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BUSINESS PROCESS RE-ENGINEERING (BPR) AND TECHNOLOGY INTERCEPTION THE CONTINUUM IN THE E-GOVERNMENT APPLICATION CAULDRON

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ABSTRACT

This paper discusses the quality and effectiveness of service delivered through the Integrated Citizen Service Centre (ICSC), eSeva, in Andhra Pradesh (A.P). The Authors have used Goals Question Metrics (GQM) and Balanced Score Card (BSC) to make their observations. The focus of the paper is on Business Process Re-engineering a major Strategic initiative in e-government applications. Biometric-based recognition because of inherent features such as reliability, speed and cost and the different possible uses can have a profound influence on the way government conduct its business. With newer technology like iris scan already being used in the issue of ration cards in Andhra Pradesh, other e-government applications necessitating authentication of identity of citizens, the same database can used hence inevitably BPR will assume greater significance. The authors in a limited sense also examine the possible role of usage of mobile technology in health applications opening up a possibility of extending eSeva services to health sector.

Keywords: Balanced Score Card (BSC), Biometrics, Business Process Re-engineering (BPR), General Packet Radio Service (GPRS) Mobile, Goals Question Metrics (GQM) and Integrated Citizen Service Centre (ICSC).

Introduction

The tenth five year plan, formed the basis of India's major thrust in developing e-government applications in the last five years outlined "Re-engineering of existing government process and procedures as essential to bring about transparency in working, reducing bureaucratic control, increasing efficiency and productivity, reducing cost of service delivery etc. Integration of Projects across various departments to provide a single point of contact for citizens for delivery of services electronically is essential". [1]

The literature reviews on BPR in the manufacturing sector adapted for e-government suggest:

- The fundamental rethinking and radical redesign of business process to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality,

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service, and speed. [2]

- The analysis and redesign of business and manufacturing processes is to eliminate that which needs no value. [3]
- A radically new process of organizational change that many companies are using renews their commitment to customer service. [4]

At the state administrative level convergence of utility and citizen services at a single point was piloted by Mr. R Chandrasekhar, I.A.S and followed up by Mr. J Satyanarayana, I.A.S during their tenure as Secretary IT&C, Govt. of Andhra Pradesh. Mr. Satyanarayana reveals that BPR government contributes about 35% towards the e-government projects. [5]

In Andhra Pradesh the administrative function was backed by the Political wisdom which recognized the need and led to the state emerging as a leader in e-government application. The Vision statement articulating the acronym SMART [6] reflected the thrust in e-government in the State.

This paper is divided into three parts 1) The authors describes the GQM method and Balanced Score Card Method to understand the impact of BPR, report the results of the analysis of the data gathered over the last two years at time intervals of every quarter the 2) Study of newer Technology introduction 3) Experiment with future technology in improving Health Services in Urban and Rural India.

Importance of GQM and BSC In Understanding Impact of Bpr for Stakeholders

Let us begin with understanding the Goals that eSeva set for itself

Goals of e-Seva

1. Providing a one-stop services to the citizens through a chain of Integrated Citizen Service Centers (ICSC)
2. All the counters should provide all the services at all the ICSC.
3. The architecture adopted should be scalable and secure.
4. The service time per transaction should be less than three minutes.
5. Minimize the queue formation at the centers
6. The cost of transacting with the government should be reduced
7. Selected services should be available over the Internet 24 x 7

(The services that do not involve an inspection or attestation should be offered over the Internet also to facilitate the citizen to avail them from Home / office).

There is a strong relationship between BPR and organizational change management procedures during a BPR project, which must have a high degree of top management support. In the case of e-government it must come from both the bureaucratic and the political leadership which was forthcoming in Andhra Pradesh. Jih et al [7] suggested that management must take a more holistic approach to the redesign of business processes and their relationship with information technology. The need to integrate techniques for organizational design and incorporate the same during the BPR exercise was necessitated and carried out by the state.

