

ANALYZING THE GROWTH OF E-GOVERNANCE WITH MATURITY MODEL PERSPECTIVE: A CASE OF GOVERNMENT TREASURIES IN INDIA

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Abstract - The revolutionary development in information & communication technology has brought a new paradigm shift in public administration which popularly termed as “electronic government/ e-governance”. India adopted this paradigm shift in order to bring transformation in the governmental functions and delivery of services. Treasuries are the basic fiscal units of the Government in India (at both Federal and State Governments). In this paper, the growth of e-governance in the financial treasuries of Government of West Bengal (i.e. computerization of treasuries) are examined with various e-government growth/ maturity models and attempt being made to identify the points of convergence among them. Nolan model and Layne & Lee model are incorporated which relates to the growth of information technology and e- governance. The study brings into light that these models of growth converge at various points. The study also brings out that technology life cycle is an important factor in predicting growth. It throws up issues for research on what factors other than technology could be factors of growth.

Index Terms - e-Governance, e-Government Growth/ Maturity Model, Nolan Model, Layne & Lee Model, Treasury, Computerization of Treasury, Government of West Bengal.

1. INTRODUCTION

Treasuries are the basic fiscal units of the Government in India. In India, two separate classes of accounts - Government of India and individual State Governments are maintained for receipts and payments of funds. The funds are maintained in their respective Consolidated Funds. All the receipts and payments into the Consolidated Fund of the Union and the State are made by the treasury. The respective Consolidated Funds comprise of taxes and duties collected by the respective government, contribution of taxes and duties collected by the other governments, interest, unspent balances of the previous years and any loan raised by the government by issue of treasury bills or money received as a repayment of loans.

The funds of the Consolidated Fund of the Union or the State can only be spent if they have been approved as part of the Budget. In the Budget, every department is allotted funds which are sub-divided and re-allotted by the respective departments to the Drawing & Disbursing Officers (DDO). The DDO are based in the various districts and the State headquarters of the Government. They are the only authorized officials to draw funds from the treasuries as per the sanction order of the Government. The functions of the treasury could be summarized into the following broad categories:

- i) **Payment of bills:** The DDO submits claims which are then scrutinized as per the Treasury Code, Financial Code and relevant rules. Issue of cheque after successful scrutiny.
- ii) **Receipts:** Entry of the credit scrolls received from link banks against challans. Refund of the deposited

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revenue as per the advice issued by the competent authority.

- iii) **Accounts Preparation:** Preparation of Receipts and Payment Accounts with the details of the Head of Accounts. Submission of accounts to the Accountant General (AG) of the State. Issue of monthly list of receipts and payments to all the DDO of the concerned department.
- iv) **Pension Generation/Pension Payment:** Preparation of pension, gratuity and commutation payment order, payment of pension, revision of pension cases.
- v) **Deposits:** Maintenance of personal deposits, civil deposits, education deposits and revenue deposits. Issue of Treasury cheque against cheque received from deposit holders, maintaining strong room, issue of stamps, maintenance of bills, Token books & cheque book.

2. EVOLUTION OF e- GOVERNANCE IN TREASURIES OF INDIA – THE POLICY INITIATIVES

The policy initiatives for e-governance in the treasuries started with the recommendations of the Finance Commissions of India. The process started with the “Upgradation of Standards of Administration” under the Sixth Finance Commission (1974-79). For the upgradation of the Fiscal Services and Treasury & Accounts, the Seventh Finance Commission (1979-84) recommended for capital expenditure through grants-in-aid under Article 275 of the Constitution of India amounting to Rs 5.86 crores (0.59 million) to the States of Himachal Pradesh, Madhya Pradesh, Bihar, Rajasthan, Tripura and Uttar Pradesh. The Eighth Finance Commission (1984-89) entailed an outlay of Rs 208.18 crores (2.08 billion) for the establishment of additional sub-treasuries, structural additions & infrastructure developments and staff trainings. The Ninth Finance Commission (1989-95) recommended Rs 140.07 crores (1.4 billion) for the upgradation of the treasuries and accounts administration. The explicit grant for computerization and automation of treasuries in various states was made by the Tenth Finance

Commission (1995-2000) and the Commission observed that:

“The computerization of district treasuries would go a long way in improving the managerial control of both the State and district level administration. It would also make for speedy and accurate generation of accounting information that might be needed for purposes of better planning, budgeting and monitoring”.

Tenth Finance Commission (1995-2000) assessed a requirement of Rs 23.10 crores (0.23 billion) at an average unit cost of Rs 10 lakhs (1 million) per treasury. The Eleventh Finance Commission (2000-2005) provided an amount of Rs 200 crores (2 billion) for computerization of the treasuries in 25 States of India. The amount needed to be utilized for procurement of computers, installation of hardware and software and related training activities.

