Process integration, information sharing, and system interoperation in government: A comparative case analysis

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1. Introduction

Process integration (Klischewski, 2004), information sharing (Dawes, 1996), and (information systems) interoperation (Guijarro, 2007; Lam, 2005) in government are closely intertwined phenomena exposing high degrees of complexity (Scholl & Klischewski, 2007). Whenever processes are to be integrated, or information is to be shared among government agencies, then some interoperation of systems has to be established (Scholl & Klischewski, 2007). Yet, whenever systems are to interoperate, then the integration of processes and the sharing of information will be involved in some way or the other as well (Scholl & Klischewski, 2007). It appears that integration, information sharing, and interoperation are intertwined and inextricably interrelated. Therefore, we propose the use of the compound acronym of INT-IS-IOP as a summary term for integration (INT), information sharing (IS), and interoperation/interoperability (IOP). We understand that interoperation and interoperability are distinct: Interoperation refers to the actual processes of exchanges between information systems, while interoperability has been defined as the capacity to interoperate at any given time (Scholl & Klischewski, 2007).

Interestingly, so far academic research has mainly focused on the technical aspects of INT-IS-IOP (for example, Alasem, 2009; Archmann & Nielsen, 2008; Charalabidis & Askounis, 2008; Davies, Harris, Crichton, Shukla, & Gibbons, 2008; dos Santos, 2008; Gottschalk, 2009; Paolucci, Chini, Pettenati, & Pirri, 2007; Younas, Chao, & Laing, 2005). However, stakeholders in administration have learned that mastering the technology is not only key to overall success but also to managing the interplay of organizational and technical aspects. At the same time, public spending on information technology (IT) has been increasingly put to test, putting public-sector CIOs and managers of e-government projects under pressure to evaluate the outcomes of interoperability efforts and justify investments. In the same line, in a number of recent case studies non-technical problems have also received attention as important elements of the overall equation (for example, Hjort-Madsen, 2006; Isomaki & Liimatainen, 2008; Klischewski & Scholl, 2006; Salhofer & Ferbas, 2007; Scholl, 2005; van Velsen, van der Geest, ter Hedde, & Derks, 2008). INT-IS-IOP projects, if they are to be successful, seemingly need to take into account both technical and non-technical factors and their interplay (Janssen, Charalabidis, Kuk, & Cresswell, 2011; Luna-Reyes, Gil-Garcia, & Cruz, 2007; Pardo, Cresswell, Dawes, & Burke, 2004; Pardo, Nam, & Burke, 2011).

Despite its relatively high volume and the great interest in the topic both in academia and practice, research in INT-IS-IOP has ventured into various directions employing a number of theoretical approaches. Scholl and Klischewski have addressed this variety of approaches and presented a framework along with a research agenda capable of providing an enhanced focus to INT-IS-IOP-related research (Scholl & Klischewski, 2007). Scholl and Klischewski argued that INT-IS-IOP research should be based on the analysis of stakeholders’ wants and

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needs, the ensuing project foci and purposes, which might meet limitations and constraints, leading to project-related processes and results (outcomes). While Wants-and-Needs Theory, as the two authors pointed out, is not exhaustive to explain individual or institutional behavior, they hold that individual and institutional wants and needs can be both powerful inhibitors and enablers of INT-IS-IOP projects (Scholl & Klischewski, 2007).

Recently (Kubicke & Cimander, 2009), three dimensions of organizational interoperability were proposed as additional lenses for analysis, amending and complementing the aforementioned framework. The three dimensions or perspectives encompass the institutional, the functional, and the technology/IT service perspectives on organizational interoperability (Gúijarro, 2005, 2010; Kubicke, Cimander, & Scholl, 2011). Fig. 1 depicts the amended INT-IS-IOP framework, which we used in this study. For each horizontal layer of the INT-IS-IOP framework, the three dimensions of institutional, functionality, and technology/IT service can provide another analytical lens. In this study, we focused on the layer of stakeholder wants and needs and outcomes for these additional dimensions of analysis.

In a related comparative research project, three authors of this paper analyzed these three dimensions based on 77 cases from an IT-governance perspective whereas this paper uses a sub-sample of 19 of the 77 cases and additional data to study the phenomenon.

The first aim of this paper is to systematically portray, assess, and compare the main focal areas of INT-IS-IOP projects in government from a stakeholder wants-and-needs perspective as well as by identifying the specific constraints and limitations in INT-IS-IOP projects. We also aim at shedding light on success and failure measures in such projects as well as on the socio-technical processes, which were key to success and failure of INT-IS-IOP projects in government.

For this purpose a sample of nineteen recently completed and detailed INT-IS-IOP project reports from across Europe has been selected and used in this analysis. Special attention was placed on identifying the specific project foci and purposes, the limitations and constraints, the processes and project outcomes of the respective projects. Since most key success and failure factors in information technology (IT)-related projects, (including INT-IS-IOP projects) interact in a feedback fashion, it would be insufficient to limit the analysis to identifying and assessing just those factors (Newman & Robey, 1992). In order to fully understand the outcomes and evolutionary trajectories of projects, the technical, organizational, and social processes, in which those factors interact, have to be studied as well.