There has been some confusion regarding the use of terms like reengineering, process improvement and redesign. Valiris et al [8] in their literature suggest that reengineering is synonymous to radical change and process improvement to incremental change and that both, reengineering and process improvement are included in the definition of redesign. In this paper

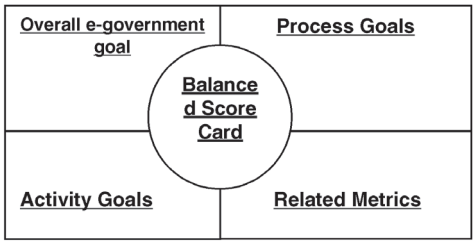
we adopt the same view. Therefore, synonymously and interchangeably we refer the topic 'business process redesign' since the term that has the broadest acceptance in the industry.

Dangers of Excess Business Process Re-Engineering

In most of the cases the officials are ambitious and introduce Business Process Re-Engineering (BPR), more than a common user can accept, in to the Project. BPR should change the existing functionality to an optimal level only. To achieve success a set of metrics to control and monitor BPR for e-Government implementation Projects is required in order to help Project managers / Project Directors.

According to Guha et al.[9] "Although there is the recognition of the needs to control and monitor a redesigned process and link it to continuous improvement programs, many methods studied did not reflect the recognition of these needs". The use of BPR at the local authority [10] level referring to the level of re-engineering, with the suitability of processes to undergo re-engineering[11] and the level of dependence on Information & communication Technology (ICT).

Any e-governance Project having BPR as central to its objectives need to create an impact on the stakeholders. The authors feel that the Project may have the following goals i) Overall e-government goal ii) Process goals iii) Activity Goals iv) Related Metrics for measurement as depicted below.



GQM Method Overview

The GQM approach is a mechanism that provides a framework for developing a metrics program. It was developed at the University of Maryland as a mechanism for formalizing the tasks of characterization, planning, construction, analysis, learning and feedback.

G QM does not provide specific goals but rather a framework for stating the goals measurement and refining goals into questions to provide a specification for the data needed to help achieve the goals.

The GQM method was originally developed by V. Basili[12] and D. Weiss, and expanded with many other concepts by D. Rombach. The GQM method contains four phases: planning phase, definition phase, data collection phase and interpretation phase. The GQM top-down approach assists Project Managers / Program Directors and application developers not only in knowing what data to collect but also in understanding the analysis method needed when the data is available. [13]

Description of Metrics

In this section the team shows the definition of each metric and the relationship between the questions defined and the metrics (see table 1) for the eSeva. We also represented graphically the relationships (see figure 2) The graphic represents the three levels: measurement goals, questions, and metrics. Metrics can help answer more than one question

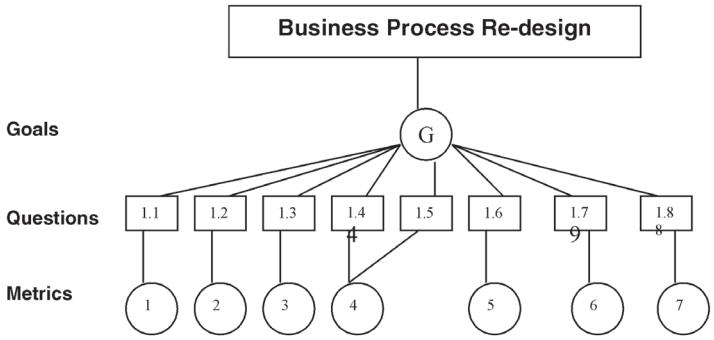


Figure 2: Graphical representation of the GQM preliminary Plan

For each metric we defined the following aspects: what they measure, when they must be measured, what possible values they could have, and the metric scale, who will measure it, what medium is used for data collection. Most of the metrics proposed are direct measurements except the metrics showing percentages.