3. COMPUTERIZATION OF TREASURIES IN WEST BENGAL

West Bengal, which is situated on the eastern part of India, is one of the important federal units out of the total 28 States (federal units) of the country. The total area of the State is 88,752 Sq Km with a total population of 91.35 million as per the Census of India, 2011. West Bengal is the fourth most populous State of India and also the most densely populated as well. In fact, West Bengal is the seventh most populous sub-national entity in the world. Kolkata (formerly Calcutta) the Capital city of West Bengal is known world-over for its rich cultural heritage and commercial value, remained the capital of British India for more than 150 years.

The State is administratively divided into 19 districts (Districts are the local administrative units). There are total 87 treasuries and pay & accounts offices under the administrative control of the Directorate of Treasuries & Accounts (DTA), Department of Finance, Government of West Bengal, located at Kolkata and established in 1972.

The e-governance program in the treasuries of West Bengal was launched in the year 1993 with the decision to computerize the treasury function in phase- wise manner. The first pilot project

was taken up at Howrah district treasury on 1995-96, in which the operating system used was 'UNIX' while the Relational Database Management System (RDMS) used was 'Oracle' with 'Developer 2000' as the Front- end tool. The application package and the database were stored in a server and the operation was carried through 'Video Display Terminals'. This system was named as 'Host- based System'. In the year 1999-2000, 'Host- based System' was replaced by 'Client- based System'. In Client-based System, Database was stored in the Server and the 'Application Package' was stored in the desktop. In 2004-2005, the system was again upgraded to Browser-based technology under the 'Thin Client System'. The System was being upgraded to 'Linux' Operating System, Oracle 10G RDBMS, 10 G Application Servers and line-printers under 'Browser-based Thin Client'.

As these treasuries are geographically distributed, therefore after 2004, initiatives were taken in the direction to inter-connect all the treasuries with West Bengal State Wide Area Network (WBSWAN). After 2005, the e-governance initiatives in treasuries had a shift towards the establishment of web-presence and vertical & horizontal integration. This move was started under the auspicious of the National e-Governance Plan (NeGP), Government of India where computerization of treasuries are brought under the State Mission Mode Project (SMMP). E-Treasury was established at DTA, Kolkata for collection of taxes under Directorate of Commercial Tax, Government of West Bengal and the duties of the State Excise through net banking system. Electronic format of collection of data from treasuries to the Central Server and transmission of that data to Accountant General (A&E), West Bengal was also started. e-Scroll was implemented in ten treasuries. Vertical and horizontal integration is the stage of

development in the form of Integrated Financial Management Information System (IFMIS).

The treasuries in different States of India had their own growth path. The present study examines the implementation of computerization in the treasuries of West Bengal and maps its progress on the various e-governance growth models. The following paragraphs examine the various growth models and the existing literature.

4. LITERATURE REVIEW

The terms 'maturity' and 'immaturity' are often used to characterize the state of a given level in a continuous process. In the information systems (IS) field, the term maturity is also familiar, for instance in the context of the "Stages of Growth Model". The Stages of Growth model illustrates the organizational stage in the development process where the organizational usage of IT is measured (Anderson and Henriksen, 2006). The stages of growth modeling is not new (Anthony 1965 and Churchill et al. 1969), the approach was first popularized in the information systems field by Nolan in the 1970's and 1980's. Nolan's model evolved in each of these papers (1973; Gibson and Nolan 1974; 1979) (de Bri, 2009).

Nolan (1973) in his four stage model identified four distinct stages in the growth of information technology. It was found that EDP budget for a number of companies, when plotted over time from initial investment to mature operation, follow an S- shaped curve. The turning of this curve corresponds to the main events – often crises- in the life of EDP function that signal important shifts in the way the computer resource is used and managed. In the S-curve there were three such turnings and four such stages (Figure 1). The four stages defined by Nolan were Initiation, Expansion, Formalization and Maturity.

