of system integration and interoperability is the timely and comprehensive sharing of task-relevant and action-critical information [16]. Vertical and horizontal integration and interoperability of information systems, however, poses substantial managerial, organizational, and technological problems [41]. As opposed to private-sector organizations, which generally enjoy immediate and undivided powers over organizational and technological decisions within their span of control, public entities face a far different decision-making environment of distributed control and divided powers (ibid).

Although major organizational and technological impacts require negotiation and intermediation among constituents in any organizational environment, the public sector as a system of deliberate checks and balances is particularly geared towards carefully negotiated outcomes, which are reflective of constituents' needs in political, organizational, social, and technological regards. This has led to markedly different practices and outcomes in the public sector when compared with the private sector, particularly also when information technology and information systems are involved [9, 37]. Efforts to organize and practice effective information sharing in the public sector have to be mindful of deliberately imposed

(constitutional and other legal) barriers, organizational impediments, technology obstacles, and stakeholder concerns regarding the policies, the processes, the procedures, and the extent of sharing information between agencies.

In this paper, the author focuses the discussion on organizational and stakeholder-related aspects of information sharing as well as on the underlying technological dimensions of systems' interoperability by using the case of Washington State's Judicial Information Network (JIN) as an illustration. By so doing, the author does not intend to suggest that this case is exemplary for good or bad handling of the tasks at hand. Rather it is felt that the challenges of information sharing become much clearer when discussed with a real case in mind, and not just in the abstract alone.

The paper is organized as follows: First, a brief summary of the literatures on information sharing, inter-organizational integration, and stakeholder management (particularly, in the public sector) is given along with the technology-related literature on system interoperability and integration. Then, the JIN case is presented, and it is analyzed how the various literatures relate to the practical case. Further, it is discussed what can be learned from this particular case, and how information sharing might unfold. Finally, an e-Gov information-sharing project framework is presented and proposed for future testing in the public sector.

2. Literatures on Information Sharing, Inter-organizational Collaboration, Stakeholder Management, and System Interoperability

Information sharing in government has been praised for its potential benefits along technical, organizational, and political dimensions: It helps improve the technical infrastructure as well as the management of data [16, 378], in fact, it can happen effectively only as a result of such streamlining. In other words, the more information is to be shared, the better the infrastructure needs to become, and vice versa. Also, with more relevant and accurate information at hand organizational problems can be tackled from a more-than-local perspective helping create larger professional networks (ibid). Finally, in the political sense, shared information allows for better coordination of government agency programs and services as well as improved accountability in the public

domain (ibid.). However, those potential benefits have been effectively barred in many instances for the lack of technology and data compatibility as well as “organizational self-interest, dominant professional frameworks, external influences over decisionmaking, power of agency discretion, and primacy of programs” (ibid.). Government agencies seemingly share transactional data more easily with each other than operational or strategic information [27].

While effective information sharing undoubtedly yields a great many benefits, it also poses potential risks such as infringing upon individuals’ privacy [28] and other rights [25]. As Jaeger points out, information sharing as practiced and sought in e-Government may pose formidable and fundamental legal issues by undermining basic design principles of Western democracy such as the deliberate division of powers and the principle of federalism [24].

As Dawes observes, policies and principles for information sharing across branches and levels in the electronic age of government need yet to be developed [16]. She proposes the two principles of information stewardship (government as caretaker of accurate and useable information) and information use (incentives for responsibly providing and sharing accurate information) as mutually reinforcing forces, which can guide the definition of information sharing policies (ibid., 393).

In the democratic system of government, which heavily relies on the division of powers and distributed control, for the parties involved, *inter-organizational collaboration* rests on their own interests and their willingness to engage in collaborative efforts, the resources available to them, and the expected benefits/outcomes [31]. In such inter-organizational collaborations, four main areas have been identified, which hold either favorable or unfavorable conditions towards collaboration: (1) Initial (organizational) disposition, (2) social and political organization, (3) purpose, issues, and values, and (4) leadership capacity and style (ibid.). Organizations with favorable experience in collaboration and a general positive attitude towards collaboration may have a greater *initial pre-disposition* than those organizations afraid of concessions and other potential detriments (ibid, cf. also [27]). In terms of the *socio-political organization*, when fewer players are involved, and also, when personal ties and peer relationships exist, collaboration is more likely to occur than when those elements are missing (ibid). Further, the core *value* system of an organization may gear it towards or prevent it from effective collaboration (ibid.). This can become visible also in and through the *leadership style* (for example, adversarial versus collaborative) (ibid.). Organizational “silos” and “stove-pipes” do not embrace and endorse interagency collaboration [30]. Formal authority, control over important resources, and legitimacy also play important roles in collaborative