	Goal	Question	Metrics – Description of Result
Q1	Magnitude of Re-design	Magnitude of redesign that is necessary for each business process	Low for each process
Q2	Users Involved	Number of users involved in the redesign	Citizens - Stakeholders
Q3	Business Process Redesigned	Number of business process that need to be redesigned	IT Architecture - Search pattern is now changed to owners name instead of survey number
Q4	Business Process affected	Number of business process that need change due to redesign of other process	Nil
Q5	BPR effort	It comprises of total number of departments involved, number of processes redesigned and people involved in each phase.	Continuous addition of new services since inception
Q8	Duration of Business process redesign	Estimated time necessary to redesign each business process	Three man months
Q9	Cost	Cost involved in adapting the redesigned process	New approach adopted PPP Model

Table 1: Definition of Metrics and relationship with Questions

Interpretation of Metrics

In relation to the magnitude of redesign metric, Guha et al. had developed a “project radicalness planning worksheet” in order to assess the BPR project radicalness. This worksheet includes eleven factors related with BPR project planning: strategic centrality, feasibility of IT to change process, process breadth, Senior management commitment, performance measurement criteria, process functionality, project functionality, project resource availability, structural flexibility, cultural capacity for change, management’s willingness to impact people and value chain target.

Each factor is measured in a Likert scale (1-5 scores). However, their view is not for each business process but for the project as a whole. We think that this method is very useful not only at the beginning of the BPR project to define the BPR plan and allocate the adequate

resources but will sustain till the Project closure. This Plan also provides for establishing management commitment and support. Higher radicalness implies more commitment and lower radicalness implies more analysis of existing processes in order to improve them.

Based on the magnitude and the scale of effort involved in a BPR approach, Bancroft et al proposed a matrix of magnitude versus scale of effort. BPR effort is quite similar to the complexity of each business process. The more departments and people involved in the change, the greater the scale and therefore complexity of the BPR effort.

The Balanced Score Card

The balanced scorecard suggests that we view the organization from four perspectives, and to develop metrics, collect data and analyze it relative to each of these perspectives:

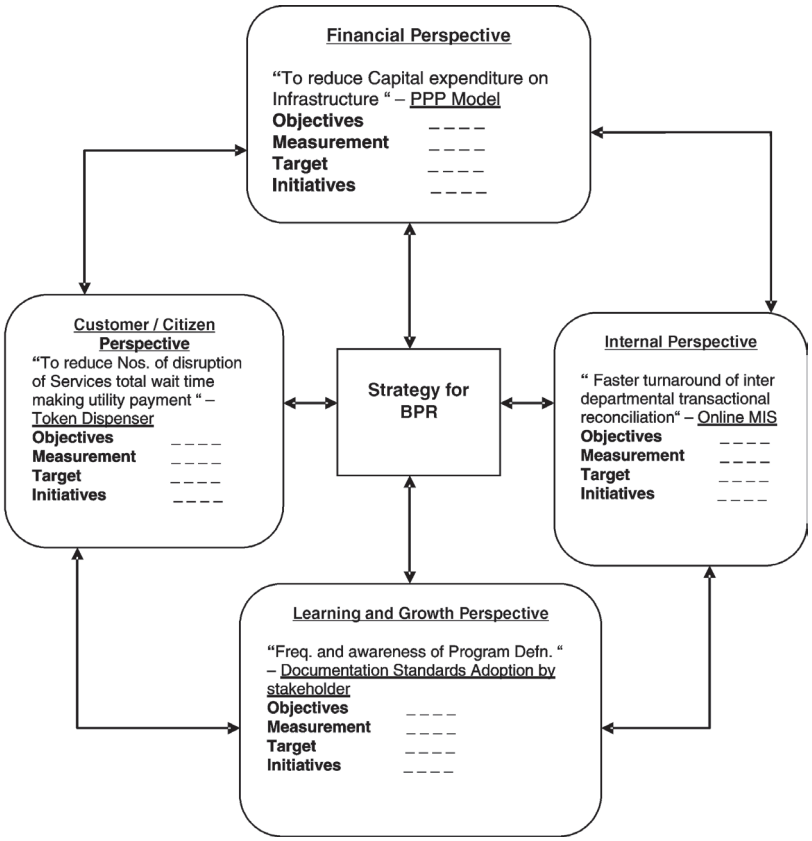


Figure 3: The Balanced Score Card

The balanced scorecard is a *management system* (not only a measurement system) that enables organizations to clarify their vision and strategy and translate them into action. It provides feedback around both the internal business processes and external outcomes in order to continuously improve strategic performance and results. When fully deployed, the balanced scorecard transforms strategic planning from an academic exercise into the nerve center of an enterprise. This method was developed by Dr. Robert Kaplan and Dr. David Norton. [14]

