# E-Government – Integrated Vision and Approach

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*Abstract:* - This paper addresses the paramount importance of addressing the requirements of all departments in the government, other related organizations and individuals 'together' and defines a coordinated 'integrated' approach that is to be considered at national level from the time of inception of E-Government. Examples for the requirement of 'unified' processes are analyzed and a 'unified' process is proposed.

*Key-Words:* E-Government, Integrated Vision, Unified Processes, Interfaces, XML

## 1 Introduction

**in-te-grate** *vt:* to form, coordinate, or blend into a functioning or unified whole [1]

As a country evolves to become an E-Government state – several Information Technology (IT) systems will be built by various organizations, initiated and maintained by different groups of varying IT skills and process direction. While countries such as United States [2], Canada and Singapore [3] have several systems that are transactional in their capabilities deployed on established networks – majority of the countries in the world are comparatively in the BEGINNING STAGE. India defined its E-Government initiative in its 10th Five-Year Plan [4]. In order to avoid hodge-podge of systems over a mish-mash of networks that may end up over a period of time, these countries should have a 'national vision' with a view to build an 'integrated system' that provides a 'singular portal' to the citizen.

This paper discusses how a national initiative can address government process definitions that form the 'framework' for the development of any IT system in the country – all leading to the vision of an 'integrated system' with 'unified' processes across organizations. Examples for the requirement of 'unified' processes are analyzed and a 'unified' process is proposed for one of the key transaction.

## 2 Problem Formulation

Consider the example of a popular 'government process', that every citizen (who earns) in every country is involved with – TAXATION (Personal Income Tax in specific). Multiple organizations, both government and private, are involved in the following activities [5]:

- Initialize tax tables based on current tax laws (keep an archive of previous tax tables to handle older tax return calculations) – (Department of Taxation – DoT has primary responsibility)
- Report the income of a citizen (paying organization is responsible to report salary, capital gain or investment gain and deduct taxes at the source)
- Determine the taxes to be paid based on total estimated income, tax tables, and allowed tax-exempt savings (citizen or the citizen's auditor uses DoT's system)
- Pay taxes in the government treasury (paying organization pays to the treasury based on verified tax calculations and the citizen pays any balance at the year end)
- File tax returns with the Department of Taxation
- Settle the balance of payments (refund or payment with the treasury)

In order to illustrate the functions of a Citizen during the process of 'Personal Income Taxation', consider UML approach [6].

The following use case diagram in Figure 1 presents the role of a Citizen across IT systems (actors/participants) built by all participating organizations, listing the use cases numbered 1 through 8.

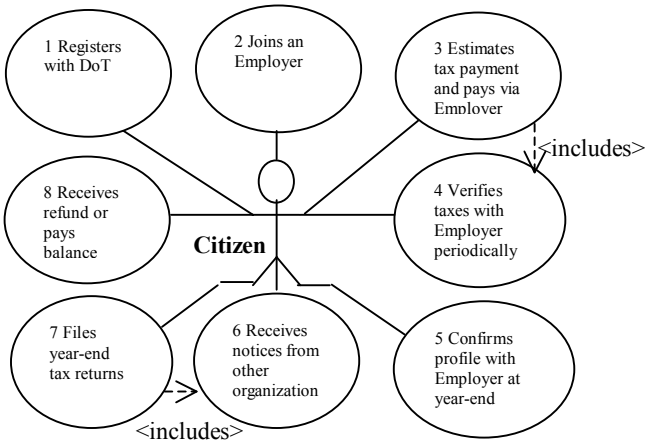


**Figure 1. Use Case Diagram**
**Principal Actor – Citizen (Employee)**

The list of organizations involved in the above set of activities include:

- Department of Taxation (DoT)
- Government Treasury
- Paying organizations
  - Industry, Company, College, Government or other Private Organization who is an Employer
  - Savings or Investment Bank
- Organizations managing tax-exempt scheme
  - Insurance
  - Pension or retirement fund
  - Children's college savings
  - Government savings bonds

Consider that each of the involved organizations become the participants in the 'act' that the 'actor' is part of, and let us look at the sequence diagram in Figure 2 [7].

In this diagram, 'Employee' is a citizen employed by an 'Employer' where the Employee registers with the Department of Taxation (DoT) Registration (Regn) system and pays taxes at a 'Treasury' (government agent to collect taxes on behalf); and files the taxes with a 'DoT System'. Each of the major 'participants' is listed in the vertical boxes and the sequences of actions are shown depicted with the arrows. Sequence of related actions are grouped under ***T1, T2*** to ***T6*** transactions**.**

Each of the participants may implement or use one or more IT systems to accomplish their responsibilities. These systems may be custom built by an IT group managed by a department or as an outsourced project, or buy an off-the-shelf product from a vendor.