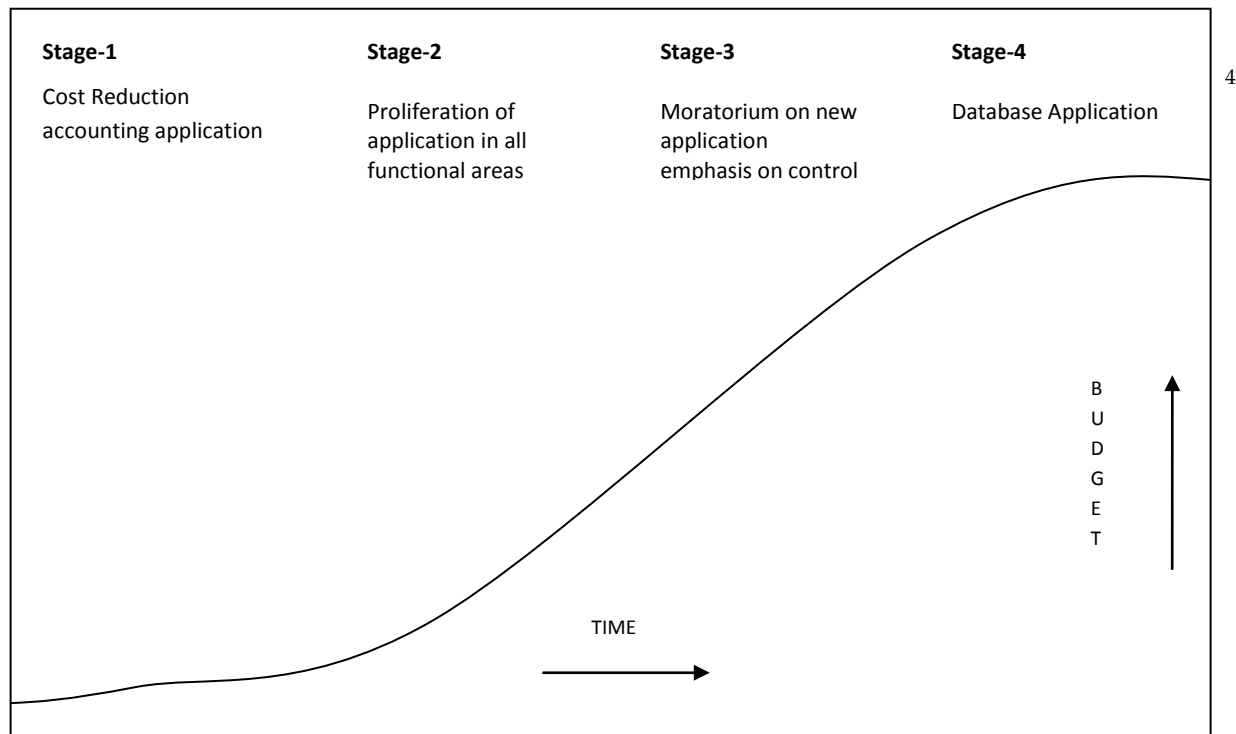


Figure 1: Four stages of application growth (Adapted from Nolan & Gibson, 2000)

These stages are associated with a distinctive informal organization process. In order for an EDP system to move from one stage to another, many of the issues related to the stages need to be resolved. The Nolan model identified the underlying forces at work these stages (Nolan and Gibson, 1974). At the end of the S-curve there would be more S-curve as new EDP technology emerges and there is more specialization in system analysis.

A year after documenting this four stage model, Nolan, in concert with Gibson (2000), offered an updated version (Gibson and Nolan, 1974). The major modification was that consideration was given to three factors that seemingly affected information systems management, these being the information systems applications portfolio, the level of specialization of the computer professionals, and the management methods applied at each stage. A secondary modification was that the stage names had been renamed as Initiation, Expansion, Formalization and Maturity levels. For the first time, there was a hint that if an organization was able to establish its position within the model, future systems management problems could be anticipated and to a certain extent mitigated. The management techniques

appropriate to each stage is clearly delineated in this work, with the expectation that progression to the next stage would eventuate if these techniques are properly executed. The assumption of predictability inferred within the model is reinforced by the interpretation of other authors (Dearden and Nolan, 1973; McFarlan, 1973).

Nolan (1979) revisited his original work and modified it into six stage model. According to Nolan, the original four-stage model was still valid, but that further research had enriched his understanding so the new model was to be seen as superseding the old one. The six stage model is named as Initiation, Contagion, Control, Integration, Data Administration and Maturity. Characteristics of each stage that alter their attributes include the applications portfolio, data processing departmental organization, data processing planning and control and user awareness. Subsequently, John Rockart's Critical Success Factor Model (Rockert, 1979), Warren McFarlan, James Mckenny and Phillip Pyburn's Strategic Grid (McFarlan et al. 1983), Gibson and Mike Hammer's Benefit/Beneficiary Matrix (Gibson and Hammer, 1985), a model later revised by Gibson and Barbara Jackson (Gibson and Jackson, 1987) were some

of the models that evolved after the Nolan Model.