Table 2: Impact Measurement Matrix for achieving eSeva goals

	Factors	Rating as per GQM (2005)	Rating as per GQM (2007)	Adapted Avg. Composite measure for BSC (2005)	Adapted Avg. Composite measure for BSC (2007)
1	BPR effort	2.0	0.2	2.1	0.1
2	Replicable ICT Architecture	5.0	5.0	4.9	4.9
3	Scalability of ICT Architecture to add newer application	5.0	5.0	5.0	5.5
4	Stakeholders acceptability	5.0	4.1	5.0	4.0
5	Cost model Replicable	4.3	4	4.3	4.0
6	Growth of transaction (month wise)	5.0	3.8	4.9	3.6
7	Cross functional Team necessity	3.0	1.8	2.8	0.8
8	ICT skills necessary for stakeholders	2.0	1.95	2.0	0.9
9	Project Management Skills	3.0	1.2	5.0	1.1
10	Governance Transparency	3.8	1.3	3.75	1.08
11	Continuity of Project Director	4.6	3.3	4.6	3.3
	Success Rate Citizen Acceptability (Weighted Avg.)	**4.65**	**4.1**	**4.5**	**3.85**

(Scale 1 – Nil , 2 – Low, 3 – Medium, 4 – Average, 5 – High)

Observations by the Authors

1. Large Scale Capital intensive Projects saw adoption of PPP model.
2. Importance of e-government applications growth.
3. Replicable e-government applications are achievable if in the Software Development Life Cycle thrust and importance is given to parameterization. Bangalore One is the replication of eSeva in Hyderabad.
4. Drop in transaction rate was due to discouragement of transaction by certain departments which is reflected in drop of transparency in Governance. Sales Tax payment, Bus pass issue, Passport form sale and application acceptance took a major drop. Touts in the system are back and the overall citizen acceptability rate therefore took a plunge. In a separate survey with respect to drop in applications of Passport in a survey conducted by the authors (Sample N=10) it was observed that 20 % of the respondents applying for new passports were Govt. servants or family member (immediate family) who preferred going to Passport Agents in December 2006 and the figure rose to 40% in June 2007. The ICSC centre had no feedback mechanism loop to respond to the applicant the reason for delay. Touts outside Passport office at Secunderabad were promising residential verification within one week. Surprisingly the passport office has a separate window at passport office for accepting passport application from passport agents. The official website of the Government of India or the Regional passport office does not mention about acceptance at eSeva Centers. Document Verification Services the cost at eSeva is Rs. 50 (Around 1US$), whereas using tout service result in expenses of 100US$ for the citizen.
5. Disjoint independent silos continue to grow and co-exists as can be observed in the case of passport application submission. The Government of India web site http://passport.gov.nic.in through the Rights to Information Act and Vigilance module seem to encourage transparency, but however visibility of this attempt is very poor as an overwhelming 95% of the respondents coming to Secunderabad came form far flung districts in the state. ESeva centers do not find mention for receiving application form. With only

one Regional passport office at Hyderabad and two application receiving centers at Vijaywada and Tirupathi respectively in the state of Andhra Pradesh and catering to population of over eight million citizens in the state, the primary stakeholder the citizen is inconvenienced through expenditure incurred, costs for efforts in follow up and ending up in the hands of touts. The study however did examine the expenditure that the state government has to incur for police verification per applicant for identity, criminal record and residence verification or the revenue share mechanism between the Central Government and State Government for carrying out the same. Discontinuance of filing of Income Tax return filing at post offices is another case of reduction of easier access to stakeholders. In both cases, the reason given by Income Tax Department and Regional Passport office was the applications received at the collection centers, namely eSeva and post office never reached them.