The second aim of this paper is to assess the utility of the amended INT-IS-IOP research framework as a guide for directing research and practical evaluation of projects in that area. So far, the INT-IS-IOP framework (in the following: the framework) has demonstrated its utility in a few studies, which were mainly limited though to single project cases (Klischewski & Scholl, 2008; Navarrete, Gil-Garcia, Melloul, Pardo, & Scholl, 2010; Scholl, 2005). However, when using the framework on larger data sets we had hoped that the explanatory power and the framework’s structuring capacity would be demonstrated in more depth and detail. As we found in this study the framework consistently demonstrates its utility also on multiple cases. As a consequence, we reason that the framework can be used with increased confidence in both academic research and government practice.

The paper is organized as follows: We first review the pertinent literature on integration, information sharing, and interoperation/interoperability. In this review we place a specific emphasis on the framework and its components. We then present our research questions and explicate our methodology. Further, we present and discuss our findings. Finally, we detail our conclusions and propose future work.

2. Literature review

According to Scholl and Klischewski, integration in government can be defined as the “forming of a larger unit of government entities, temporary or permanent, for the purpose of merging processes and/or sharing information” (Scholl & Klischewski, 2007, p. 897). Hence integration extends to both process integration and information integration (sharing) (Klischewski, 2004) and pertains to the institutional dimension and in part to the high-level functional dimension (Kubicke & Cimander, 2009). In other words, as opposed to interoperation or interoperability, which alludes to the technical and lower-level functional aspects, integration refers to the non-technical and governance aspects of intra- and inter-government collaboration. Further following Scholl and Klischewski’s set of definitions, interoperation “occurs whenever independent or heterogeneous information systems or their components controlled by different jurisdictions/administrations or by external partners smoothly and effectively work together in a predefined and agreed upon fashion” (Scholl & Klischewski, 2007, p. 900) whereas interoperability “is the technical capability for e-Government interoperation” (p. 901). In a functional perspective, IT-based interoperation encompasses layers such as technical (signal-level) interoperation, syntactic (data-level) interoperation, semantic (information/meaning-level) interoperation, and finally business process interoperation (Kubicke & Cimander, 2009). Others propose to distinguish further between technology (“computer”), business process, information, values, and goals when analyzing government integration and interoperation projects (Gottscho, 2009).

From a mere technical, that is, an IT service perspective, interoperation is provided by various and evolving technical means such as directory or conversion services, buffering and routing of messages, as well as providing clearing houses and mediating services (Kubicke & Cimander, 2009, p. 8). Integration and interoperation initiatives in government, although different in individual approaches, have been found to address all three dimensions—the institutional, the functional, and the technical—through, for example, standardization (Charalabidis, Lampathaki, & Askounis, 2009; Charalabidis, Lampathaki, Kavalaki, & Askounis, 2010). It has also been suggested that the higher the degree of integration and interoperation and the higher the vertical level the better the service orientation and flexibility in government (Klievink & Janssen, 2009). It is not clear though whether or not the suggested scaling would also apply on inter- and transnational levels (Navarrete et al., 2010).

Like in the private sector, at a minimum, the strategic foci of business and technology management have to be aligned to some extent also in government (Gregor, Hari, & Martin, 2007). In the institutional perspective of IT governance a number of scholarly contributions have developed a deeper understanding of integration and interoperation in government. Key decision areas of institutional IT governance regard IT principles, IT architecture, IT infrastructure strategies, business application needs, and IT investment and prioritization (Weill & Ross, 2004).
In these areas technical and institutional decisions are highly intertwined (Bekkers, 2005; Gil-Garcia, Chun, & Janssen, 2009; Harrison, Gil-Garcia, Pardo, & Thompson, 2006; Iannacci, 2010; Pardo & Tayi, 2007), in particular, with respect to collaborative efforts (Damsgaard & Lyttinen, 2001; Luna-Reyes et al., 2007) such as process integration and information integration as well as interoperation. The collaboration between institutional entities appears to fare best via a peer-oriented, participative approach and consensus building, which accounts for the relative independence of the participating parties (Bekkers, 2005; Janssen, Chun, & Gil-Garcia, 2009) despite some situational exceptions to this general rule (Klischewski, 2004). Yet, with rising degrees of institutionalized interoperation the governance of such inter-organizational interaction appears to become more complex (de Vries, 2008), possibly necessitating highly sophisticated steering instruments (Valtonen, Seppänen, & Leppänen, 2009). On State level, governments apparently mostly prefer a federated format of IT governance to a hierarchical-centralized format (Helbig, Hrdinová, & Canestraro, 2009). Frequently, integration and information sharing initiatives have to overcome various boundaries and barriers (Zheng, Yang, Pardo, & Jiang, 2009), many of which pertain to governance issues and reside in the institutional and legal rather than the technology realm (Gil-Garcia et al., 2009; Isomaki & Liimatainen, 2008; Janssen & Cresswell, 2005; Lam, 2005).

