Can e-Government Adopters Benefit from a Technology-First Approach?  
The Case of Egypt Embarking on Service-Oriented Architecture

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Abstract
It seems common sense that “policy matters” in setting up e-government interoperability, mainly because collaboration should be guided by dedicated integration objectives and implementation rules. However, this is not always the case: this paper focuses on Egypt implementing technology and systems based on service-oriented architecture, largely without the expected organizational readiness regarding the interoperability effort. Does this mean that the current initiative is bound to fail? Or is the Egyptian approach maybe an appropriate strategy for countries which do not want to repeat painful non-interoperability experiences of their developed peers? This case study research seeks to provide evidence to what extent the Egyptian experience indicates a model for e-government adopters how to best develop interoperability. The paper concludes that a technology-first approach indeed can be held accountable for waste of time and resources due to delays in inevitable collaborative organizational learning. But if the latter is impaired for other reasons then choosing and implementing the “right” technology upfront is likely to have a positive impact on streamlining the organizational discourse and on pursuing a consistent e-government interoperability strategy.

1. Introduction
Throughout the last years interoperability has been in the focus of e-government practice and research. The term itself refers primarily to a technical challenge, i.e. the technical capability for e-Government inter-operation. “Interoperation in E-Government 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.” ([19], p. 900)

Governments have started initiatives and launched frameworks addressing the pressing need for interrelating existing administrative information systems in order to provide integrated services for citizens and businesses and to reduce the cost of linking these systems together. Such initiatives and frameworks usually address several levels including technical and organizational issues, acknowledging that interoperability in e-government can only succeed on the basis of stakeholder commitment to inter-organizational collaboration: “An interoperability framework can be defined as a set of standards and guidelines that describes the way in which organizations have agreed, or should agree, to interact with each other.” ([6], p. 5)

The need for G2G information sharing has been articulated long time ago (e.g. [4]). “However, inter-organizational collaboration in spite of its obvious task-specific need, when organized in a non-hierarchical and not market-based fashion as typical in government, has also accumulated a long history of friction, conflict, and failure.” ([19], p. 892) After all, interoperation and information sharing rest on the participants’ capacity for inter-organizational collaboration.

The actual experience of technical and organizational difficulties in e-government collaboration has led to the rationalization of interoperability and has certainly contributed much to the readiness of all actors involved to accept such kind of governance and commit to G2G frameworks or similar instruments. The rationale behind implementing technology solutions for current G2G interoperability can be summarized as a three-step argument:
1. governmental agencies are in need to share information and link their administrative processes in order to fulfill their (common) strategic objectives
2. the existing information systems and the available infrastructure do not sufficiently support such interaction
3. in order to overcome the heterogeneity of systems and content to be shared, the intended collaboration shall be guided by dedicated integration objectives and implementation rules. In retrospect, it seems evident that the origination of e-government interoperability basically follows such kind of top-down approach, and we are inclined to assume that all further dissemination of e-government interoperability and development of corresponding frameworks will 'naturally' take the same path.

Unexpectedly, this is not always the case. This paper focuses on the development of a G2G framework in Egypt, a country which just in recent years has notably achieved much success in e-government [3]. The evidence found can be clearly characterized as a "technology-first" approach: the first step in developing an e-government interoperability approach was to decide on the statewide implementation of a service-oriented architecture (SOA); and only after this has been pursued for several years, a G2G framework is now being developed that shall tune in government agencies to use the available infrastructure for collaboration purposes – note that many of the agencies still have no experience of providing electronic services and thus lack the awareness of interoperability problems from their own perspective.

Such kind of, at first sight, unexpected observation could be attributed to the fact that Egypt (being considered as a developing country) is an e-government "follower", i.e. implementing concepts developed and practiced elsewhere, and therefore a technology adopter. But does the absence of the expected rationalization regarding the interoperability origination mean that the current G2G initiative is bound to fail? Or is the Egyptian approach maybe an appropriate strategy for countries which simply do not want to repeat the painful non-interoperability experience of their developed peers? Between these two options of interpretation we choose the positive path and therefore pose as the main research question: To what extent does the Egyptian experience indicate a model for e-government adopters how to do develop interoperability right from the beginning?