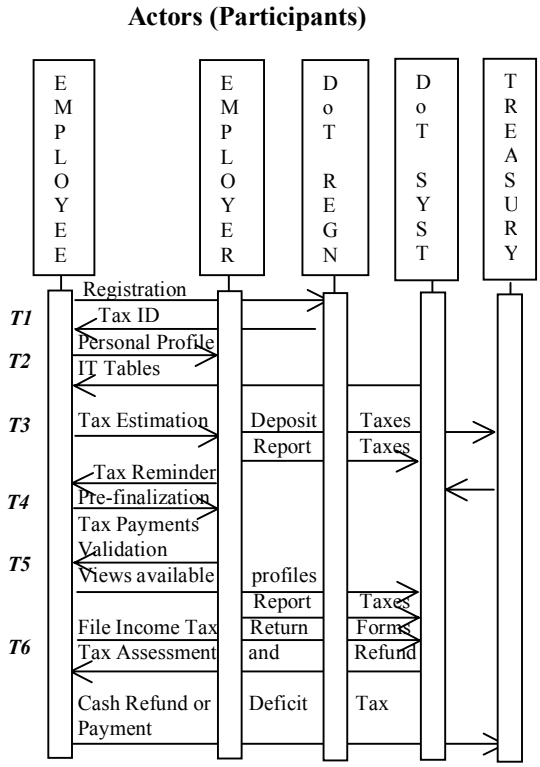


**Figure 2. Sequence Diagram**
**Personal Income Tax Process**

Without proper supervision and over all control, these systems may consist of wide varying technologies and implementations that may result in varying issues and problems as described below.

***Processing logic related issues and problems*** -

- *Lack of coordination across departments.* Consider the case of an employee that has single source of monthly income from one employer, capital gains from a transaction at an investment bank, payment to a tax-exempt scheme and a family position (if applicable) – where the employee files year-end tax returns with the Dept of Taxation (***T6*** from the sequence diagram).

It so happens the Dept of Taxation receives filings from all other participants (employer, investment bank, savings organization) relating the same information. Why is it that the employee needs to fetch all relevant documentation and go through an expensive process of filing to the Dept of Taxation with the help of tax consultants – while the entire information is already available with DoT?

Is it that the current filing process is set up for the purpose of 'cross-verification'? How can this be improved without the involvement of expensive auditing and tax preparation process?

- *Duplicate implementation of common rules* – leads to incompatibility and inconsistency in the process over a period of time. Every IT system that is involved in the process may or may not have resources to maintain timely updates.

***'Data related' issues and problems*** arise due to data inconsistency across different database instances and incompatible database technologies. The problems, in specific, are -

- *Ownership of data* – who creates and maintains the 'data of record'? Is there a defined 'owner' of key data records?

  From the sequence diagram in Figure 2, as part of ***T1*****,** a citizen registers with the DoT to obtain a Tax Id. Is this ID different from a National ID that is implemented in a country (for example, Social Security Number in USA)?

  Who has the latest address of the employee? Who collects it? Who maintains it? Is it the Dept of Taxation? Who is it likely to interact with the employee on a more frequent basis?
- *Data duplication* – if the employee's address is duplicated at each involved IT system, changes may not be updated across all systems in a timely manner. Many times, changes may not be applied at all. This typically leads to inconsistency of the databases, further leading to incorrect application of rules and procedures.

***User interface related issues*** – access technology (desktop or wireless), inconsistent user interface, supporting different state languages.

***Connectivity issues*** – network interoperability, manageability and reliability issues because of bandwidth or involved vendor technology.

***Management related issues*** – supporting different technologies and implementations may require support facilities and people with different skill sets.

This paper discusses a possible solution to address 'process-related problems' and 'data-related problems' described above. The problems are addressed at an objective level in Section 3 ('Integrated Vision') and at systems design level in Section 4 on 'Integrated Approach'.

# 3 Integrated Vision

In order to address data and process related problems, across different organizations in a country, the issues should be addressed at the national level.

A national level ministry for Information and Technology, MIT, should approach the development of all E-Government IT systems with a clear mandate and strict guidance – at a broad level and also in specific.

A unified vision should be defined that should cover the following objectives (addressing the problems at hand):

- A *unified 'boundary-less' process* should be developed for each major Citizen transaction across the nation.
- Processes and services should be defined with respect to the user-in-perspective, citizen (or a business) – and not based on current departments and organizational boundaries.

  New processes should not reflect current 'systems-in-use' which are developed over years using paper trails, approvals and counter approvals of bureaucracy and choked information flow between departments.

  New government processes should be defined that understand the new IT systems in development, the new data models and application services, network architecture and user interface, and take complete advantage to offer advanced Citizen services.

- Participate in international standards committees and working groups that affect 'interface' related development. XML and UN/EDIFACT standards for example. Following interface standards helps the country to be competitive as the world becomes more 'inter-connected' into a 'global economy'.