The stages of growth of information systems management model could be an appropriate means for managing e-governance initiatives and that such models had been considered appropriate for previous technological interventions, such as when end-user computing arrived (Huff et al. 1988), and again, when enterprise resource planning systems became available (Holland and Light, 2001). There have been models of growth specifically for e-government (Layne and Lee, 2001 and others). The growth of e-governance goes much beyond the growth of EDP systems or Information

Technology Systems. Many models have tried to map the growth of Information Technology, the difference being the perspective in which these models were developed. The growth of e-governance systems have been quite different from the way Information Technology has grown in the private sector. The factors guiding business operations are being quite different from the factors that guide e-governance systems. e- Governance has elements of bureaucracy, politics, citizen and a non-profit motive, which makes it different from the private sector. The summary of the e-government development or growth or maturity models are presented in Table 1.

Table 1: Summary of Growth/ Maturity Models of Information Technology/e- Governance

SR No.	Name of the Model/Year/ Area	Stages
1.	Four Stage Model (Richard L Nolan), 1974 Area: General IT	Initiation, Expansion, Formalization, Maturity
2.	Six Stage Model (Richard L Nolan), 1979 Area: General IT	Initiation, Contagion, Control, Integration, Data Administration, Maturity
3.	3x3 Matrix Model (Gibson & Hammer), 1985 Area: General IT	Task Mechanization, Process automation, Boundary Extension, Work Improvement, Functional Enhancement, Service Enhancement, Role Expansion, Functional Redefinition, Product Innovation
4.	Four Stage Model (Gartner Group), 2000 Area: Government	Presence, Interaction, Transaction, Transformation
5.	Four Stage Model (Darral West), 2000 Area: Government	Billboard, Partial Service Delivery, Full-integrated Service Delivery, Interactive Democracy with Public Outreach and Accountability
6.	Five Stage Model (Hiller & Blanger), 2001 Area: Government	Information Dissemination, Two-way Communication, Service & Financial Transaction, Vertical & Horizontal Integration, Political Participation
7.	Three Stage Model (M Howard), 2001 Area: Government	Publishing, Interacting, Transacting
8.	Six Stage Model (Deloitte), 2001 Area: Government	Information Publishing, "Official" two-way Transaction, Multi-purpose Portals, Portal Personalization, Clustering of Common Services, Full Integration and Enterprise Transaction
9.	Five Stage Model (UN/ASP), 2001 Area: Government	Emerging, Enhanced, Interactive, Transactional, Seamless or Fully Integrated

10.	Four Stage Model (Layne & Lee), 2001 Area: Government	Cataloguing, Transaction, Vertical Integration, Horizontal Integration
11.	Five Stage Model (M J Moon), 2002 Area: Government	Simple Information, Two-way Communication, Services and Financial Transactions, Vertical & Horizontal Integration, Political Participation
12.	Four Stage Model (Chandler & Emanuel), 2002 Area: Government	Information, Interaction, Transaction, Integration
13.	Three Stage Model (World Bank), 2003 Area: Government	Publish, Interact, Transact
14.	Four Stage Model (IBM), 2003 Area: Government	Automate, Enhance, Integrate, On-demand
15.	Six Stage Model (Asia Pacific), 2004 Area: Government	Setting up an E-mail System & Internal Network, Enabling Inter-organizational and Public Access to Information, Allowing two-way Communication, Allowing Exchange of Value, Digital Democracy, Joined-up Government
16.	Two Stage Model (Christopher G Reddick), 2004 Area: Government	Cataloguing, Transactions
17.	Public Sector Process Re-building Model (Anderson & Henriksen), 2006 Area: Public Sector	Cultivation, Extension, Maturity, Revolution

The e-government maturity models are widely used in different aspects of studies and research relating to the e-government strategy formulation, development, implementation, assessment and analysis. More advanced and empirically established models forming the base of the e-government maturity models, fitting most suitably to the local administrative and governmental situations also conceptualized. Maturity models are also incorporated to study the effects of the implementation of the innovative technologies in the government organizations.

Nasr et al. (2012) conceptualized “Before Cloud E- Government Model” (BCE governmental model) after systematically studying the e-government maturity models/ growth models. The model conceptualized is a five stage model with the objective to help the transition of the e-government to cloud computing. According to the authors, the

untrained manpower and lack of infrastructure is the greatest challenge for the development of e-governance. The solution is the viable transition to the cloud computing. Al- Khatib (2009) developed an e-government maturity model for analyzing the citizen’s perspective of e-governance because the existing maturity models in the literature mainly reflect the technical perspective.

eGovernment Maturity Model (eGov –MM) was developed by Valdes et al. (2005) after analyzing all the e-government growth/ maturity models and integrated the assessment of technological, organizational, operational and human capital capabilities, under a multi-dimensional, holistic and evolutionary approach. The model than applied to 30 public agencies in Chile and its implementation generated several recommendations for policy makers at the national and agency level. de Bri (2009) described stages of growth model for e-

government. The proposed model comprised of seven stages, which are divided into three phases. The model is based on research into and analysis of Information Systems and Information Communications Technology (ICT) solutions in the Irish Revenue Offices. It is argued by the author that this model provides a useful template for understanding the growth of ICT in government organizations. Nawaz and Hyder (2008) proposed a four stage model based on the e-government maturity/ growth models to evaluate the maturity of e-governance services in Pakistan. Shahkoo and Abdollahi (2008) with qualitative meta-synthesis approach compared nine e-government maturity models and synthesize them. Then, the authors proposed a five stage model: online presence, interaction, transaction, transformation and digital democracy.