Among those barriers, legal constraints may rank among the most arduous (Lampathaki, Koussouris, Gionis, Charalabidis, & Askounis, 2009), and close attention to the overall political and institutional environment appears to be of utmost importance (Pardo et al., 2004). Moreover, collaboration projects might be subjected to a powerful reinforcing feedback mechanism, in which successful project outcomes breed more trust among parties and more willingness to push collaboration, integration, and interoperation even further (Luna-Reyes et al., 2007). Furthermore, organizationally and technically IT and information infrastructures must maintain a high degree of flexibility to be able to cope with changing needs (Bekkers, 2005). However, IT systems and infrastructures also “stick” in the sense that they have a capacity to reinforce and perpetuate existing structures including power structures (Cordella & Iannacci, 2010).

Information sharing-related capability assessments, though, have shown mixed results in government contexts (Cresswell, Pardo, & Hassan, 2007). Integration, interoperation, and information sharing efforts evolve over time and require collaborators’ ongoing monitoring and care (Charalabidis et al., 2009; Ciborra, 1997). Furthermore, increased and improved information sharing practices might have the capacity to mitigate information asymmetries, for example, beneficial law enforcement (Clarkson, Jacobsen, & Batcheller, 2007).

Quite a few contributions addressed the functional perspective, for example, the development and assessment of tools for process analysis and modeling (Becker, Pfeffer, & Räckers, 2007), or integrative ontology development for semantic interoperation (Bednar et al., 2008; Hreno, Bednár, Furdík, & Sabol, 2011; Shukla, Harris, & Davies, 2010) including frameworks, which strive to cover a complex administrative system such as government semantically on all levels and in all dimensions (Peristeras & Tarabhan, 2004; Schrott & Schmidt, 2008; Sourouni, Lampathaki, Mouzakisitis, Charalabidis, & Askounis, 2008; Todorovski, Kunstelj, & Vintar, 2007; Wang et al., 2007). Fueled also by calls for open government, the quest for interoperability in government has been extended to create more transparency regarding the structure and meaning of government data, for example, on the basis of data catalogs (Maali, Cyganiak, & Peristeras, 2010). Addressing the technical (IT service) dimension, a layered approach has been proposed, which distinguishes between the access layer, the e-government layer, the e-business layer, and the infrastructure layer (Ebrahim & Irani, 2005). In this context, standardization appears as a key element of interoperation and information sharing, although technical standards evolve and change rather frequently (dos Santos, 2008; Fernández, 2002). Frameworks and open standards appear to play an increasing role in government integration and interoperation (Guizarro, 2005, 2010; Kubicék et al., 2011). However, too often standardization is understood as a mere technical rather than an all-encompassing issue, which has to include the whole phenomenon also in non-electronic contexts or on (inter-) organizational levels (Ferrario & Guarino, 2008; Kubicék et al., 2011).

In summary, the electronic government-related literature on integration, information sharing, and interoperation interoperability has evolved over the past few years pursuing various directions and employing multiple foci. As we mentioned before, the first aim of this study is to demonstrate the importance of focusing INT-IS-IOP research on stakeholder-related wants and needs as well as the ensuing project foci and purposes. Further, the limitations and constraints in INT-IS-IOP projects need to be understood as well as the related measures of project success and failure. The additional analytical lens of institutional, functionality, and technology/IT service amends this analysis.

3. Research questions

3.1. Research question #1

In part, the amended INT-IS-IOP framework rests on Needs-and-Wants Theory (Burton, 1990; Lederer, Galtung, & Antal, 1980), which posits that individual and institutional action can be explained and predicted, when objectively and subjectively perceived needs and wants of interacting actors are known. Since actors’ needs and wants are rarely in harmony or sufficient congruence, but oftentimes are rather competing and conflicting in nature, clashes with other actors pursuing different or even opposing goals can be expected, when each actor legitimately pursues his or her own goals. The negligence of interfering goals and diverging stakeholder interests has been found to be one of the most prominent and pertinent root causes of project failures (Scholl, 2001).

Research question RQ#1: What stakeholders and what stakeholder needs and wants influenced this INT-IS-IOP project?

We broke down this summary research question into (a) who were the primary stakeholders in the particular INT-IS-IOP project, (b) which were each stakeholder’s wants and needs, (c) which were the purposes of each stakeholder’s action, (d) which were the principles, requirements, and choices, and (e) which degree of integration was incorporated into the INT-IS-IOP project.