The research method is basically a single case study approach. We trace the development of e-government in Egypt and in particular the steps of decision making regarding the interoperability initiative based on official and/or published documents. Additionally, for three months in 2009, one of the researchers had joined the team at the leading ministry being in charge of the G2G initiative and contributed to the G2G framework under development; throughout this participation in-depth observations and interviews had been conducted and additional material could be obtained. The other researcher remained as observer throughout and served as a second-order interviewer in order to challenge the views of the participating researcher. The evidence of the Egyptian case then is analyzed in view of: what are the motives for this approach? How does the implementation differ from organizationally driven approaches? Is the chosen approach (going to be) successful?

The paper is organized as follows. First we establish the research perspective on the origination of e-government interoperability. Second, we document policies and state-of-the-art of e-government in Egypt and trace the decision-making and ongoing implementation of a service-oriented architecture as the basis for e-government interoperability. Third, we discuss and interpret the evidence found and, finally, conclude and point to future research.

2. E-government interoperability origination

The origination of e-government interoperability has not yet been established as a research topic in itself. However, e-government research has developed a number of research perspectives and has studied cases that allow some insights on how governments manage to increase their “ability to exchange information and mutually to use the information which has been exchanged” (a 1991 definition of interoperability by the European Commission; cited from [9], p. 163). In this section we identify those major challenges in establishing e-government interoperability by which we will analyze our case study below.

The main driver for e-government interoperability is considered to be the need for interorganizational information integration (cf. [13], [18], [19]). The integration processes as such need to be studied from multi-disciplinary perspectives ([18], [20]) because organizational and technical resources and artifacts are framing and are formed by the social processes making use of these. E-government interoperability is an outcome of this dynamic interrelation, in which interoperability frameworks, standards and architecture play a major role. However, all authors concede that interoperability can only be adequately understood in view of higher-level integration concepts such as information and process integration [13] or even from defined maturity levels of organizational interoperability [8].

Establishing interoperability means to set and agree on certain standards facilitating the interoperation. Guijarro [9] examined policy and practice in selecting standards for e-government interoperability frameworks: While open standards are being enforced throughout all frameworks, de facto implementations reveal that more often than not proprietary
technologies and specifications are used. Aiming at comprehensive standardization to support all levels of interoperability, governments increasingly develop so-called enterprise architectures (EA) which can be viewed as a coherent set of principles, methods and models enabling comprehensive use of the IT and other resources for supporting the business objectives.

Developing and implementing EA in e-government comes along with specific challenges such as handling the complexity [12] as well as economic and political factors [10]. Isomäki and Liiimatainen [11] followed up establishing an EA within Finnish state government and identified the challenges from the point of view of the different stakeholders involved. The authors conclude that the main challenges are the implementation ability and governance, followed by legislative and socially rooted boundaries of the government structure, and, last but not least, the lack of a shared infrastructure. The case study shows that architecture development can be a beneficial approach also to providing interoperability, but it needs to be adequately adjusted and enforced as a tool for the development of business operations.

The e-Government interoperability guide provided by the United Nations Development Program also emphasizes EA and recommends that a service-oriented architecture (SOA) “is the best underlying paradigm with which to begin to roll out e-government services that can be used in cross-agency and cross-border situations” ([21], p. 23). The report, supported by IT vendors such as IBM and Oracle, seeks to give advice to e-government adopters, i.e. governments that want to benefit from technological experience of precedents.

The UNDP guidelines conclude also with “policy, not technology, matters”, calling for designing what is needed for and by the public (and not designing based on technology that is available) as well as governments’ strategic framework and the vision of its leaders. However, De’ [5] argues that in developing countries e-government systems are mainly benefitting supply-side stakeholders by enhancing their power base, improving their standing and helping them in their career path; whereas demand-side stakeholders are rarely included in e-government development, records of their motivations cannot be found, and in most cases the benefits of the systems for them remain marginal.

That means in developing countries, which only lately have a chance to advance their e-government systems on a large scale, we are likely to find interoperability driven by a technology-first approach rather than by a requirement-driven approach. The question is: if and/or how such kind of endeavor can be (still) successful?

3. Towards G2G interoperability in Egypt

In this paper we focus on the origination of G2G interoperability of Egypt – a country which already has made remarkable progress in the area of e-government and is ambitious to continue a “fast pace development” [3]. After tracing the highlights of Egypt’s short e-government history we follow up the vendor-driven adoption of SOA and how ongoing G2G efforts seek to make the best out of such technology-first approach.