efforts [22]. While knowing key success factors is important, without understanding the nature of the dynamic interaction of those factors in and through the social and organizational process [35], effective collaboration seems to be hard to establish and to maintain [17]. As Faerman et al (2001) illustrate, the collaborative process feeds an initial pre-disposition for collaboration, a strong impulse from leadership towards it, sufficient incentives to stay the course, and a relatively small number of players. In contrast, other research found that even large and diverse groups might converge towards collaboration when appropriate interaction methods for fostering and mediating the planning and implementation process are employed [11].

Although the literature on *stakeholders* originates from the private sector, the management and alignment of constituents and their needs has a long tradition in the public sector [39]. The basic idea of stakeholder theory is that those who “can affect or can be affected by” an outcome when pursuing an organizational objective should be accounted for [19, 25]. Since constituents differ with respect to their potential to influence the sought outcome, the identification of the most salient stakeholders appears to be essential [33]. Stakeholders might assume different stances towards an organizational outcome over time, which is why the three dimensions of their salience, that is, power, legitimacy, and urgency, need to be reassessed from time to time (ibid.). Primary stakeholders are those who can exert the highest influence along those three dimensions. However, stakeholders may also be distinguished regarding their potential to support or threaten an outcome [6]. Based on the analysis of stakeholders’ salience and likely stances towards an outcome, the proponents of a desired outcome (for example, project managers) have a better grasp of the field of interests and influences they operate in. One frequently observed result of a thorough stakeholder analysis is the direct involvement of at least the primary stakeholders in the sought outcome as well as a detailed analysis of the particular needs, which those primary stakeholders have [39].

System interoperability has been practiced and researched for decades, however, with the advent of both the Internet and non-proprietary (frequently open-source) software, new realms of connectivity and interoperability have been opened up. The focus is directed toward more recent developments in this regard. Building on Dawes’s work [16], a three-stage standardization framework for interagency information sharing has been proposed, which incorporates technical, architectural, and institutional standards, on which, in turn, various legal, managerial, and policy approaches of information sharing would be couched [27]. An example for the technical implementation of such information sharing approaches is the XML-based Inter-agency Information Sharing (IAIS) architecture, which attempts to optimize between

information searching efficiencies and storage and maintenance requirements [5]. As opposed to other approaches like free-text or database schema, the IAIS method enjoys both high recall and precision and ease of information maintenance, while the other two methods trade one of these metrics off against the other (ibid, 73).

More generally, in the wake of XML's triumphal procession in recent years and with the introduction of XML Webservices (WS), three approaches for interoperability have been described and tested: (1) the integration of the backend systems, (2) the integration of front-end clients (presentation), and (3) a hybrid combining the two [36, 38]. XML WS work on four basic principles: (1) the web service is described in XML and can be accessed via standard protocols and transports, (2) the service can cross organizational boundaries, (3) the service can be found based on standards for publishing, locating, and interoperating; and (4) the service itself can identify and connect to its management services [18]. While the basic concept underlying XML WS promises far greater interoperability than other approaches before [14, 43], some harsh limitations in response time and scalability were found in practice [12, 29]. The technical changes and more flexible ways of system inter-operation through the use of XML WS, however, present new organizational challenges in terms of (1) the sourcing mix, (2) integration of internal and external resources, and (3) new skill acquisition [21, 108].

Summary: Information sharing between government agencies faces challenges of different kind and caliber at (1) legal, (2) policy, (3) organizational, (4) managerial, (5) social process, and (6) technological levels. In most cases, the sharing of information between government agencies cannot be imposed on organizational players; collaboration appears more likely when an initial predisposition for sharing and collaboration exist, the process is strongly supported by the participating agencies' leadership, and incentives for sharing are strong. The various constituents of an information sharing initiative need to be closely involved and their specific needs have to be accounted for. Technological standards and methods have become available, which make system interoperability feasible even between systems of proprietary origins and legacies, however, currently still at the expense of scalability and response time penalties.

