Study of Factors Impacting the Successful Establishment of Enterprise Architecture Implementation Capability in Indian Public Sector

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Abstract

In recent years, digitalization has impacted the private and public sectors alike. While the private sector remained focused and organized to deliver more value with less, public organizations across the globe struggled to cope up with expectations of consumers. Over the years, globally, many small to large public and private enterprises have adopted Enterprise Architecture to derive maximum value from the technology investments. On the other hand, the Indian public sector is still coping with inorganic growth in technology platforms and thus resulting in several strategic and operational issues.

The systematic literature review reveals that there are the various inhibitors to the effective implementation of e-Governance programs in India and how the adoption of Enterprise Architecture can help in bringing up the overall effective implementation of such programs and realizes the vision of connected government. Further based on an analysis of recent doctoral dissertations and of key academic publications, it was assessed that Enterprise Architecture itself doesn't create value rather a good Enterprise Architecture implementation enables the value creation and hence these researches point towards having a right team in place.

After a critical review of the previous work examining EA research communities in isolation, most of the key success factors behind the value-driven Enterprise Architecture implementations by several government organizations across the globe, are highlighted. The study further lays down an outcome-based approach to establish Enterprise Architecture implementation capability within Indian public sector organizations. Based on the findings, a successful Enterprise Architecture implementation plan could be created keeping the minimal team structure in place with the right skills.

General Terms: *Enterprise Architecture Implementation Capability, Standardization of the Use of Information Technology in Indian Public Sector*

Keywords: *Enterprise Architecture, EA Implementation Capability, Connected Governments, e-Governance, Information Technology, Business Value, Digitalization, Innovation, Indian Public Sector, IndEA*

1. Introduction

1.1 Enterprise Architecture

The CISR defines Enterprise Architecture (EA) as the management and organizing of business processes to enable IT infrastructure to integrate and standardize the running of the enterprise as operational model. The operational model is a business process integration activities and standard business process creation in order to deliver goods or services from the company to the customer. [1]

Governments around the world are using Information & Communications Technology (ICT) to increase their system of service delivery to boost citizen satisfaction with government and to achieve competitive advantage in attracting investment over other nations. In order to achieve maximum value from the investment in e-Governance programs and associated infrastructure, developing and developed nations both were forced to invest in advanced technologies. As the technology adoption between public and private sectors was not similar, the collaboration between different functions, process restructuring, information sharing, and organization streamlining to embrace the technology were among the major challenges faced by public sector. [2] [3] [4]

As the need for standard frameworks and guidelines to follow the enterprise wide standards utilizing the existing business, technology and data structures, grew, few such frameworks were introduced, adopted and further enhanced. Zachman and Togaf EA frameworks were widely adopted by different enterprises across the globe. [1] [3] [5] [6] Though since the past few years, EA has been used for standardization and for better business to information technology (IT) mapping in both the private and public sectors. However, most organizations still face challenges in implementing the EA, and EA Development is not an easy task. [7] [4]

1.2 E-Governance Challenges

Globally, public sector organizations were lagging behind with having a mandate to deliver digital governance to citizens, businesses and other government peers but also dealing with some of the key challenges with inorganic advancement of technology. Following is a list of some of the key challenges faced by public sector bodies in past two decades, which lead them to adopt the standards and establish the enterprise-wide frameworks for ease of business:

Table 1.

Key Challenges Challenge	Description
Discrete Systems [8] [9]	Each local/regional office started their own procurement and hence ended up creating a farm of discrete systems
Information Sharing	Between the applications from different suppliers, there was no mean to share the data. Their interface didn't follow any standard protocols or formats to exchange information
Data Security [10] [8]	Data authenticity, integrity and security remained in question because local suppliers had the super admin privileges and none of the department user was well ready to transfer the knowledge or systems ownership
Inorganic Growth [11]	Generally local suppliers didn't plan for data/transaction growth and hence local bodies were forced to buy new application systems with new hardware. But again, due to the vendor lock-in issue, data from older systems could not be migrated to new systems and hence both instances of applications kept running
No Reporting [8]	Reporting from the discrete set of applications was another challenge and hence there were multiple reports available and each in different format, raising questions on overall efficiency of any given application or of overall information system landscape
Policy Compliance [12]	Overall technology landscape was disconnected and hence was not in compliance with major national and regional policies and guidelines
Skilled Personnel [12]	Technical trainers were not available and collaboration and learning sources were scarce. In addition to that there was a push-back from the public sector staff to learn technology