3.1 E-Government in Egypt

Egypt’s vision of e-government constitutes of three main principles ([16], p. 2): (a) “Citizen centric service delivery” (reflecting the “government intention to develop a one stop shop e-services approach focused at citizen’s needs”, (b) “Community participation” (meaning that ‘citizens' demands are constantly being analyzed and reflected, and private/public sector companies are active participants in project’s implementation and management”), and (c) “Efficient allocation of government resources” (i.e. “productivity, cost reduction, and efficient allocation of resources are among the major expected outcomes from project implementation”).

The leading role in Egypt’s e-government program is held by the Ministry of State for Administrative development (MSAD) after taking it from the Ministry of Communication and Information Technology (MCIT) in 2004. Table 1 highlights important milestones on the development of e-government in Egypt.

The motivations for e-government development in Egypt are manifold. Budget constraints call for reducing administrative costs; political pressure to reduce corruption levels is increasing; red tape has never been more straining; and according to a study by the Suez Canal University (as reported by [14]) the average number of visits to government entities by citizens to complete a certain procedure is 3.5 times.

The “Bawaba” portal (at www.egypt.gov.eg), intended to implement a one-stop shop solution, calls also for appropriate backend solutions enabling data exchange and process integration between the various governmental agencies involved on a vertical and horizontal (intra and inter agency) level. With this interoperability need in mind, and in view of developing and integrating national databases, a project was initiated in 2005 with aim of enabling various agencies to share and exchange information and services, and eventually orchestrating joint administrative processes. This effort was then coined as the development of G2G, with the objectives shifting over time more to enabling ministry interoperation than connecting to “El Bawaba” services.
Table 1. E-government development milestones in Egypt

<table>
<thead>
<tr>
<th>Year</th>
<th>Milestones</th>
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<tbody>
<tr>
<td>1976</td>
<td>Ministry of State for Administrative development (MSAD) was established with the aim of enhancing the efficiency of the administrative system while modernizing public services</td>
</tr>
<tr>
<td>1999</td>
<td>Ministry of Communications and Information Technology (MCIT) was established with the aim of developing and enhancing telecommunication and overall ICT infrastructure in Egypt</td>
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<tr>
<td>2001</td>
<td>E-government development program was initiated by MCIT (program director back then is now minister of MSAD)</td>
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<tr>
<td>2002</td>
<td>The e-government portal “El Bawaba” was launched, aiming at the fast and efficient delivery of information and services to citizens and businesses (see <a href="http://www.egypt.gov.eg">www.egypt.gov.eg</a>)</td>
</tr>
<tr>
<td>2004</td>
<td>MCIT’s e-government program director became the new minister of MSAD and since then the e-government program is MSAD’s responsibility</td>
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<tr>
<td>2004</td>
<td>New strategies and goals for MSAD are set: (1) development and modernization of governmental institutions, (2) development and enhancement of governmental services, (3) development of the resource management systems of the state (including human resources capable of improving administrative efficiency), and (4) development and integration of national databases for improved service delivery to citizens and administrative efficiency (see <a href="http://www.msad.gov.eg/About%20MSAD/Programs/">www.msad.gov.eg/About%20MSAD/Programs/</a>)</td>
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3.2 SOA for G2G in Egypt

After the success of creating an e-government portal MSAD was ready to begin focusing on other sectors of e-government development. In 2005 a multinational IT vendor was requested to share its expertise in addressing the following priorities as specified by MSAD:

- Improve the efficiency of administrative workflows and systems within the government
- Provide the government with improved data about the population for decision making purposes.

According to MSAD and the IT vendor such aims can best be achieved through the integration and the aligning of the various governmental entities and that has indeed become the objective of the new initiative. According to the IT vendor it would be in MSAD’s best interest to adopt SOA technology in order to enable such integration and interoperability.

In September 2005, a “project definition workshop” was conducted under the directive of MSAD’s e-government program director in which seven representatives from the IT vendor met with another seven members of MSAD for in order to “evaluate several government areas within MSAD for suitability to demonstrate the value of a Service Oriented Architecture, and lay the foundation for a broader SOA based IT infrastructure rollout.” With an a priori understanding about the need to align and integrate entities using SOA technology, the IT vendor performed an investigation about the government IT infrastructure existing at the time and in particular the environment in which the Pension Application and Family Card program (applications that enable citizens to request pension pay or family support) integrates with the e-government portal. The investigation assessed the existing IT infrastructure provided by multiple vendors as well as the government’s human capital and business process workflow environment.