3. The Case of Washington State's Justice Information Network (JIN)

Overview, Project Motivation and Objectives

When a police officer stops a driver for a traffic-related violation and checks both the vehicle and the driver records using her police vehicle based information system, she has access to various local sources of information. Provided both vehicle and driver have remained within the jurisdiction and its span of control (for example, at county level), the information the police

officer receives from the information system will be highly accurate and complete. However, if a vehicle, a driver, or both frequently cross the boundaries of jurisdictions, the information recorded and available to the officer represents a local view and, hence, is incomplete. Vehicles and drivers sought (for example, for collecting fines and fees) in one jurisdiction cannot be identified in that capacity by another jurisdiction because the information sources are neither integrated, nor are they standardized. In the absence of the proper information, the officer will let the person and the vehicle drive on after the traffic violation incident has been administered.

Currently, the dispersed and fragmented information sources throughout the state provide local and State law enforcement officials with dangerously incomplete information. The expected benefits when integrating all available information motivated the conceptualization of a JIN, which would increase the public safety, improve the decision making in the public policy process, and provide public access to justice information [1, 12-13]. In order to achieve those goals, JIN would “

- Maximize standardization of data and communication technology among law enforcement agencies, jails, prosecuting attorneys, courts, corrections, and licensing.
- Eliminate redundant data collection and input efforts
- Reduce or eliminate paper-based information exchanges
- Improve work flow within the justice system
- Provide complete, accurate, and timely information to justice practitioners in a single computer session
- Maintain security and privacy rights respecting justice information “ (ibid, 12).

Stakeholders

In the late 1990s, the JIN stakeholders at state, county, municipality/city levels had clearly identified the need for better integrated, more complete, more recent, and more accurate information of criminal justice. Those stakeholders include the Administrative Office of the Courts, Washington State Patrol, the Department of Corrections, the Office of the Attorney General, the Department of Licensing, the Office of Financial Management, the Department of Information Services, the Sentencing Guidelines Commission, and as representatives of the local authorities the Washington Association of Sheriffs and Police Chiefs, the Washington Association of County Clerks, the District and Municipal Court Judges Association, the Washington State Association of Counties, the Association of Washington Cities, the Association of County and City Information Systems, and the Association of Prosecuting Attorneys.

The stakeholders chartered the JIN initiative with the mission “to improve public safety by providing criminal justice practitioners with complete, timely, and accurate

information, and to improve operating efficiency by facilitating the integration of disparate systems throughout the state” [1].

Under the leadership of the State-level Justice Information Committee (JIC) various stakeholder committees and subcommittees were formed, which developed the mission, objectives, and goals for the JIN. The Justice Information Network Act of 2003 further supported these efforts.

Project History, Goals, and Assumptions

In 2002, the JIC involved a renowned consultancy with sound public-sector experience, which helped develop data and systems architectures and also provided implementation-related recommendations. The consultancy conducted an extensive user requirements study in a series of five workshops with 15 to 25 representatives from various stakeholders in each workshop. Those workshops focused on the technology architecture, which the technical experts in the JIN stakeholder community had broadly conceptualized upfront. The workshops served as the basis for the development of detail specifications of JIN architectures and components (infrastructure, applications, publication, integration, analysis, governance, policy, administration, and support).

A major element of the JIN integration effort is the development and maintenance of a central Summary Offender Profile (SOP), into which information from various sources is linked. SOP has been implemented as a ubiquitously accessible web-based query application, which provides timely and accurate information on offenders. A prototype-based test-run was conducted as a proof of concept in July of 2004. The implementation of this prototype was conducted under the guidance of the Department of Information Services (DIS).

In its envisioned final stage of development and implementation, the Washington JIN would rest on a unified network architecture, which uses as much as possible the existing infrastructure. On top of the network would rest a logical architecture, which incorporates the rules of information exchange in a secure fashion. Based on the logical architecture the formats of data exchanges would be defined. Beyond the SOP application, JIN would encompass three other applications, (1) Jail Booking and Reporting, (2) Felony Disposition, and (3) Electronic Judgment and Sentence.

A steering committee consisting of 17 representatives from various stakeholder groups and the JIN program manager based in the Department of Information Services have orchestrated and supervised the project through its elaboration and preparation phases. As of this writing, the project is headed towards the next phases of design and development as well as pilot deployment.