Process Compliance [10] [8]	The discreteness of systems resulted into another major challenge that almost no proposed system could completely adhere to the established departmental processes. Every system proposed the process re-definition and amendments and hence diluting the impact of overall service delivery
Cost Optimization [9]	With the growth of IT ecosystem there was a need to optimize the costs and deriving maximum value from the investment, but the overall un-organized local procurements resulted into shadow IT, multiple procurements for the same system and higher cost of systems support from suppliers

2. EA Adoption in Public Sector

2.1 EA Adoption Process

EA framework adoption process consists of three phases [11] [13]. Each of the phase involves different people, roles and skills, as explained below:

2.1.1 Initiation Phase

In this phase key people including the program sponsor establish the objectives, guidelines and policies to introduce the EA framework [11] [13]. They also establish the core team with their roles defined, who will develop and govern the implementation of EA. At this stage all the key government officials from IT, Policy and Standards departments participate in workshops and contribute to the establishment of common goal of establishing EA framework. The initiation document then is shared with principle consulting groups to refine and finalize it, which further is released to other government departments as an anchor to gear up to the EA development and adequate trainings.

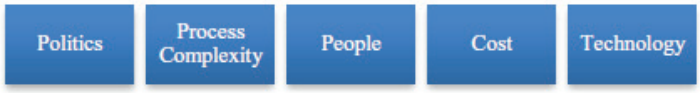
2.1.2 Development Phase

EA development requires key expertise and generally key consulting groups are invited to develop the initial framework with all necessary information and processes. During the EA development phase, series of workshops are held with directors of each departments and business logic about EA is finalized. [11]In early stages of EA introduction, senior stakeholders are provided adequate training and tools to understand and adopt the EA methodology. During this phase a basic standards repository is created, which will evolve with each department/solution.

2.1.3 Implementation Phase

This phase requires EA specific trainings to further down the hierarchy and hence resulting into more learnt audience. People must stay motivated and clearly see the value driven by the particular EA implementation so that more innovation and ideas could be received and hence EA could be further enhanced. [11]

As the governments do not work like private sector [14], there are different factors which impact the EA development and few of them are:



2.2 Global EA Absorption in Public Sector

The following table illustrates the literature review with respect to studying the critical success factors of implementation of EA in respective governments:

Table 2. EA Frameworks Studied

Table 2. EA Frameworks Studied Country	EA Framework	Literature Studied	Ref
USA	US FEAF	4	[15] [16]
Thailand	TIF	1	[15]
UK	xGEA	1	[16]
Germany	SAGA	1	[16]
UAE	Togaf	5	[16] [17] [18] [19] [20]
Korea	GEAF	1	[21]
China	National EA	1	[22]
Netherland	DYA	1	[23]
Sweden	BITA	2	[24] [19]
Malaysia	IGovEA	2	[18] [25]

A detailed systematic literature review highlighted that there were different objectives in mind when different EA frameworks were adopted by these public organizations (as mentioned in the Table 2. These objectives resulted into evolution of government enterprise architectures (GEA) which were specific to the country or department.

In nutshell public sectors in developed countries like USA, Denmark, Finland implemented EA framework as:

- Established national policies for EA adoption
- Secured budget for training, establishment of standards and core committee on board including consultants
- Tightly governed policies so that EA framework development and implementation remains politically unbiased
- Selected key programs to be enrolled in EA framework in initial stages
- Remodeling of established processes using modern process engineering techniques to use LEAN methods
- Business service delivery using digitalization was enforced and value on investments were realized
- Stakeholder collaboration and critical stakeholder's active involvement was ensured

On the other hand, developing countries like India, Philippines, Malaysia etc. were striving hard to become visible on the global e-Governance digitization index.

In India too, during last one-decade state of Andhra Pradesh, Panchayati Raj Program and other entities tried to create a footprint of EA but due to several challenges these programs could not derive the maximum value out of the EA. Government of India (GOI) has been looking forward to improving the e-Governance and other mission mode programs to follow a common set of standards and policies and hence kept working with The Open Group to setup the initial draft of enterprise architecture of India (IndEA).

The overall impact of these initiatives was that GOI introduced similar projects at national level and the overall result was shown the Digital Evolution Index report (2017) by Digital Planet, which shows India as a steady mover towards digitalization. The international e-Government development index based on the survey of United Nations, India stands at 107th position as compared to 125th position in 2012. Similarly index report states the improvement in e-Participation with 27th position in 2016, as compared to 75th position in 2012.