3.2. Research question #2

With regard to wants and needs, we further distinguished between permanent/frequently recurring needs, occasional needs, and ad hoc needs. Also the principles, requirements, and choices were separated along the lines of governance choices, economic choices, organizational principles, and technological choices. Once the various needs and wants, the various purposes for action, and the various (governance, economic, organizational, and technological) principles, requirements, and choices were known for each case, we hoped to see some patterns in the nineteen cases under study. We expected to find areas of convergence of interest and relative compatibility, potential conflict, and undetermined interest that can be identified and assessed. We then would be able to compare project outcomes with the various stakeholders’ interests and also match outcomes with the perceived usefulness of and perceived benefits provided by the information systems applications resulting from the project.

In government projects, nine classes of constraints have been distinguished, which exert both limiting and enabling influences on any given project: (1) constitutional/legal constraints; (2) jurisdictional constraints; (3) collaborative constraints; (4) organizational constraints; (5) informational constraints; (6) managerial constraints; (7) cost constraints; (8) technological constraints; and (9) performance constraints.
Research question **RQ #2**: What were the specific limitations and constraints in the INT-IS-IOP project?

Again, we broke down this research question into (a) what were the specific limitations and constraints for each stakeholder; (b) what were the characteristics of the specific limitations and constraints; (c) how did the specific limitations and constraints interact, counterbalance, or reinforce each other; (d) to what extent and how were the specific limitations and constraints mitigated; and (e) which degree of integration did the stakeholders ultimately incorporate?

3.3. **Research question #3**

Furthermore, the amended INT-IS-IOP framework proposes the analyses of project-related processes and outcomes and distinguishes “problematic” and “non-problematic” outcomes (Scholl & Klischewski, 2007). Problematic outcomes are those in which “an intended or unintended outcome was desirable but unsuccessful, or, in which an intended or unintended outcome was undesirable but successful” (p. 909), while unproblematic outcomes are those in which “an intended or unintended outcome was desirable and successfully accomplished, or in which an intended or unintended outcome was undesirable and also unsuccessful” (Scholl & Klischewski, 2007). Outcome analyses of INT-IS-IOP projects along those lines have rarely, if ever, been conducted, although they would greatly benefit practitioners and researchers alike. The framework distinguishes problematic outcomes as type A (desirable/unsuccessful) and type B (undesirable/successful).

Research question **RQ #3**: What were the measures of success, if any, how do they compare across the INT-IS-IOP projects with respect to project outcomes?

We also broke down this research question in several sub-questions: (a) What measures of success, if any, were used? (b) What was defined as failure/success? (c) How do the measures compare across cases? (d) What “type B” problematic outcomes, if any, were recorded, and why were they seen as problematic? (e) What “type A” problematic outcomes, if any, were recorded, and why were they seen as problematic? (f) What is the ratio, and what is the relationship between unproblematic and problematic outcomes? (g) Given the problematic outcomes identified, which areas of application were most frequently affected, if any? (h) Given the problematic outcomes identified, which degree of integration (federations, project groups/co-ops, or interest groups/loose affiliations) did actors (primary stakeholders) incorporate in the INT-IS-IOP project? We hoped and found that the outcome analysis provided valuable information on the riskiness and outcome uncertainty of INT-IS-IOP projects. We also expected that we would better understand side effects (desirable and undesirable) in such projects.

3.4. **Research question #4**

Finally, we were interested in the breakdown of wants and needs as well as the measures of project success or failure with regard to the institutional, functionality, and technical/IT service dimensions of INT-IS-IOP. The results of this portion of the analysis would further help inform research and practice about the drivers of INT-IS-IOP project in government and about the metrics used in such projects.

Research question **RQ #4**: Given the three dimensions of INT-IS-IOP (institutional, functionality, and technical/IT service), how do stakeholders’ wants and needs as well as project success/failure measures compare?
interoperability layers (Kubicek & Cimander, 2009), levels of government, and also the extent of interoperability.

5. Findings

Ad RQ #1: What stakeholders and what stakeholder needs and wants influenced this INT-IS-IOP project?

When identifying primary (also referred to as strategic or key) stakeholders, we used the three dimensions of salience, which are power, legitimacy, and urgency (Scholl, 2001). It is trivial that we found at least one government agency in all nineteen cases as primary, if not the primary, stakeholder. In eleven cases businesses were primary stakeholders, followed by citizens in ten cases, and elected entities in seven cases. Please note that multiple stakeholders could be primary in any given case. As the case reports also indicated, some stakeholders changed (exited, entered, changed from primary to secondary, and vice versa) over the course of a project. As was found earlier, so in this study, primary stakeholders tend to exert a major influence on project outcomes and need to be carefully managed and maintained (Scholl, 2001). This, in turn, requires a clear understanding of primary stakeholders’ wants and needs. As Fig. 2 shows, eight permanent wants and needs were found in more than half of the cases: Service enhancement (in 84% of the cases) topped the list followed by secure and reliable data and transaction processing and effective data collection and exchange (in 74% each). Time savings and/or workload reductions, ease of use and handling, as well as standardization were next with 63% each, followed by information quality (in 56% of the cases), and secure personal identification and authentication (in 53% of the cases).