The workshop report points out the benefits of SOA for MSAD as follows: “The use of a SOA will enable the integration of common services into the operating infrastructure of both new and existing MSAD business initiatives. The use of common services can help enable the rapid instantiation of new business initiatives, improve the ability to monitor and manage activities across MSAD business initiatives, reduce operating costs and business risk through automation and simplification of business processes, and consolidate specialized IT and business skills. A Services Oriented Architecture will allow common processes to be more easily streamlined across the MSAD business initiatives, while both accommodating unique needs of each initiative as well as an evolution of the supporting infrastructure of each initiative from the existing state to one that capitalizes on the ability to share processes and resources.”

In more detail several issues were pointed out, each providing a rationale for adopting SOA technology and/or being a barrier to be overcome by adopting SOA:

These quotes as well as other material in this section are extracted from a confidential report of the IT vendor delivered to MSAD in October 2005. The researchers were granted access to this and other internal documents; however the name of the IT vendor was requested not to be disclosed.
• absence of an implementation strategy for incorporating services to the e-government portal that have not been developed on that vendor’s architecture
• support for multiple channels of communication that enable citizens to gain access to the government portal through mobiles, kiosks, etc. needs to be customized for every new channel
• administrative processes take a long time for citizen to complete: data often has to be reentered (leading also to inconsistencies), and certain information is required from other administrative units which is not easily accessible
• data critical to the optimization of back-end administrative processes and decision making is difficult to access, inconsistent and disparate across multiple unconnected databases as well as paper sources
• security concerns have been an impediment to sharing data across government programs
• lack of a consistent methodology for development and integration of systems throughout the government
• processes and systems are being defined for a desired future state that have dependencies on concurrent developments that may not complete at the same time

The workshop investigated the readiness of the Egyptian government towards SOA adoption, and also provided a vision as to which direction MSAD should follow in order to begin SOA adoption and operation. The IT vendor proposed a phased SOA adoption road map including implementation of a pilot prototype, establishment of a SOA Center of excellence (COE), and implementation of common business processes (as well as possible exceptions).

Based on the proposed road map a prototype pilot project was initiated late 2005. The pilot aimed to attain the following objectives:

1. Simplification and utilization of SOA technology to improve the efficiency of a selected governmental process: The process adopted for the pilot was the process of registering a new employee for pension at the Social Insurance Organization (SIO).
2. Allowing the governmental entities involved in employee registration at SIO to be able to exchange information required to complete the registration workflow: The three entities to be “integrated” are the Civil State Office (CSO), the Social Insurance Office (SIO) and the Income Tax Authority (ITA).
3. Identification of the technical specifications and the architecture requirements for the Enterprise Service Bus (ESB) as well as establishing a connection between both the ESB and the government portal allowing web services deployed on the ESB to support the portal’s one-stop shop applications.

The prototyping project came to an end in 2007 and was considered to be a great success because (according to a vendor presentation to MSAD in 2006) it contributed to:

- improved process execution time and satisfaction for citizens
- increased productivity of government staff
- reduce number of improperly rejected applications
- automate checks and balances (reduce fraud)
- increased cooperation across authorities
- foster the development of cross-organizational processes and services
- reduce data capture errors
- improve consistency of data across authorities (“single view of the truth”)

MSAD was satisfied with the results of the pilot as it met the ministry’s objectives of creating a loosely coupled architecture that allows the various governmental entities to exchange information and data: (a) full automation of the process of registering an employee for pension subscription at SIO was achieved, (b) connections between the three governmental agencies (CSO, SIO and ITA) had been established, (c) suitable technical specifications and architecture for the ESB hub have been identified, and (d) an infrastructure was created that allows the ESB to connect with the Egyptian government portal (through a virtual private network). However, in spite of the technical readiness, an actual connection of the ESB with the government portal had never been established nor tested during the pilot project. This testing failed because administrative service providers were not willing to have their services accessed by the citizens directly through the portal. However, MSAD was satisfied with just ensuring that on the technical level a connection can be made. Furthermore, the pilot allowed MSAD personnel to overcome the fear of adopting SOA technology as they became more familiar with its concepts and potential benefits as it had led to several improvements and capacity building (as mentioned above).