Critical assumptions underlying the JIN project include that (1) the project will have a sufficient number of

participating local government partners willing to make the necessary financial commitments, (2) the partners will accept the already developed functional and security standards, (3) sufficient human resources will be available throughout the project. The project managers also acknowledge that (1) JIN might impose additional costs on the participating partners, (2) JIN is dependent on the partners’ ongoing commitment to sharing information, and (3) the geographical and organizational dispersion of partners might present an obstacle to coordination and communication [4].

Alternative Technology Architectures

Led by the consultancy, the JIN planners took three alternatives for the statewide integration of criminal justice information and systems into consideration: (1) point-to-point interfaces, (2) a hub-and-spoke backbone, and (3) an integration backbone with a master index.

The point-to-point architecture

This architecture would connect every participating system and application with any other peer system. While it maintains the agency’s utmost autonomy, it would burden the local systems and applications with the interfacing task and the overall system with a performance penalty. Moreover, as systems change over time multiple individual interfaces would need to be changed at the same time leading to an ongoing maintenance burden for keeping the interfaces current.

The Hub-and-Spoke Backbone

The “backbone” of this architectural alternative would be a middleware component, which functions as a centralized exchange, which provides a single uniform interface to all participating systems. Applications would be able to access a JIN data warehouse through the exchange. This architecture would also include a business rules repository, which would enable pre-programmed actions upon occurrence of predefined conditions in the system-wide messaging traffic.

The Integration Backbone with a Master Index

This architectural alternative would build on the hub-and-spoke principle and add to it an (actively or passively maintained) master index, which keeps track of identifiers of applications and data repositories system-wide. All information available in the network pertaining to a certain subject could be identified at once eliminating the need for multiple queries. When assessing the three architectural alternatives, the JIN planners found the third alternative (“Integration Backbone with a Master Index”) the most attractive. Although this architectural alternative “involves high risks related to complex governance and the implementation of ... more new technology” [1, 16], the higher functionality and performance as well as the lower long-term maintenance burden was a clear advantage it was found.

In summary, JIN is an ambitious, multiyear, multilevel, and multi-branch e-Government information sharing and interoperability initiative involving multiple,

diverse stakeholders who share considerable potential benefits and risks. JIN, if completed successfully, would greatly benefit public safety, law enforcement, and policymaking. The risks encompass constitutional, legal, financial, inter- and intra-organizational, as well as technological aspects.

4. Discussion

In this section, the JIN initiative is compared to the insights and recommendations in the various literatures on collaboration, information sharing, and interoperability presented before and discuss how those could benefit the project.

Information Sharing

Information sharing is at the heart of the JIN initiative, and, hence, involves the two dimensions of information stewardship and information use. Both dimensions influence one another: The more accurate and complete the information provided through JIN, the greater are the incentives for information use and sharing at all levels, and vice versa. For this mutually reinforcing relationship to materialize, certain pre-conditions need to be considered and addressed:

Heterogeneity of infrastructures, information sources, resources, and skills

The JIN project leaders have identified a multitude of justice-related information sources representing multiple formats and also residing on diverse technology platforms and generations. More than 55 percent of the State population is concentrated in just four (Snohomish, King, Pierce, Thurston) counties, which account for a little over 10 percent of the counties in the State. While those populous counties as well as many city governments in that area possess highly developed information infrastructures and skilled IT personnel, less populous and less wealthy counties and municipalities do not enjoy that same high standard of infrastructure and an equivalent level of sophistication in their employee base. From the JIN documentation, which the author had access to, it was not clear, whether or not an inventory of existing systems and networks, information sources, applications, data formats, along with an inventory of locally available skilled workforce and local skill-sets had been prepared. For the development of a unified information-sharing infrastructure, such inventories would be indispensable. Since information ownership remains at the local level in an information-sharing network, the weakest link limits the network's overall information quality. Consequently, special attention needs to be directed to those participating counties and municipalities with weak infrastructures and resources.

Justice Information: Locality and Governance

Along with the inventories of infrastructures and resources, the distribution of relevant information between and among governmental entities across branches and levels needs to be known and documented.

Most of the information resides at local and county levels it is assumed, For integrated uses such as the Summary Offender Profile (SOP), for example, it needs to be precisely understood, which levels and branches of local government actually provide which fraction of the information. The SOP information quality rests upon the quality of the various information component providers. Within the confines of their respective infrastructure, resources, and skills, local information providers greatly codetermine the overall quality the SOP. Quality improvements, hence, need to focus at least as much on the originating local JIN provider side as they do on the integration and (downstream) cleaning side.