As opposed to permanent wants and needs, government agencies as well as other primary stakeholders also have wants and needs, which occur only occasionally rather than permanently. We found the following occasional wants and needs to occur most frequently in the sample (see Fig. 3): The desire to reduce the amount of paper-based processing (paper reduction) was found in 15 of 19 cases (79%), while the streamlining and simplifying of business processes was observed in 14 of 19 cases (74%). Also, process harmonization and integration was found in the majority of cases (12 cases, that is, 63%). In terms of one-time, or ad-hoc, wants and needs only legacy systems integration was found in the vast majority of cases (16 cases, that is, 84%).

It is noteworthy that cost reduction albeit a major driver in the private sector was not even among the top five wants and needs in public-sector INT-IS-IOP projects. Yet, we found ample evidence that e-government, in general, and e-government IOP, in particular, produce numerous and sizable cost savings.

As Fig. 4 reveals, the foremost general purpose pursued in e-government INT-IS-IOP projects is the provision of effective, lean, and agile service to the public. More specifically in that vein, the modernization of administration, effective and efficient infrastructure, and inter- and intra-governmental collaboration are purposes pursued the most.

The overwhelming majority of the projects in the study can be characterized in the following way: The projects were focused on service enhancements (permanent, or recurring, wants and needs) meant to make government more agile, lean, and effective in its service delivery (general purpose) and were specifically concerned with the modernization of the administration based on an effective and efficient information technology infrastructure as well as collaboration (special purposes). In these projects, efficiency and productivity gains through paper reduction and process optimization were frequently found (occasional wants and needs) along with the integration of legacy systems.

When identifying most prevalent wants and needs, which fueled INT-IS-IOP projects, we also looked at the scope of those projects. Elsewhere (Kubicek et al., 2011), we distinguished multi-service, multi-stage, multi-area, and multi-file scopes of interoperability (also referred to as interoperability requirements). A multi-service scope obviously is concerned with the interoperation of multiple services; multi-stage interoperability sets out to interoperate systems through multiple sequential stages of service (during which several separate providers can be involved); multi-area interoperability involves interoperated services from and to various geographical areas; finally multi-file interoperability pertains to services involving multiple directories and files.

Stakeholders’ salient wants and needs are shown in Table 1. The wants and needs of time savings and process speedups, effective data collection and exchange, business process streamlining, and paper reduction were the most frequently found wants and needs in the various scopes of interoperability. The wants and needs of business process streamlining and paper reduction were particularly prevalent in the multi-service and multi-area scopes.

Ad RQ #2: What were the specific limitations and constraints in the INT-IS-IOP project?

In the nineteen case reports, we found quite a few indicators for limitations and constraints, mostly referring to legal or administrative constraints. However, we were missing a richer picture of the nature and specificity of limitations and constraints. As mentioned above, in five of the 19 cases we were able to conduct in-depth follow-up interviews in person or over the telephone. In the following treatment of this research question, we mainly report on the findings derived from these follow-up interviews. Although these five cases confirmed the legal and administrative nature of the limitations, which we had found looking at the case reports, we also came across a number of other limitations and concerns. In one case, budgetary limitations had
In summary, the INT-IS-IOP projects met quite a number of challenges and harsh constraints, whose mitigation were essential for securing the projects’ successes. Legal constraints and resource scarcity, along with unwillingness to sufficiently share authority and responsibility were among the most serious constraints identified. Intensified collaboration and leadership commitment toward a positive project outcome along with the provision of financial and human resources were also critically important for the projects’ successes.

Ad RQ #3: What were the measures of success, if any, and how do they compare across the INT-IS-IOP projects with respect to project outcomes?

When analyzing the case reports for pre-defined measures of project failure or success, we were surprised to find only a few cases, in which such measures had explicitly been specified ex ante. The project management literature, (for example, Celand & Ireland, 2002), has emphasized the importance of project scope definitions and basic metrics, by which the project’s success or failure can be determined. Among those measures one typically finds the meeting of ex-ante budgetary projections, timelines, and client satisfaction scores. In the European public sector, it appears from the 19 case reports, such stringent performance controls are frequently absent. However, the case reports nevertheless provided ample evidence of implicitly used measures of success. Measurable process improvement and faster processing speeds were found in 17 of the 19 cases (89%), cost savings in 15 cases (79%), service quality improvements and service take-up in 14 cases each (74%), and time savings in 12 cases (63%). Process improvement, process speed-ups and cost savings were the top two measures in all four European regions (Central, North, South, and West). In our follow-up interviews (five cases), we found explicit mention that no measures of failure/success had been predefined, which is an interesting footnote this study delivers. In the interviews our findings presented above were confirmed. We also probed for measures of failure, which were reciprocal to the aforementioned measures of success. In one of the five follow-up cases, we found a problematic project outcome of type A (desirable outcome/unsuccessful project). In this particular case, important primary stakeholders were not brought aboard in support of the project. In that particular case the national INT-IS-IOP project and standardization effort were in conflict with standardization efforts on European levels. In other words, the higher-level standardization and INT-IS-IOP needs trumped the national effort. In another case the extent of desired standardization was not accomplished, while in a third case the project goals were “diluted.” On the positive side, in some cases synergies emerged in a way that new initiatives were started benefiting from the positive project outcomes. In other cases, the methodologies were transferred, or the new infrastructures were used in new projects.