3.3 G2G Framework Development

The project definition workshop provided a rationale to the causes that should drive MSAD to adopt SOA technology as well as assessing the readiness of MSAD towards adopting such a technology. The prototype then provided reassurance that SOA is the right technology to be deployed as well as creating an architecture that best suits the government’s needs.

These have been the cornerstones by which the ministry was encouraged to pursue implementing a nationwide SOA that enables information integration between all governmental entities and another.
However, it was not until January 2009 that implementation of the actual project began: it was now named “Government to Government G2G Services Bus” aiming to provide a common back-bone layer based on which the governmental entities systems can be integrated. The high-level objectives mentioned for this project are:

- increasing services outreach to all beneficiaries (including government)
- timely and efficient services delivery
- more services productivity, quality, and performance

The IT vendor listed a number of direct and indirect business values which could turn out to be the result if certain prerequisites with an agile technical foundation for the G2G services integration can be achieved, namely data consistency (i.e. each data element will be the responsibility of a specific entity) and processes simplification (suitable for one-stop services).

The process of implementing a nation wide SOA is a process that requires extensive efforts and thus it has been determined that the process of SOA establishment will be segmented to four phases:

**Phase zero.** The first two months were allocated to requirements gathering as the need to make additional adjustments in the exact requirements of the SOA environment were essential in order to further adapt it to an actual working (production) environment. Additional adjustments involved extra security, more enhanced routing, and better service monitoring and life cycle management. The final draft has segmented requirements to three levels of priority (high, medium and low). The main deliverables of phase zero was the provision of completed requirements document that determines the exact specifications of ESB, the specifications that service providers as well as service consumers are expected to comply to, and finally a fully detailed architecture document.

**Phase one.** The focus is on addressing the needs of the governmental entities for the informational services, and selecting the best model for the information sharing for these entities. This phase is considered to be the most critical as it starts with the basic atomic services addressing the core business needs across the governmental entities, and evolves with simple articulations of these services to provide compound services. The main deliverable of a fully functioning ESB is that it will support SOA message transmission in a secure manner based on high priority requirements finalized in phase zero. Priority will be given to installing the necessary components that allow SOA governing, monitoring, management, routing and back up. Furthermore towards the end of phase one it is expected that ten informational atomic web services will be deployed in addition to the establishment of a G2G portal available only for participating governmental entities (and not for citizens). Phase one is expected to reach its objectives by the beginning of 2010.

**Phase two.** The main focus here shall be channeled towards the development of transactional services that enable IS integration by facilitating the possibility of updating data on certain IS.

**Phase three.** This phase is planned to be a consolidation of the services implemented in phase one and two into a complete end to end business processes.

At the time of writing this phase zero is coming to an end as planned where the ESB’s technical specifications and architecture documents have been completed and are awaiting MSAD's approval and signature.

The start of phase one relies on that all necessary software licenses have been obtained (some of which are being reused from the prototype) and all necessary hardware components are ready for set up. The IT vendor proposal lists more than 20 different software products for which licenses and maintenance must be purchased.

Additionally while the technical consultant of MSAD reviews the final draft of the specifications and architecture of the ESB, the business consultant of MSAD prepares a team to handle daily operations concerned with ESB monitoring and security.

Up till phase one the G2G team was composed of nine members with various technical and business backgrounds. Three of the nine were representatives of the IT vendor out of which two contributed to the technical settings of the requirements, as they had a more of a technical background. The remaining vendor representative is the project manager (previously contributed to the G2G development in Dubai). His main role in the project is to coordinate meetings and negotiations, provide business perspective to the setting of requirements and architecture specifications, ensure that everything operates in a timely manner and negotiate any demands and request by MSAD.

The remaining six team members are MSAD employees. Three of them have profound technical backgrounds and contributed to setting out the specifications and the infrastructure, the designing of the various services of the e-government portal. One member is the program manager of SOA development, i.e. to handle all negotiations to take place with the vendor company and with the various governmental agencies that shall participate in SOA, provide feedback to the minister, ensures that the implementation of SOA and ESB takes place according to planned schedule and according to agreed upon quality. The remaining two are actually consultants whom MSAD
has hired as technical consultants with already long-standing experience of working with MSAD.

At the time of writing the G2G team is in need to find five more web services that can be deployed on the ESB hub. To this end the e-government program manager meets up with different service providers in order to analyze what web services may be produced. The five web services to be developed need to be atomic and have a high demand.