Ownership and control over sharable information typically remain with the originating agency. Different interpretations and stances towards information sharing might develop over time depending on whether the uses as well as the benefits versus the cost of sharing remain agreeable to all participating parties. JIN participants, hence, need to agree on sustainable principles of governance, which ensure the uninterrupted and uncompromised provision and maintenance of best-quality justice information among all participants. It is important to analyze, how robust and sustainable such inter-level and inter-branch information governance agreements promise to be. After all, at any point in time no elected or appointed administration can waive the right of control over local information (including the willingness to share or not to share with others) for all future administrations.

Potential for Ongoing Collaboration

Collaboration between participants within the JIN initiative is based on free choice among peers rather than imposition. No federal or state law, statute, or regulation can force any local government entity to share its information, leave alone to do so in a certain fashion. As the State Law clarifies in Section 5 (k) 2 (b) "Nothing in this section supersedes the authority of courts, state agencies, and local agencies to control and maintain access to information within their independent systems" [3]. Thus, the JIN initiative of information sharing rests on the principle of enlightened self-interest, where every party benefits from the effort of sharing to more or less the same extent.

Initial Pre-disposition for Collaboration

Some participants involved have extensive experience in collaborating with each other (for example, the grass root eCityAlliance of Bellevue, Bothell, Issaquah, Kirkland, Mercer Island, Woodinville, and other cities; or, within the Washington Association of City and County Information Systems (ACCIS). The JIN initiative, however, requires a statewide and more complex collaboration of governmental entities of different levels and branches. From the JIN documentation, the author was unable to identify whether or not an analysis of the pre-disposition for collaboration had been conducted and

what the results had been. As pointed out above, the lack of confidence among potential participants regarding the effectiveness of a proposed collaboration can significantly hamper any such effort, while positive experiences favor and foster future collaboration. The project planners assume that “{t}here are sufficient number of partners interested in and financially committed to participating in a Justice Information Network” [4, Appendix A, 7]. Given the complexity of the collaborative undertaking, this assumption it appears needs to be reassessed from time to time, since the willingness to collaborate may change among parties as the project unfolds.

Leadership Support and Involvement

Collaboration between organizations heavily hinges on the leaders' stance and support of those participating organizations. As discussed above, if the leaders engage in the collaborative effort, the success is more likely than if they refrain from involving themselves. The JIN initiative enjoys the support and involvement of high-ranking leaders from important organizations and agencies involved: For example, the Integrated Justice Information Board (IJIB), which oversees the initiative, comprises a representative appointed by the governor, the director of the office of financial management, a representative of the Washington Association of Prosecuting Attorneys (WAPA), two representatives of the Washington Association of Sheriffs and Police Chiefs (WASPC), the State Attorney General, two representatives of the JIN committee, a representative of Washington State Association of Counties (WSAC), the secretary of the Department of Corrections, the director of the Department of Information Services (DIS), the Administrator for the Courts, a representative of the Washington Association of County Clerks (WACC), the chief of the State, the assistant secretary of the department of Social and Health Services, the director of the Department of Licensing, a representative of the Washington Association of City and County Information Systems (ACCIS), and a representative of the Association of Washington Cities (AWC). While those board members undeniably represent a high level of leadership, it is unclear whether or not the eight State and eight local government representatives plus the two JIN appointees have the clout and support, particularly at county and municipality level, to effectively influence outcomes and commit resources. It is unclear from the JIN documentation, for example, how county level interests are aligned: Would King or Pierce county interests (which are the two wealthiest, resource-richest, and IT-savviest counties) automatically and smoothly align with those interests of smaller, poorer, and less IT-experienced counties? If alignment cannot be reached, how would a potential conflict be resolved at board and county leadership levels? How would the leadership of larger City governments be aligned, etc.? The board representation along functional lines (e.g., courts, police

chiefs, sheriffs, clerks, prosecutors, information systems, cities, counties etc.) may potentially cut across more powerful lines of interests such as the local jurisdictions. Should that be the case, then important leadership representatives might not be directly and sufficiently involved in the current JIN-related decision-making process. It might be worthwhile to assess the JIN leadership involvement from a local government perspective in order to secure the necessary support from important players.