Last, we were interested in identifying problematic project outcomes of type B (undesirable outcome/successful project); however, in the follow-up cases as well as in the remaining 14 cases no such type B outcome was detected.

In summary, the measures of project success or failure were mostly not defined ex ante. Process improvements/speed-ups and cost savings

A major constraining effect on the project, which had to do in part with higher priorities given to other projects. Also, the heterogeneity of the technological landscape presented a major challenge and constraint to the unfolding interoperability project. In another case, the participating agencies appeared ill prepared and unready for the interoperability project. Some administrations outright doubted the practicality of the project. In yet another case, the legal constraints were identified and addressed in time, so that provisions could be made to pave the path for the project. As a result, the project became a hub for interagency collaboration and interoperation even beyond the particular INT-IS-IOP project.

Other projects were not so lucky, particularly when data quality suffered due to the constraining effects of legislation, which did not allow for easy information sharing. In that particular case, the scarcity of resources, which were dedicated to mitigating the ensuing data quality problems, further exacerbated the problem. In one case, primary stakeholders’ concerns regarding a perceived loss of autonomy through the INT-IS-IOP project presented a challenge. In another case, the participating agencies interacted with the resource scarcity. Or, the project had become a scapegoat for failing in basic collaboration unrelated to the project.

The project leaders also found ways to mitigate the influence of constraints and limitations. For example, the forming of support teams, intensified collaboration and cooperation, increased investment and political support, and permanent risk assessment were among the frequently mentioned mitigation tactics.

Table 1
Scope of interoperability for select wants and needs.

<table>
<thead>
<tr>
<th>Scope of interoperability</th>
<th>Time savings, speeding up processes, reducing red tape</th>
<th>Effective data collection and exchange</th>
<th>Streamline and simplify business processes</th>
<th>Paper reduction</th>
<th>n (scope)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-service</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Multi-stage</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Multi-area</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Multi-file</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>n (multi)</td>
<td>12</td>
<td>14</td>
<td>14</td>
<td>15</td>
<td>19</td>
</tr>
</tbody>
</table>

were the most frequently cited measure of project success in the sample. Not all projects reached the implicitly expected goals.

Ad RQ #4: Given the three dimensions of INT-IS-IOP (institutional, functionality, and technical/IT service), how do stakeholders’ wants and needs as well as project success/failure measures compare?

As mentioned above, in the institutional perspective political governance principles are studied such as the type of institutional arrangement (for example, permanent or temporary) along with their legal, ordinance, or contractual anchoring, or the rules for public/private partnerships, and also the adoption of and commitment to technical and organizational standards in the respective INT-IS-IOP project.

In terms of the institutional arrangements we found the format of federation, that is, a contract- or law-based, formal, mostly permanent arrangement in all 19 cases. This permanent format appears to match well the permanent needs for interoperability in the cases studied. Still, we were surprised to find no single case of a temporary arrangement, which would have given the participating agencies an opt-out opportunity, had project outcomes not lived up to expectations. However, this result might be owed to the sample of convenience (mostly cases reported successful), which we used.

With regard to the principles of institutional governance, we most frequently found the enactment of legal compliance and stewardship (in 12 of 19 cases, that is, 63%), followed by an orientation toward business needs (as opposed to technology or other needs — in 10 of 19 cases, that is, 53%). Interestingly, central as opposed to decentralized control was found almost equally frequently (in 9 and 10 of 19 cases). Last, in 8 of 19 cases (42%), the governance principles incorporated the rules of peer-based collaboration with other sectors (private and non-governmental).

In summary, from an institutional perspective, permanent/long-term arrangements (federations) appeared to best suit the collaborating government agencies and other partners in their INT-IS-IOP projects. The format of federation seemingly best addressed the needs for legal compliance and orientation toward business needs in the respective projects.

As seen before in the functionality perspective, four layers of interoperability have been distinguished (technical, syntactic, semantic, and business process). We cross-tabulated the most salient effectiveness- and quality-related wants and needs and broke them down per IOP layer (see Table 2). While expectedly the projects in all 19 cases covered the lower two IOP layers (technical and syntactic), the semantic layer was not covered in one project, and the business-process IOP layer was covered in 11 of 19 projects (58%). Elsewhere, it has been shown that the IOP layers form a perfect Guttman hierarchy (scalogram), that is, the presence of a higher IOP layer always indicates the presence of all lower layers in a given case (Guttman, 1944; Kubicek et al., 2011). With regard to the effectiveness- and quality-related wants and needs, the want and need for service enhancement was found in 16 of 19 projects (84%), followed by ease of use and time savings/speed-ups in 12 of 19 projects (63%), information quality (11 cases, 58%), and new services (9 cases, 47%). The adherence to IOP layer standards was found high and very high throughout all four layers (between 69 and 100%) for these particular wants and needs. It is remarkable that the adherence even on the highest layer (business process IOP) was between 69 and 89%. In terms of the measures of success found before, we could clearly identify the drive for service enhancement (speed-ups, process improvements) in the functional IOP areas.