In Egypt the G2G initiative nowadays comprises the activities aiming that agencies are capable of coherently working together on the organizational and technical level as well as activities associated with maintenance and use of SOA. As decisions for technology concepts and products have been made early in the process, MSAD and other government entities now proceed to embracing these technologies within a more mature framework of organizational readiness. It has been highlighted by the IT vendor that a SOA center of excellence is crucial to the success, mainly through establishing a SOA governance model, establishing policies and producing methodologies and approaches for performance monitoring. As phase one is about to start this issue is back on the agenda. Policies are under development which can be subsumed under an emerging government interoperability framework. MSAD has actually published an initial document addressing an Enterprise Architecture Framework for the Egyptian Government. However, this document did not unfold any impact yet. In spite of explicit high-level strategy for interoperability development, up to today the approach primarily focuses on technology issues.

4. Case analysis and lessons learnt

The government of Egypt has decided early on to ground its interoperability efforts on the implementation of a service-oriented architecture (SOA). This decision had been strategic in the sense that choosing an adequate concept for the technical infrastructure is expected to facilitate all future e-government interoperability efforts and integration efforts.

Since Egypt can be considered as an e-government technology adopter, we set out to asking to what extent the Egyptian experience may serve as a model for e-government adopters intending to do develop interoperability right from the beginning. As indicated above (see introduction) we analyze the Egyptian case according to the specific characteristics of this implementation, the motives for this approach, and its (potential) success.

Several differences of this implementation compared to an “expected” organizationally driven approach are obvious: the whole G2G team consists only of supply-side stakeholders, the interoperating parties are not included in decision-making, no detailed requirements from the user point of view (citizens, businesses, administrations) are being elucidated, no control of administrative goal achievements has been exerted (only for prototype), a cost-benefit analysis is not in sight, the advice that “policy matters” was not taken into account.

The motivation for such kind of approach may have different roots. First, the e-government program and the top policy makers originally came out of the MCIT which has a successful record of significantly improving the country’s ICT infrastructure in a few years; here the technology-first approach has led to widespread internet connectivity and impressive take-up rates (although no for e-government applications). Second, the ministry’s a priori confidence in a technology-first approach met with the IT vendor interest in seizing business opportunities, thus constantly re-emphasizing the strategy and reassuring each other. Third, the reluctance or even unwillingness of other stakeholders (e.g. other ministries) to seriously engage in cooperation keeps discouraging any effort to solve the organizational issues at stake. Forth, when consensus finding and cooperation remains difficult, establishing facts is a viable approach: once the technical infrastructure is ready it is reasonable to assume that further application development and organizational take-up will become much easier. And finally, the ministry seeks to continue its success story in “fast pace” e-government development: the opportunity to jump ahead shall not be missed even though there might be organizational implementation obstacles.

The success of this endeavor can be assessed from different perspectives. From the objectives stated in 2005 – i.e. providing quality services to citizens, increasing the number of services available to citizens through the e-government portal, improving the efficiency of administrative workflows and systems, providing the government with improved data about the population for decision making purposes (see section 3.2) – none has been accomplished because of SOA implementation. Only the prototype implementation led to an automation of the process of registering an employee for pension subscription, based on successful cooperation between the three participating governmental agencies, resulting in administrative benefits in this particular case – but which could easily have been achieved also without SOA. In spite of the lack of measurable success, the approach also cannot be considered a failure: it is expected that building up interoperability between governmental agencies is an intricate effort which takes years to accomplish, especially between agencies largely inexperienced in e-government provision. Much organizational learning
has been accomplished on the side of MSAD, especially regarding infrastructure management. And even though quick gains obviously have not been accomplished, the ministry is quite persistent in its leading role and still has all the options to reach the set objectives, eventually. However, it seems that the dependence of the SOA implementation success on organizational agreements and commitments has been consistently underestimated; there are indicators now that this dependency will be managed more explicitly and insistently, but it remains to be seen when and how the organizational readiness for interoperability will be mature enough to really enable the payoff from the huge technology investments.