Incentives for Collaboration

As shown above, incentives to stay course in a long-term collaborative effort must be strong, otherwise the ongoing support and outcome may be compromised. While the broad objectives of greater public safety, better law enforcement, and more effective policymaking pursued through JIN most certainly enjoy the broadest support among constituents, when it comes to the intricacies and details of sharing information and interoperating systems, the support might hinge upon more immediate and practical benefits versus incurred costs and committed resources. From a local perspective, trading off local programs, which directly and traceably benefit local constituents, against long-term and less tangible benefits might turn out a hard sell for local leaders in times of austere budgets. Also, requesting to commit scarce local IT resources to JIN-related system overhaul and integration efforts, which (in a local perspective) might be seen as asymmetrically benefiting higher courts as well as state-level agencies and legislation more than the local constituents, could potentially become a problematic undertaking. Hence, it appears necessary (1) to directly involve local leadership, (2) provide funds for the local integration and overhaul efforts, and (3) also support those efforts through technical assistance

The Number of Players

As discussed, the literature is not unanimous regarding the number of players most conducive to successful collaboration. However, it seems that one-time efforts may be successful even with a large number of players provided certain large-group interaction methods are effectively employed. Long-term collaborative efforts in an environment of distributed powers (as is the case of the JIN initiative), though, may be more successful with a smaller number of players. If applicable, this, in turn, would cause a formidable dilemma for the initiative. It might be worthwhile to assess, whether or not a collaboration between a limited number of resourceful local governments and State agencies would be able to take the lead and create an initial JIN implementation. In such a scenario, less resourceful local governments would not incur the initial high cost of JIN but rather gradually have an opportunity to participate and also benefit from financial and technical assistance through other sources at a later point in time.

Salient JIN Stakeholders and their Needs

The JIN initiative presents itself as an extraordinarily complex case of collaboration and interdependencies between participants. Ongoing stakeholder management in such a case, hence, appears as a necessity for the initiative's ultimate success. From the literature three main areas of stakeholder analysis particularly apply to this case: (1) identification of salient stakeholders, (2) identification of needs and wants (of those salient stakeholders), and (3) identification of likely stances towards the project (in terms of potential collaboration or potential threat). In an initiative of this magnitude (also with regard to its long-term effect) stakeholders may change in terms of their salience, their needs and wants, and their likely stances. An upfront analysis of the stakeholder landscape alone does not suffice, since it would fail to capture any stakeholder-related changes in the course of the project. The JIN documentation available to the author does not indicate whether or not any detailed stakeholder analysis along the three dimensions has been carried out at the beginning of the project. However, from the documentation the author concludes that the project leaders were completely aware of the complexity of the stakeholder relationships and sincerely tried to employ the most inclusive approach possible. Ironically, this may have unintentionally led to a lower active involvement of some salient stakeholders such as the large counties and the big cities, which have to significantly contribute to the information sharing effort.

The JIN initiative as well as the implementation project the author believes would greatly benefit from a detailed analysis, which discriminates between primary, secondary, and tertiary stakeholders, their respective needs and wants, and their likely stances. For example, while the various local government associations involved in the IJIB formally represent all counties, all cities, all county and city information services etc., the needs and wants of those entities cannot be assumed identical. On the contrary, resourceful local governments most certainly define very different priorities in their investment patterns than resource-constrained local governments leading to different needs and wants as well as different stances towards the initiative. The JIN project team explicitly makes the assumptions that the partners involved "will accept the standards and requirements the Board deems as necessary to ensure network security," and, also, "{a}ppropriate DIS and Partner staff will be available during all phases of the project" [4, 7]. The analysis would make possible to identify important convergences and divergences of interests among and between stakeholder groups. It would allow assessing the risks embodied in the assumptions stated above and also help identify more precisely and succinctly the individual benefits various stakeholders may expect from the successful completion of the JIN implementation project.

System Interoperability: Standards and Formats

Among other principles, those of (1) scalability, (2) use of standards, (3) use of open systems technology, (4) use of commercial-off-the-shelf (COTS) systems whenever appropriate, and (5) vendor independence have particularly guided the development of the JIN technical architecture [2, 17-20]. In using this approach, the technical JIN implementation design attempts to establish an optimum of flexibility, modularity, vendor independence, functionality, performance, and cost for this long-haul undertaking. Although the technical architecture document does not explicitly mention any middleware methods such as XML WS, the architecture is generally open enough to adopt such emerging standards, if found appropriate. While the architectural principles appear to meet the intended goal, technical evaluation criteria and metrics still need detailed upfront specification, in order to assess the overall system performance against the desired optimum. Among those criteria, the JIN technical implementation should define and meet predefined metrics regarding scalability [10], performance [44], system reliability [20], security [10, 26, 32], usability [23, 34], design [10, 20], error handling [32], and documentation [34, 42].