In the technology/IT service perspective, the IT governance principles are studied, under which IT services are provided.

We were a little surprised to find the principle of IT service standardization employed in all 19 projects. However, in 13 of 19 projects (68%), these IT service standards were incorporated via centralization. In 8 projects (42%) clearing services were provided. Open source implementations were only found in three projects (16%) and, hence, were not of particular importance when implementing INT-IS-IOP projects.

In summary, standardization and centralization were found to be the main principles in IT governance of INT-IS-IOP projects in our sample.

6. Discussion

In this paper, we employed a qualitative analysis along the lines of the amended INT-IS-IOP framework. However, with a moderate number of cases (n = 19) we felt that some quantitative representation in the format of descriptive statistics would help better illustrate the findings and add to the interpretation of our results (Table 3). By incorporating descriptive statistics we therefore do not mean to say that the shown quantitative measures suggest any generalizability of our results.

Rather we aimed (from a wants-and-needs perspective) at systematically portraying, identifying, and assessing the main focal areas, the key success (failure) measures as well as important socio-technical processes in government INT-IS-IOP projects. Ultimately, we wanted to see how the wants and needs influenced the course and outcome of the projects. For so doing, the primary stakeholders and their particular needs and wants needed to be determined first. It came as no surprise that the participating agencies themselves were the foremost primary stakeholders in all INT-IS-IOP projects. But also businesses and citizens were found primary stakeholders in more than half of the cases. Furthermore, in each project in this study multiple stakeholders were found primary, and these stakeholders were fairly diverse. Interestingly, the wants and needs in the INT-IS-IOP projects converged toward a few main focal areas nevertheless. As outlined, we distinguished between permanent (recurring), occasional, and ad-hoc wants and needs. Among the permanent wants and needs it came as no surprise, again, that (1) service enhancement, (2) secure and reliable data and transaction processing as well as effective data collection and exchange, and (3) time savings and ease of use and handling were the main wants and needs (and with those the main focal areas) in the vast majority of the studied INT-IS-IOP projects. The primary stakeholders’ occasional wants and needs of paper reduction, streamlining processes, and process integration, and also the prevailing one-time ad-hoc want and need of legacy system integration strongly and logically support the three aforementioned permanent wants and needs. It appears that INT-IS-IOP projects in government are far and foremost focused on service improvements in the wider sense of the three permanent wants and needs and on methods for gaining effectiveness and efficiency in support of those improvements rather than on any direct cost savings (like in the private sector).

Interestingly, the measures employed apparently led to cost reductions, which were substantial at times, while service levels and service quality were increased at the same time.

It is also noteworthy that the general purposes pursued in INT-IS-IOP projects converged toward the same ends of improved services and increased agility as well as leanness in government. The modernization of government in this context was not only an intended outcome of these projects but also a prerequisite for the projects’ success at the same time. While we refrain from re-advancing the argument of technology as a driver of innovation, we nevertheless would like to observe that the INT-IS-IOP projects under study have technically not been possible without today’s technology’s facilitating capacities. On the other hand, it needed human actors, that is, primary stakeholders’ vision, resolve, and action to bring together independent entities and align them behind a common cause and a shared vision for the INT-IS-IOP project. As we found in almost all cases, forging such alliances was the hardest part. Showing early and promising results (“reaping the low-hanging fruits,” as one interviewee put it) helped advance the projects through initial disturbances and droughts. In the unsuccessful cases, it was mainly the lack of a shared vision and primary stakeholder alignment, which caused project underachievement or failure. It is further noteworthy that multi-service, multi-stage, multi-area, and multi-file INT-IS-IOP projects, although they had some range of penetration and coverage, all showed high levels of want-and-need orientation. In other words, the wants-and-needs analysis provided important clues with regard to the potential for primary-stakeholder alignment and the potential for collaboration on INT-IS-IOP projects.

The use of a wants-and-needs-informed perspective also helped to better understand how projects could fare, when facing limiting or constraining effects. Such limitations (or constraints) were found to be of mainly legal/administrative, financial/resource-scarcity-related, technological, or vested-interest-related nature. In many instances, the management of such limitations and constraints worked sufficiently well as long as the constraints/limitations could be handled in isolation. For example, the legal or administrative framework could be adjusted in ways that the INT-IS-IOP project was able to unfold. Or, conversely and undesirable side effects). It appears intuitively clear that if detected, greatly increasing the risk of failure. The absence of success and failure metrics also explains in part that we were unable to identify any problematic outcomes of type B (successful project/negative story) or type C (failed project/positive story). In other words, the higher the complexity of an INT-IS-IOP project (also in terms of diverse stakeholders’ wants and needs) the more experienced and skilled the project leadership needs to be.