6. The table below lists the initiatives started vis-à-vis Benefit that started accruing with each BSC perspective

BSC Perspective	Initiative Started	Benefit
Financial	PPP Model in e-government applications	Reduction of Financial burden on State Exchequer
Citizen	Introduction of Token Dispenser	Eradication of Mob mentality at service counter
Internal	Online MIS	Better Treasury Management
Learning and Growth	Documentation Standard	External Vendor Management- Only CMM Level 5 companies in Bid participation. Ensuring Service Quality.

Table 3: Balanced Score Card Initiatives

Technology Introduction - Iris Recognition for Issue of Ration Cards in A.P

In July 2005 to September 2006, the Government of Andhra Pradesh State Government introduced 'iris' technology cameras intended to speed up the process of issuing ration cards. Totally 1,800 cameras through Designated Photography Location (DPL) were deployed statewide to enable an average 15,000 ration cards could be distributed throughout the State in a day. In India the ration card is recognized legally as valid proof in all Government and commercial transaction. [15]

The Technology introduction program would have ensured 20 million individuals enrolled in the first phase. When the program concludes, the user base was targeted to cover 80 million persons. This undoubtedly was the largest iris recognition program ever done, even though in 1996 Malaysia was the world's first country to use biometrics based recognition for issue of passports to citizens. [16]

Biometric recognition, or simply biometrics, refers to the automatic recognition of individuals based on their physiological and/or behavioral characteristics. [17] To understand in brief, any human physiological and/or behavioral characteristic can be used as a biometric characteristic as long as it satisfies the following requirements: [18]

1. *Universality: ea*ch person should have the characteristic. *2) Distinctiveness:* any two persons should be sufficiently different in terms of the characteristic *3) Permanence:* the characteristic should be sufficiently invariant (with respect to the matching criterion) over a period of time. *4) Collectability:* the characteristic can be measured quantitatively. *5)* ***Performance:*** refers to the

achievable recognition accuracy and speed, the resources required to achieve the desired recognition accuracy and speed, as well as the operational and environmental factors that affect the accuracy and speed. *6) Acceptability:* indicates the extent to which people are willing to accept the use of a particular biometric identifier (characteristic) in their daily lives *7) Circumvention:* indicates how easily the system can be fooled using fraudulent methods.

The applications of biometrics in e-Government applications can be

1. National ID card / Voter 's Card 2) Ration Card 3) Driver's license, 4) Social security, welfare-disbursement 5) Passport control 6) Criminal investigation 7) Terrorist tracking mechanism perhaps necessitating convergence of applications.
2. The skill-sets identified as being necessary for handling programme / project level issues are Business Process Reengineering, Change Management, Financial Management and Technology Management [19]

In Andhra Pradesh the Government has started using the same database gathered in this phase to provide health insurance to citizen living below poverty line, leading to build up of an effective social security welfare disbursement for the economically backward (Citizen's Living Below Poverty Line (BPL)) and bringing in interdepartmental collaboration. [20]

The table below gives the comparisons of various biometric technologies based on the perception of the authors, High (H), Medium (M), Low (L)

Table 4: Perception of various Biometric identifiers

Biometric Identifier	1	2	3	4	5	6	7
DNA	H	H	H	L	H	L	L
Ear	M	M	H	M	M	H	L
Face	H	L	M	H	L	H	H
Facial Thermogram	H	H	L	H	M	H	L
Gait	M	L	L	H	L	H	M
Finger Printing	M	H	H	M	H	M	M
Hand Geometry	M	M	M	H	L	M	L
Hand vein	M	M	M	L	M	M	L
Keystroke	L	L	L	M	L	L	M
Odor	H	H	H	L	L	M	L
Palm print	M	H	H	M	H	H	M
Retina	H	H	M	L	H	L	L
Signature	L	L	L	H	L	H	H
Voice	M	L	L	M	L	H	H

(Legends used 1) Universality, 2) Distinctiveness, 3) Permanence, 4) Collectability, 5) Performance 6) Acceptability, 7) Circumvention)

Mobile Technology in Health Services

Mobile Technology could be extended for bridging the existing gap in health care services.