5. A Framework for Planning and Evaluating Information Sharing and Interoperability

Information systems are notorious for high failures rates, particularly, the larger they are or become. In decades of intensive research on the failure causes, a plethora of factors has been identified [40]. However, the interplay of those factors has remained obscured, mainly due to the overwhelming emphasis on the technical-functional and rational aspects rather than by considering the whole equation including organizational and social processes [35, 40] as well as non-rational aspects in human decisionmaking and interaction [13]. Further, every individual and organizational player develops and maintains idiosyncratic interests, perspectives, and expectations towards any given organization and its supporting information systems, that is, a multitude of conceptualizations is the norm rather than the exception (ibid.). Inter-organizational information sharing and system interoperability increases rather than decreases the mix of incongruent interests and conceptualizations, which need to be aligned and accommodated. In that, it represents a far more difficult case than the deployment of a new information system in a single organization. While a sound technical architecture is indispensable, the overwhelming focus on the functional-technical side of an information-sharing and system-interoperability project drastically increases the risk of shortcutting the organizational and social processes [13, 40], to which the technical aspects are necessarily subordinated.

The framework for planning and evaluating information sharing and interoperability, which the author

proposes, is iterative in nature and deliberately accounts for the flux and potential volatility in intra- and inter-organizational relationships (see Figure 1).

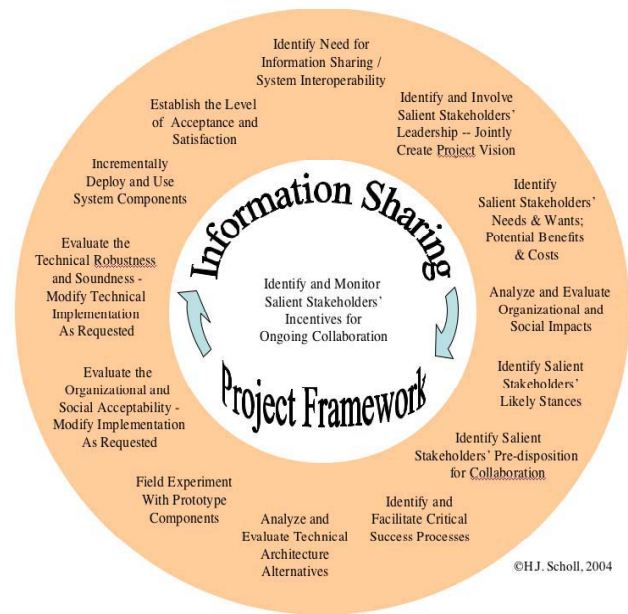


Figure 1 The E-Gov Information-Sharing Project Framework

The Need for Sharing

Every interoperability and inter-organizational collaboration project begins with at least one party articulating a need for more information than she currently possesses, but which she assumes or even knows to exist elsewhere. Parties who have a symmetrical interest in sharing potentially complementary pieces of information may find themselves in a straightforward position for establishing information sharing policies and procedures. Whether or not the information need is symmetrical or asymmetrical, in the project definition phase, the specific needs for information sharing must be elicited and documented. It can happen as early as at this stage that the definition of information needs indicates incongruent interests of potential information sharing partners. In other words, no unifying need may emerge among potential partners, although still, a specific understanding with respect to the variance of needs can be established.

Identifying and Involving Salient Stakeholders and Their Leadership

Stakeholder analysis has become an integral part of project management [15]. However, that analysis is mostly done at an early stage of any given project once and forever implicitly assuming that the stakeholder landscape would remain irreversible. Also, most project teams do not discriminate among salient and non-salient

stakeholders but rather treat them as equidistant and equivalent players. Consequently, different weights of influence and need go unattended. Furthermore, changes in stakeholders' salience are not accounted for providing the project leadership with an incomplete stakeholder analysis at best. Large information-sharing projects, however, need to identify those stakeholders who really count and involve their leaders right from the beginning. When crafting a project vision for an information-sharing project, the active participation of leaders from salient stakeholders is indispensable for providing the collaboration project with the necessary clout and credibility.