The e-government maturity models are also extensively used to study the implementation of the e-governance initiatives in the public sector and government organizations. Reinwald and Kraemmergaard (2010) studied the e-governance maturity as a case study in a Danish local government (municipalities). According to the e-governance maturity literature, public organizations will move through different stages of maturity implying that the more mature e-government the better. The authors with the help of e-government maturity models analyzed the stage of transformational e-governance. In municipalities of Bosnia and Herzegovina, Cosic and Medic (2009) incorporated the overview of few e-government maturity models on the local government level and conceptualized their own model. They conducted the study on 131 municipalities and the results showed that the maximum number of web portals of municipalities is at the lowest stage of development. Similar e-governance maturity at local government (municipalities) in Spain was studied by Claver-Cortes et al. (2006) through a quantitative survey addressed to the Chief Technology Managers (CTO) of the Spanish municipalities that have adopted an official web page to communicate with their citizens. The results show that the Spanish Councils (municipalities) still remain at the most basic levels of e-governance maturity. Waal van der

and Vloeimans (2005) studied the effects of implementation of technology on the organizations. They analyzed the impact of introduction of innovative technologies in the Dutch local governments (municipalities) with the help of e-government maturity models. The study highlighted the effect of e-governance on the organizations which is helpful for policy makers and administrators.

Eyas El- Qawasmeh (2011) analyzed the websites of the ministries of the Jordanian Government by engaging the e-government maturity models of Howard (2001), Chandler and Emanuels (2002), Layne and Lee (2001) and Deloitte and Touche (2001). The author then suggested an evaluation technique to investigate the quality and sophistication of the websites of ministries. Similar type of analysis is also conducted by Dokhtesmati et al. (2011) of the websites of the ministries of the Middle Eastern countries. 79 websites were investigated with the help of the indicators of e-government maturity model introduced by Layne and Lee (2001). The authors found that Saudi Arabia, Bahrain and UAE have the first ranks of achieving e-governance, while Armenia, Iran and Iraq ranked the last.

Al- Mushayt et al. (2009) analyzed the development of e-governance in Saudi Arabia with the framework of e-government maturity models, specially focusing on Deloitte's six-stage model, Layne & Lee four stage model and Accenture five stage models.

The e-government maturity/ growth models also went through critical evaluation. Jungwoo Lee (2010) found that since the year 2000, a number of e-government stage models have been suggested by international organizations, consulting firms and individual researchers. These models seemed to be incongruent with each other as these are based on different perspectives and use somewhat different metaphors. This presents a difficulty not only in understanding different research results, but also in planning future actions for e-governance.

With respect to treasuries and its automation in Indian perspective, there are only case studies

describing the computerization process and application development which have been reported in literature so far. Table 2 provides

details of the case studies being carried out with respect to automation of treasuries in different states of India.

Table 2: Case Studies on automation of treasuries in different States of India

SR No.	Author & Year	Description
1.	Paikara et al 2006	Functional aspect of Directorate of Treasury Accounts and e- Kosh (Computerized Treasury Application) of Chattisgarh, India.
2.	Govt. of Karnataka 2006	Detailed description of the Khajane (Computerized Treasury Application) of the Government of Karnataka.
3.	Raghunathan and Nisarudeen 2006	Case study of Treasury Information Management (Computerized Treasury Application) of the Government of Kerala.
4.	Pandey et al. 2008	Detailed description of the e- KHAZANA (Computerized Treasury Application) of the Government of Bihar, India.
5.	Rao 2008	Analysis of the e- Kosh (Computerized Treasury Application) project of the Government of Chattisgarh, India.
6.	Siddarth et al. 2009	Description of the computerization project of the treasuries of the Government of Haryana, India.