Research on the origination of e-government interoperability (section 2) reveals that providing a shared technical infrastructure is one of the key elements, but the ability govern and implement interoperability on several levels at the same time, while overcoming boundaries rooted in the government structure, is even more a success factor for e-government integration. Our case study confirms that an architecture-based approach to interoperability has a lot of potential, but indeed it needs to be adequately adjusted and enforced as a tool for the development of business operations. There might be good reasons for a developing country to pursue or lean more towards a technology-first approach in setting up e-government interoperability; but especially in case of SOA stakeholders should be well aware of the risks and inhibitors that need to be addressed, and the sooner the better. Building on the insights of the SOA literature (e.g. [1], [2], [6], [17]), we can identify the following lessons learnt from our case study for e-government adopters:

1. Sharing data is the key to e-government interoperability and to the success of integrated services; it is more basic compared to the challenge of enabling and monitoring process flows. Therefore data accuracy and meta models are key enablers which do not come through SOA but their absence is a major inhibitor.

2. Governments seek process support as well as decision support; as far as the latter is concerned not with case-based decisions but political decisions based on the analysis of bulk data, the SOA is not an efficient backbone for providing bulk data; to this end the establishment of data warehouses and other business intelligence solutions should be considered.

3. If the SOA introduction is vendor driven, it still might result in technology lock-in because of the vendor’s specific SOA interpretation and SOA technology components. Vendor related limitations can be detected through comparing solutions and evaluating them on the basis of detailed requirement analysis.

4. SOA is recommended for enterprises with distributed IT infrastructure but which still can build on an integrated management structure. However, governments (ministries, governorates, municipalities etc.) are separate entities – therefore a legal framework is prerequisite which ensures the conditions and sustainability of collaboration.

5. Implementing SOA is a long journey, especially for less IT experienced organizations: if in the beginning the focus is mainly on technology issues, the semantic and organizational issues of G2G will delay the interoperability leading to disadvantages such as: early technology investments do not pay off, the acquired technology might be outdated by the time of productive use, the organizational readiness may never reach the required level.

Summing up, a technology-first approach is certainly not a short-cut for e-government adopters: it can not substitute or speed-up the processes of organizational learning and establishing cooperation; rather it implies the risk of major delays because organizational issue are not addressed in timely and sufficient manner. On the positive side, technology-first enables to some extent establishing facts early on (e.g. prototypes) and frames the discourse of cooperation even before collaborating partners might have set their strategies. In case of SOA for example, other governmental entities are being addressed as service providers and/or service consumers right from the start: it influences their mindset of participation and of conducting their own requirement analysis. And the supply-side stakeholders (in our case: MSAD and the IT vendor) become more committed to a persistent strategy the more resources are actually spent on the selected technology path.

In a nutshell, a technology-first approach can be held accountable for waste of time and resources due to delays in inevitable collaborative organizational learning. But if the latter is impaired for other reasons then choosing and implementing the “right” technology upfront is likely to have a positive impact on streamlining the organizational discourse and on following a consistent e-government interoperability strategy.

5. Conclusion

In this paper we sought to provide evidence to what extent the Egyptian experience indicates a model for e-government adopters how to do develop interoperability. The case is significant because the leading ministry teamed up with a major IT vendor to decide early on implementing SOA-based technology solutions, while at the same time the organizational requirements
remained vague and stakeholders on the demand-side were neither involved nor ready to participate in the interoperability effort. Throughout the last four years the ministry heavily invested in technology products and consultancy, but the return of these investments cannot be measured against the set objectives; in fact it still remains questionable if the approach taken will ever lead to the expected interoperability benefits.

In spite of this rather gloomy résumé at the moment, the case also has a lot to offer. In fact it can be argued that actually Egypt is just on the right path: that because of demand-side stakeholders are lacking e-government experience and therefore cannot contribute to the organizational interoperability from the start, the only rational way to proceed is deciding on and implementing a well-recommended and indisputable technology path (such as SOA) – and involve other stakeholders step-by-step as the technology implementation unfolds.

Obviously, one case study alone cannot add more than some exploratory research to our e-government knowledge and stimulate further insights. Therefore future research should focus more on studying (a) how e-government strategies are being set up in countries that seek to catch up with e-government development, and (b) at which stage and under which circumstances a technology transfer actually contributes to that aim.

By no means has this research intended to advocate a so-called technology-first approach as such. However, we are probably well advised to reset our expectations regarding the rationale driving the origination of e-government interoperability. Variations in e-government histories and track records, combined with specific differences in polity and culture, might lead to the insight that some of our assumed-to-be-reasonable approaches cannot be used as expected in other places – which calls for even further maturing our e-government (research) methodologies.

6. References

government. Government Information Quarterly, 24, pp. 691-715