Identifying Needs, Wants, Benefits, & Cost

Without a detailed understanding of the information needs and wants that various salient stakeholders hold, the project cannot effectively focus. The needs and wants can be tagged with individual benefits and cost, which each party may expect and accept. It helps the collaborating parties more precisely identify what is in the project for them.

Analyze & Evaluate Organizational and Social Impacts

Not all organizational players can be assumed to embrace an information-sharing project enthusiastically. The project may impact the organizational and social status of constituents in unforeseen areas. This analytical step attempts to uncover such potential areas of recalcitrance and resistance before they come in existence. Apart from the immediately sought project benefits, this step also strives for understanding the bigger picture of the intended change via information sharing.

Identifying Salient Stakeholders' Likely Stances

Stakeholders have been observed to assume varying stances towards a project in its course over time. While some stakeholders may maintain a threatening or collaborative stance from the onset throughout the project, others may change their stance. Some stakeholders can be both support and threat for a project depending on the course of the project. Understanding those stances and managing them is of great importance to successful interoperability and collaboration projects.

Identifying the Pre-disposition for Collaboration

Some organizational players may not have a track record of collaboration nor may they have the organizational culture, which would make collaboration possible. At this stage, the potential project partners need to be assessed along the lines of this critical success factor.

Identifying and Facilitating Critical Success Processes

As opposed to focusing on critical success factors, this approach postulates the conscious design and implementation of carefully maintained and monitored

organizational and social processes, within which the project and its team are embedded. As discussed in the conclusion section, one potential candidate for such a process design may lie in participatory action research approaches including practitioners and researchers as peers in an iterative process of action planning, action taking, evaluating, learning, and starting over.

Analyzing and Evaluating Technical Architecture Alternatives

Compared to technical-functionalist waterfall and system-development-and-life-cycle (SDLC) approaches [7, 8], this approach considers potential technical alternatives rather late by consciously subordinating them to the supremacy of organizational and social processes, which need to unfold among and between salient constituents and set the stage for technical alternatives in the first place, not the other way around. The acceptance of technical solutions is seen in this approach as emanating from the social process, which brought about the solution rather than from the technical solution alone.

Experimenting with Prototypes and Components

Unlike the SDLC methods, which postulate the upfront elicitation of "user requirements" and their translation into technical solutions by experts, this approach sees user needs and wants, on the one hand, and system functionality, on the other hand, as co-evolving. Modularity of components and functionality, prototyping, user involvement, and direct, interactive user-expert collaboration help this process unfold.

Evaluating Organizational and Social Acceptability

Based on the previous experimental stage an early assessment of the organizational and social acceptability can be conducted. Adjusting developments and accommodating for organizational and social incompatibilities comes at relatively lower financial, psychological, and emotional cost at this stage than after rollout of the full-blown information-sharing architecture.

Evaluating the Technical Robustness

After salient stakeholders have found the organizational and social compatibility of the architecture satisfactory, the technical robustness and soundness represents the next stage of testing.

Incrementally Deploying Components

Rather than immediately switching from one organizational state of operation to a new, organizational absorption of greatly enhanced information-sharing capabilities takes time to take a hold. The gradual and successive implementation and placing into operation of new components makes their acceptance and comprehensive use more likely.

Establishing the Level of Acceptance and Satisfaction

Since multiple and diverse constituents participate in the information-sharing project who will reap different benefits as outcomes, it is important to establish the various levels of acceptance. Collaborating parties should be enabled to determine their individual benefits versus their individual cost. The more widely spread the benefactors and the more specific the benefits, the more future collaboration between participants becomes likely.

6. Future Research

The presented framework needs further testing in real-world information-sharing and system-interoperability projects for assessing its usefulness and claimed superior outcomes. Since the purely technical-functionalist approach to such projects as the author believes will prove fundamentally flawed far sooner in environments of distributed control than in hierarchically controlled projects, a need for alternative approaches to facilitating and enabling information sharing will be imminent in e-Gov projects. The information-sharing project framework can be tested and used also in projects, which are already underway, as long as the leadership of those projects is willing to accept the supremacy of the organizational-social dimension over the technical-functional. As shown elsewhere, participatory action research designs have the capacity to fuel and entertain a multifaceted process of inquiry, action, and evaluation, which finally promises to bring about a widely accepted organizational and social outcome with an important technical component embedded in it [40].

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