The information technology implementation started late in the treasuries. The study of the treasury computerization of West Bengal reveals that the first computer was installed in the Howrah treasury in the year 1995. After that there followed a period wherein there were changes in technology and changes in the implementation agencies. The phases of computerization have been mapped across six stages (Table 3). The present study examines the growth of Information Technology using the two models of Nolan (1979) and Laynee & Lee (2001) to map the growth of e-governance in treasuries. Nolan (1979) model is widely established and incorporated for mapping the growth and effects of changes of Information Technology in an organization. All the e-government maturity/ growth models are mainly for studying the stages of development of the online system (especially the website) by the government for the citizens. But the Layne and Lee (2001) model could be incorporated for the study of the growth of e-governance application

system which is in the transition phase of conversion to web-based systems. Thus, Nolan (1979) and Layne & Lee (2001) models has been considered for this study.

5. STAGES OF GROWTH AND TREASURIES

The history of the computerization of treasury in West Bengal was mapped from the year 1995 to 2010. The implementation started with a standalone system in the year 1995 and reached to partial online transaction in the year 2008. The stages have been shown in the Table 3.

The computerization of treasury in West Bengal has gone through a six stage growth as shown in Table 3. According to Nolan (1973), when Budget and Skills levels of implementation, mapped across time frames yields an S curve. The expenditure on Information Technology during the period 1995 to 2008 is presented in Table 4, when plotted across time frames yields the curve as shown in Figure 2.

Table 3: Stages of development of computerization in treasuries of West Bengal

Stage	Year	Hardware	Skill Level	Application	Utilization
I	1995-97	Intel Pentium	One operator by vendor	Host- based system developed by NIC. Compilation of report	No utilization
II	1998-99	No change	Treasury staff trained by NIC	Compilation of budget statements	Compilation of budget statements and take printouts.
III	1999-2000	No change	Treasury staff trained in data entry and compilation of reports	Trial testing of the Client-based system	More treasury functions performed through the application system
IV	2000-2001	Server based machines	For intensive training to staffs	Client-based application system deployed	Almost all the treasury functions done through the computers
V	2001-2005	No change	More training to staffs	Brower-based application system and connectivity with WBSWAN	Fully utilized
VI	2005 and beyond	No change	No change	Development of web based application system with integration vertical and horizontal integration.	Partial deployment in 2008 and full deployment still under development

Table 4: Expenditure on computerization of treasury in West Bengal (1993-2008)

Year	Expenditure (\$ billions)
1995	0.05
1996	0.10
1997	0.09
1998	0.50
1999	1.22
2000	1.12
2001	2.11
2002	4.10
2003	2.49
2004	2.25
2005	1.60
2006	1.61

2007	2.10
2008	1.50

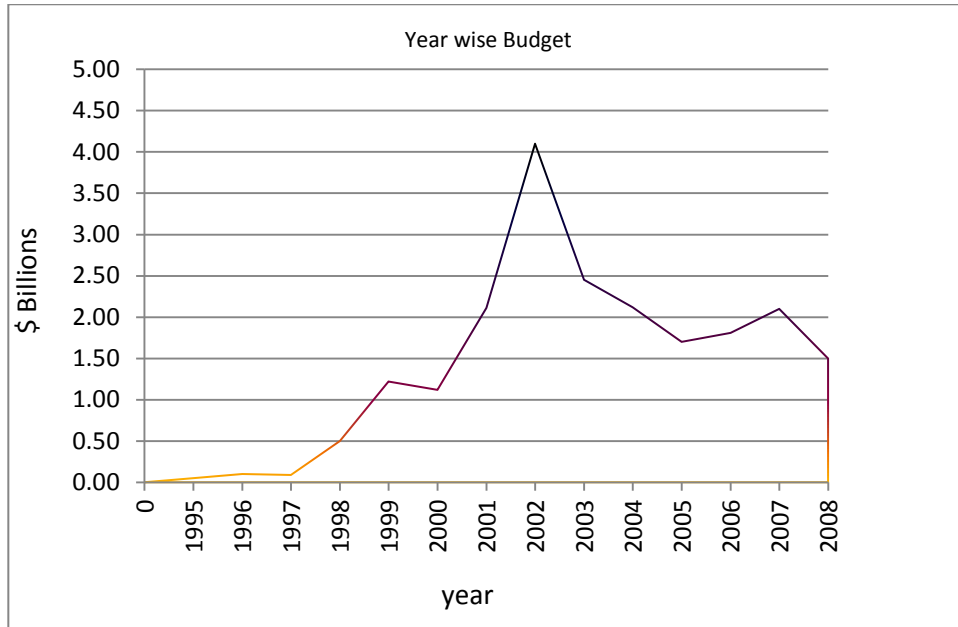


Figure 2: Expenditure occurring on treasury computerization across years in West Bengal