Stakeholders from each involved division are to be gathered to guide the definition of unified processes and implementation. Similar objectives are to be defined to handle user interface, connectivity and management issues, which are not discussed within the scope of this paper.

### 3.1 Unified Development vs. Application Integration

The subject of Enterprise Application Integration (EAI) is a large field in the commercial IT systems. Several tools and packages, off-the-shelf or custom built, attempt to address the constant requirement for 'existing' IT systems to 'interface' with each other using application or technology adapters.

The difference with E-Government initiatives in most countries is that – there are 'no existing' systems, built with legacy technologies, to interface with. At the current moment, E-Government initiatives require a 'unified' systems development process and government process development. This development approach is defined in further detail below with examples.

## 4 Integrated Approach

Based on the 'Integrated Vision', here is a proposed implementation to address some of the key problems defined earlier.

- Define *'unified' processes* for different transactions within Personal Income Tax.

  Take the example transaction described in the previous section – 'filing year-end personal income taxes with the Dept of Taxation' (***T6*** from the sequence diagram).

  The Dept of Taxation receives filings from participants (employer, investment bank and savings organization) relating to the earnings, capital gains and tax savings of an Employee. If some of these filings are not yet electronic, they should be. This inter-connectivity should take into consideration the following:

  - Standards based exchange - using predefined data formats based on standards work done by XML [8], UN/EDIFACT and others
  - Abstract interfaces – that do not change frequently with changes in implementation
  - Support distributed transactions across systems
  - Bi-directional transfers – allow for information transfer or transactions initiated from both IT systems involved
  - Real time communication – enable access to most current information and processes in other systems (for smaller packets of data)
  - Off-line transfer of data files – for the purposes of integration, local caching, or verification

  Given that the Dept of Taxation is the focal point of this transaction, it is best suited to implement the 'framework' for this 'unified' process. This framework is designed around the different 'taxable' events (salary from the employer, capital gains) and 'tax deductible' events (savings) that an Employee is involved with.

  Instead of having to wait till year-end, an Employee can visit the Dept of Taxation system, via a Citizen 'portal' ('unified' user interface), any time to review the 'filings' from related organizations. This facility enables the employee to be up-to-date about the tax implications of his financial health.

  Or the Dept of Taxation may prepare the tax returns for the employee at the year-end, since it has all of the relevant information. All that the employee may have to do is to – verify and confirm the final results.

  As new tax laws are announced by the government and new tax-saving schemes released by savings banks, the Dept of Taxation updates the tax tables and can 'personalize' the applicability of the new information to an Employee. The Employee can log on to the DoT system and immediately explore new scenarios to be aware of the implications or take advantage. Even though employers are required to notify their employees of new tax laws,

every employee does not need to become a taxation expert in interpreting the changes.

The DoT system should 'integrate' or 'include' information filed by an employee from the previous years. For example, if an employee bought a tax-savings bond in year 2000, with 10 years maturity, and recorded the transaction in 2000 tax returns – the DoT system should include it for all future tax filings (until there is a change). With the new unified process the employee will not be required to include any previous savings transactions in later tax filings.

As part of the unified process implementation, the Employee should be able to 'connect' to participating organizations, 'directly' from the DoT system.

- *Common processing logic* should be identified within the 'unified process', assigned to the best suitable IT system (division) and defined as 'services' available for access from other applications.

  For example, for the transactions defined earlier in the sequence diagram, multiple participants (employee, employer, auditor and the DoT) are required to calculate the taxes owed by an employee. The tax laws are public information and can change with each yearly budget or other special amendments.

  'Calculation of estimated taxes for an employee' is a well-identified common function that is best suitable for the Dept of Taxation to implement and offer the implementation as a 'service' to other systems.

  The DoT System can publish a set of services (implemented using upcoming technologies such as Web Services) for citizens and other organizations.
- Key data elements should be defined across the 'unified process' and coded as 'objects'. Owners should be defined for each of the object based on the primary responsibility of the departments. Public and private interfaces should be defined for the common objects.

  Physical location of storage of the objects can be determined based on the technical architecture of the owner IT system and interfacing systems.
- Interfaces should be defined for each system to facilitate horizontal integration across organizations so that – key processing logic and data elements are accessible only from the respective 'owners' to any requesting system under proper privileges and security policies.

# 5 Conclusion

In this paper a common process used by most citizens, Personal Income Tax is considered; roles of different involved organizations are reviewed; and significant problems with the data and processing logic with different IT systems are analyzed.

With the help of national level commitment and mandate, an Integrated Vision is proposed that includes defining *'unified' boundary-less processes* – virtual processes that cross over organizational boundaries. A unified development approach is also discussed that handles the mentioned process and data problems along with examples.

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