As we indicated in the previous section, we were surprised that measures of success (or failure) were rarely defined ex ante. As one interviewee sardonically stated, “Projects in government never fail, no matter what.” In other words, in the public sector an apprehension might exist to openly admit and showcase project failures for several reasons (not least of which those might be politically motivated). As a consequence, the relative performance, even of successful projects, cannot be determined. On the other hand, some projects studied appeared to have made major strides toward remarkable success within relatively short periods of time. So, the absence of publicly (or, even internally) pre-established measures of success in the end camouflages both failures as well as outstanding successes in INT-IS-IOP projects in government. But also the management of the projects might suffer from the absence of clearly defined metrics in that known pitfalls in projects such as scope creep, cost and schedule overruns, and stakeholder disengagement and dissatisfaction can remain undetected, greatly increasing the risk of failure. The absence of success and failure metrics also explains in part that we were unable to identify any problematic outcomes of type B (successful project/negative and undesirable side effects). It appears intuitively clear that if desired outcomes cannot be measured, then undesired outcomes might also be hard to quantify or qualify.

Introducing and adding the institutional, functionality, and technology/IT-service-related perspectives of governance into the analysis helped explain from a wants/needs perspective why government agencies and their partners overwhelmingly chose the arrangement of a law/ordinance or contract-based format of federation. Since long-term and recurring needs were to be addressed, it is only consequential to use a collaborative format that best supports this long-term need, which is a permanent federation rather than any short-term and loose format. Through the functional view it became clear that standardization (at least at the lower two levels of interaction) was an indispensable prerequisite for project success. But also the higher levels were standardized to high degrees. Also, from the functional and IT service views, the stakeholders’ primary wants and needs in the INT-IS-IOP projects were clearly identifiable explaining why standardization and centralization were the main principles enacted in the projects.
In this paper, we also aimed at assessing the utility of the amended INT-IS-IOP research framework as a guide for directing research and practice projects in that area. As shown in the previous sections, the framework helped distinguish, understand, and explain important aspects and interrelationships in government INT-IS-IOP projects. Wants/Needs Theory provided a handle not only for understanding issues of stakeholder management in multi-jurisdictional settings but also helped identify major directions and foci in such projects, which can be used to specify criteria for the measurement of success or failure. The limitations of this study and of the ultimate assessment of the utility of the theoretical lens pertain to the empirical base that we used in this study, which was mainly based on desk research on case reports of successful INT-IS-IOP projects, which were already terminated at the time of this study. However, in the follow-up interviews, we were able to pinpoint critical areas of project evolution with great analytical accuracy when using the amended framework. That gives us reason to expect that the framework might produce even greater explanatory power (and guidance) when used in ongoing case research or in survey research directly targeted at projects in progress.

7. Conclusions and future research

Integration, information sharing, and interoperability (INT-IS-IOP) in government have become major foci of practice and research. Collaborative undertakings of this kind in government are different from those in the private sector, in particular, for their inherently higher degrees of complexity. With higher complexity, however, project risk increases. Much of the complexity of INT-IS-IOP projects in government is rooted in the multi-jurisdictional and non-hierarchical settings, in which these projects are carried out. In order to be successful under these circumstances, government agencies and project leaders need to skillfully manage the stakeholders who can affect or are affected by the project. The contribution and novelty of this study is the recommendation to employ a Wants/Needs-theoretical perspective to INT-IS-IOP projects allowing for the detailed analysis of the major wants and needs, which primary stakeholders pursue in these projects. Employing this perspective helped identify and better explain the courses of action taken as well as the perceived risks and opportunities in those INT-IS-IOP projects. Using the lens of Wants/Needs Theory produced a plethora of detailed insights also in terms of the institutional, functionality, and technology/IT-service (governance) perspectives in these projects, which had not systematically been assessed in the literature before. When looking at the results of this study, we feel encouraged to use the amended framework in the analysis of INT-IS-IOP projects also in future projects. The framework might help also in the planning, organizing, and conducting INT-IS-IOP projects in practice.

Ever changing technical infrastructures are and will keep adding to the challenge of managing and evaluating INT-IS-IOP projects. Looking ahead, e-government researchers have proposed enriching the conceptual basis for analyzing interoperability challenges and designing interoperability frameworks, for example, through distinguishing interoperability of processes, services, applications, and data (Janssen et al., 2011) or inclusion of service composition and discovery, development and management of semantic elements, certification mechanisms, and authentication standards (Lampathaki, Tsikalakis, Stasi, & Charalabidis, 2010). The dissemination of new technologies and services is expected to lead to the revision and new alignment of stakeholders’ wants and needs probably requiring new strategies and alliances. Therefore, in the future, we plan to employ the amended framework in both qualitative case research and, as the number of INT-IS-IOP projects grows, also in quantitative survey research.

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