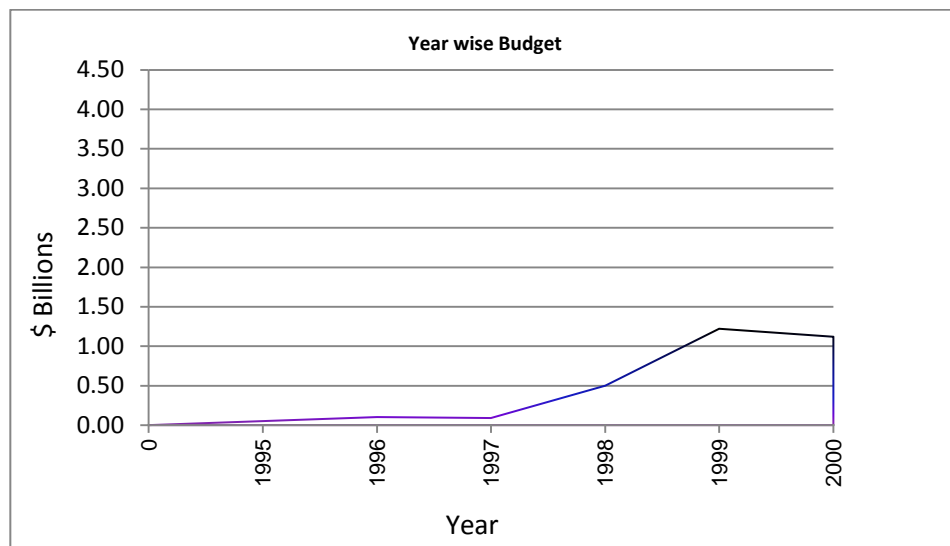


Figure 3: Trends of expenditure on computerization (1995-2000) in West Bengal

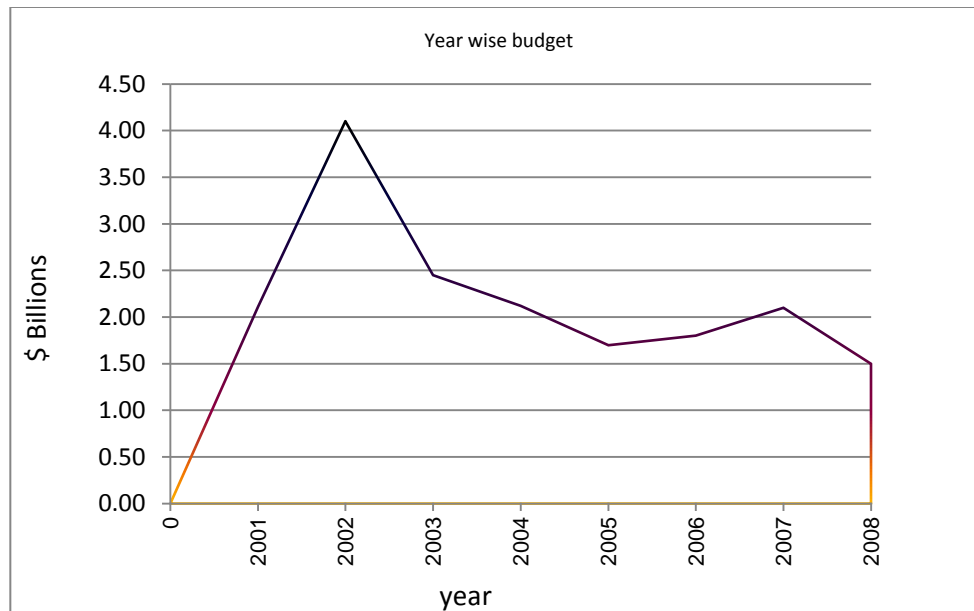


Figure 4: Trends of expenditure on computerization (2001-2008) in West Bengal

Table 5: Integrating Nolan model and Laynee & Lee model with growth e-governance in treasuries

Stage	Year	Application	Nolan	Laynee & Lee
I	1995-96	Host-based system developed by NIC, West Bengal Unit	Initiation	Catalogue
II	1998-99	Compilation of budget system	Contagion	Catalogue
III	1999-2000	No change	Transition to S curve	
IV	2000-01	Client-based system	Initiation	Transaction
V	2001-05	Browser-based system	Contagion	Transaction
VI	2005 and beyond	Connectivity with WBSWAN, partial online presence, horizontal and vertical integration initiatives	Control	Vertical Integration

Various stages of development of Information Technology are indicated by the transition points on the curve in Figure 2. Two S curves can be clearly identified in Figure 2, one for the period 1995 to 2000 and another for the period 2000 onwards. The curves have been plotted separately in Figure 3 and Figure 4. The two time periods correspond to the time when the computer system was single user and subsequently a multi-user application system.

The history of computerization has been traced in detailed in the following paragraphs.