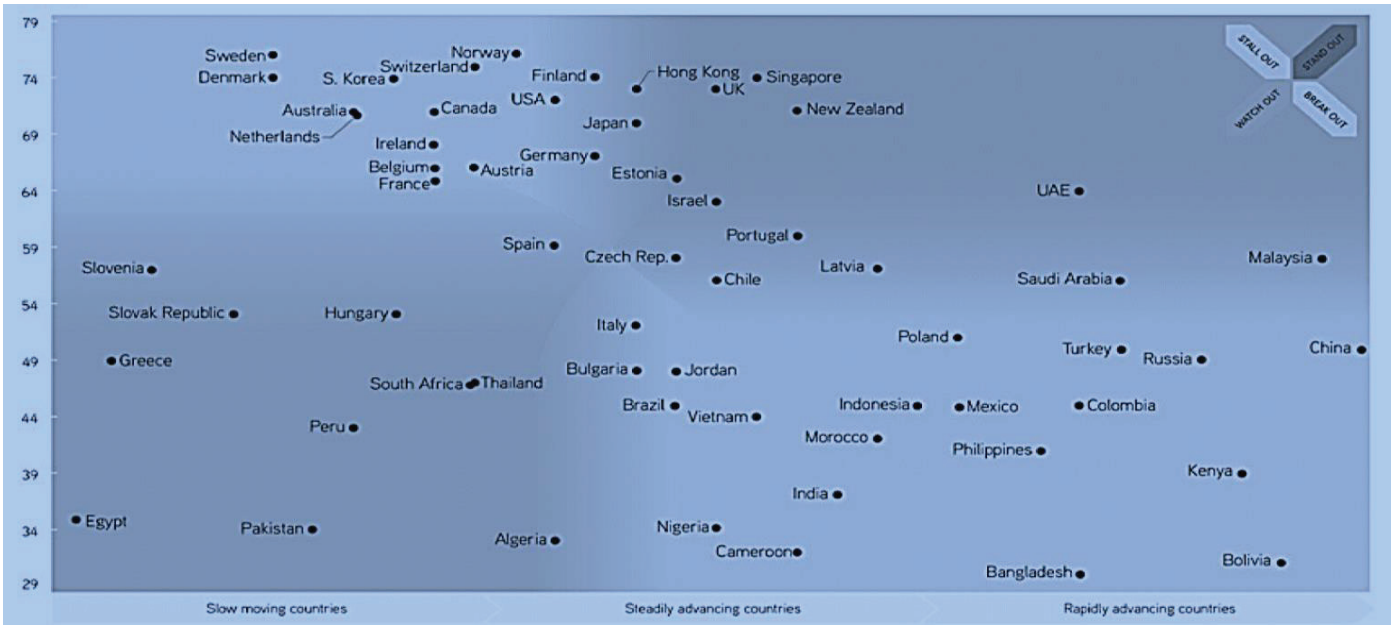


Fig 1: DIE Score Showing India in Steadily Advancing Countries

3. Critical Success Factors

3.1 Indian Public Sector and EA

After detailed analysis of three government departments, following are the findings related to different impact factors about the local processes and service delivery. From the global research papers on EA adoption it is evident that there are certain key factors which play a critical role in understanding the EA in completeness and its value to the whole enterprise. As mentioned by key research reports that EA framework must be developed effectively for its best use.

While authority support provided a solid foundation of EA implementation, adequate budgeting fueled the further absorption of EA within the respective enterprises. Strong governance includes open collaboration and exchange of information without boundaries, and such borderless information flow brings more ideas

to innovate, re-engineer and deliver the services to the customer's satisfaction. Talent management and training for EA were other differentiators which have direct relation with the successful implementation of EA. And as the overall objective of EA implementation revolves around establishing standards for IT reuse, deriving value and increase digital footprint for the services being delivered via G2G, G2C and G2B channels, setting up standards for IT procurement and inter-system data exchange formats and protocols, the overall e-governance is improving during past 3 years, which is pretty evident from the DIE score card for India.

Highcharts.com

EGDI Rank	2016	2014	2012	2010	2008	2005
India	107	118	125	119	113	87

Figure 2 E-Government Development Index

Highcharts.com

EPART Rank	2016	2014	2012	2010	2008	2005
India	27	40	75	58	49	57

Figure 3 E-Participation Index

Following spider chart depicts the emerging trend of readiness among the selected departments. It is pretty much evident that each function is trying to achieve the best with the help of factors stated above. For EA implementation it is important to have the well documented process and a powerful authority who can set EA as a mandate.

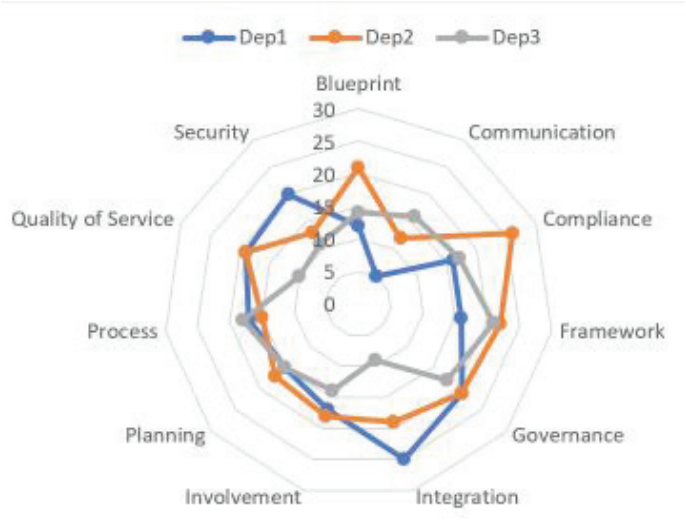


Fig 4: EA Implementation Readiness Factors

3.2 Research Summary

Upon detailed analysis of EA adoption by the public sectors in the countries under study, it can be stated that there are several key success factors for a successful implementation of EA and the associated initiatives, and these factors are different for different objectives and goals.

From the studies it was also revealed that EA is just a framework which points towards the right standards and guidelines, stored in a common repository. EA itself doesn't deliver any value, but a careful planning, strong governance and effective implementation does. Following are the key success factors, which are common for all the public sector units and thus can be observed and enforced to create a framework that actually works for all agencies. [26] [20] [10] [12] [24] [19] [27] [21] [28] [9] [2] [25] [15]

3.2.1.1 Willing Authority

For effective EA implementation top authority should exist with a strong will and adequate funds to invest into the program.

3.2.1.2 Legal & Compliance

Legal and compliance teams along with national standards body are to be involved to provide better guidance and direction for compliance, policy or standards establishment as part of the EA implementation program.

3.2.1.3 Stakeholders Identification and Role

Core committee must pick the key stakeholders very carefully so that business viewpoints could be accessed effectively, and EA agreements could be signed between the different functions. Each stakeholder has to be assigned a pre-defined role and the asks from the role just to bring the utmost clarity in EA planning, development and implementation phases.

3.2.1.4 Collaboration

There must be a well-established medium of information exchange between the stakeholders. Technology should enable this free-flow of information generating more ideas and creating more avenues of innovation.

3.2.1.5 Change Management

Increased awareness of e-government change management, deeper change in emerging IT technologies, and extension of public sector EA applications, all of these need a strong change management and governance.

3.2.1.6 Learning Culture

Culture of learning, comprehensive documentation, adequate training and certification of associated team members will lay down a strong foundation towards better EA implementation.

3.2.1.7 Framework & Tools

To enable the effective collaboration among stakeholders, executive members, sponsors, program-level participants

and activists, it is mandatory to have right framework and tools being made available, customized and standardized. These tools can be forked from the existing standards like EA frameworks from The Open Group (TOGAF) or Zachman, similarly program management frameworks PMP, Prince2 in addition with SABSA and COBIT. Together a neatly knitted fabric of tools, enabling borderless information exchange in same open format will surely follow the guidelines set by the key EA-led initiatives.

4. Conclusion and Way Forward

4.1 Way Forward

The research acts as a foundation stone to further research on the subject and opens the channels of debates and development of better strategies for effective implementation of EA-led e-Governance programs in India. Indian public sector, though is actively engaging citizens, businesses and peer government organizations to come to a single platform and start discussing about expectations and how the gaps could be covered by implementing the new digital technology initiatives which further promotes technology re-use, effective program governance and reporting, stakeholder sentiments feedback, analysis and intelligence on future resource requirements and setting up a standardized digital landscape across public sector, starting with mission mode programs.

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