The introduction of computers in the year 1995-96 at Howrah treasury saw an extremely low level of expenditure on hardware and extremely low levels of skills. In this stage, the treasury staffs were first introduced to the computers. It was a period of resistance and a period when the technology acceptance levels were low. There was a sense of fear among the

computer operators and hence the computer usage remained limited to printing of reports using computers, something that they had been doing manually.

Thus stage of implementation of Information Technology corresponds to the initiation stage of Nolan Model. It was a gradual progress from a stage of getting familiar to compiling reports using computers. The data used to be typed into the computer to generate reports. This stage also corresponds to the first stage of Layne and Lee model i.e. Catalogue Stage, a stage where data is fed into the computer only for the purpose of retrieval at a later stage. The skill level of the employees improved from the year 1998 to 2000.

With more advanced application in treasuries in 1999, all the functions are able to be performed with the use of the application system. Technologically advanced hardware was installed from 2000. Thus, there is a case of change of technology both with respect to the hardware and the software. According to Nolan (1979), the growth model would follow a new S curve whenever there is a change in technology (Figure 2). This stage also corresponds to the second stage of Layne and Lee model i.e. Transaction. The initiation phase the new S curve corresponds to the second stage of Layne and Lee model. This brings to light an interesting behavior of the two models. In the case of Nolan (1979), the growth shifts from one S curve to another whereas in case of Layne and Lee, it follows the same growth pattern instead of starting from the first stage whenever there is a change of technology. It possibly appears that the change in technology enables e-governance systems in the Layne and Lee model to progress from one stage to another.

Technology advancement came after 2004 when more advanced application system was developed and deployed, most of the treasuries were connected to the Central Server at DTA, Kolkata through West Bengal State Wide Area Network (WBSWAN) and partial online system was initiated. There is a change of technology and attempt is going on to change from a multiuser environment to a web based system.

There is an effort to vertically integrate the various departments so the treasury data could be effectively updated. The Nolan (1979) model predicts that the implementation would follow a new S curve which would taper giving way to a maturity stage. The two models discussed above can be mapped onto the stages of growth of computers as in Figure 2.

The two reference models do not have any explanation for a situation wherein there is a change in technology. Both the models assume that all projects will progress from one stage to another. The technology related to the e-governance system of the treasury had undergone change thrice. While the S curve in case of Nolan (1979) model changed, the Layne and Lee model continued to follow the various stages of the model. It brings into light an important issue that e-governance system may not complete all the stages of growth starting from the stage of initiation to maturity. Technology changes may be enough to change the pace of growth of e-governance and also more e-governance to a higher stage.

The growth of Information Technology among the treasuries has not been voluntary process. The computerization efforts have been more forced and implementation through strict orders. Many of the treasuries or changes in technology have been due to through compulsory government orders and hence many not follow a natural path of growth as predicted by Nolan (1979).

6. CONCLUSIONS AND PRACTICAL IMPLICATIONS

The study of treasury computerization in West Bengal brings into light some key important issues of convergence of growth models. One of the growth models related to IT growth in general and the other model relates to e-governance growth. The growth models converge at various stages. How do these models converge and at what stages is a matter that requires further research.

Technology is an important factor for growth of e-governance. Information Technology has been known for a very short life cycle. When

Technology Life Cycles are short, organization may like to abandon old technologies for newer technologies. What is the extent of effort of technology on growth is an issue that requires to be studied. What are the other factors that enable e-governance systems to grow also needs further examination. Technology acceptance at various stages of growth might be one of the factors that need a deeper examination.

The study may bring into light the fact that technologies may not grow to their full life time. They may be replaced by a new S curve even before they reach the second or third stage. The S curve has shown a fall towards the end of the technology life cycle. Whenever there is a tendency of an S curve to be replaced by another S curve there is a fall in the budget allocations at the end of the S curve. For organization this would mean that they need to explore technology options if they want to move from one stage of growth to another. Changing over to a newer technology would cost them less and also enable them to move into a higher stage since they would be at the beginning of a new S curve.

The transitions of technology were very evident in the computerization of treasuries in West Bengal as part of the e-governance initiatives. This may not hold good in areas where the Technology levels have saturated. Governments in general are technology followers and tend to adopt technology which the private sector uses for its operations. Hence, there may be organizations which may like to keep the technology and not change it will the end of the life cycle.

The study throws up issues of research in an area where technology transformations triggers system growth. The relationship between technology life cycle and system growth needs to be studied in detailed to establish the fact that, whether changes in technology can trigger e-governance growth. How do the organizations adapt to changes in technology which may also have an effect on technology acceptance. One of the issues that need to be further studied is whether an attempt by an e-governance to

growth triggers changes in technology or vice-versa.

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