In the event of early diagnosis in cases of acute myocardial infarction (AMI) when patients under clinical observation in a limited trial by Wifin Technologies Pte. Ltd., with a Chennai based private hospital has proven to have improved Patient Management leading to decrease in adverse event / mortality. We envisage that in a network of community / public hospitals which can be technologically upgraded, in real time specialist advice is available in Cardiac Care. Our aim is to use a combination of teaching and decision support technology involving Cardiac Specialist to ensure that all patients with AMI and other Cardiac related ailments have

the opportunity to access timely and appropriate Health Care in the Rural sector

The early detection of cardiac ischemia and arrhythmia with an ability to record a professional-quality, 3-lead electrocardiogram (ECG) based on leads I, II, and V2; derive the missing leads of the standard 12-lead ECG, the patient risk factors and clinical data; different levels of alarms can be generated and forwarded along with Public electronic Health record (PHR) onto a standard Bluetooth-enabled, GPRS-compatible mobile phone as an alarm.

Smart devices together with the advances of wireless technologies such as Bluetooth, ZigBee, GPRS, or WIFI will allow the citizens to access and/or transmit their health data anywhere and anytime and to act as consumers responsible of their own health. This concept is called pervasive computing, where e-Health represents only one of the numerous application areas.

According to medical data Irreversible damage happens to myocardial tissues occurs at about 240 minutes from first symptom. Our aim is work on reducing the 180 min and the 80 minutes by 50% to facilitate better patient Management

The work was initiated based on reference data in developed countries [21]

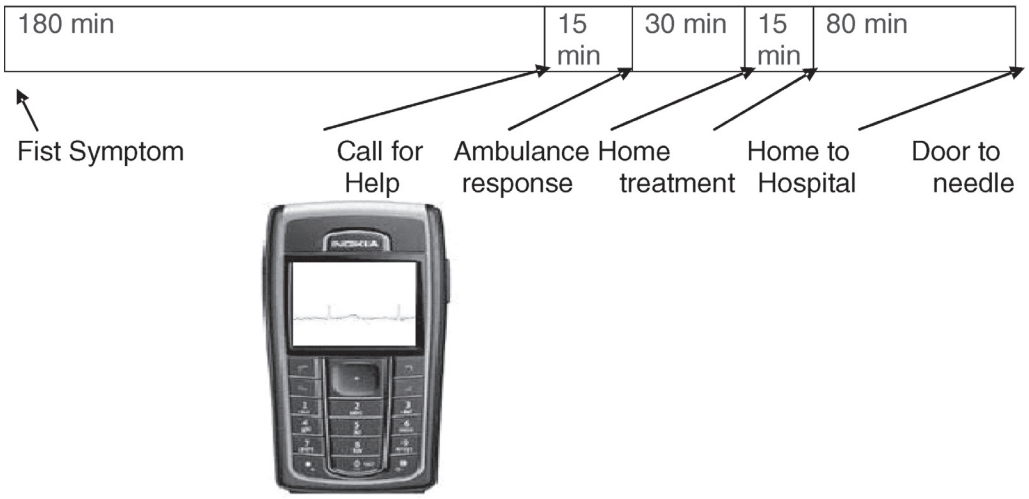


Figure 4: ECG Visualization on Mobile Phone

Conclusion - The Road Ahead

The Parameterization, Visibility, access to information, Right To Information (RTI Act), need for transparency leads to BPR. Technology is an enabler for Re-engineering.

- The BPR should be optimum and should be a requirement of the process but not the requirement of technology.
- BPR is not a one time activity, it is a continuous process associated with People, Process and Technologies to create efficient , effective working environment.

The finding of the measurement of Impact using GQM and BSC methods, its adaptability, the importance of BPR Strategy is depicted below to facilitate improved implementation in the of e-government application cauldron.

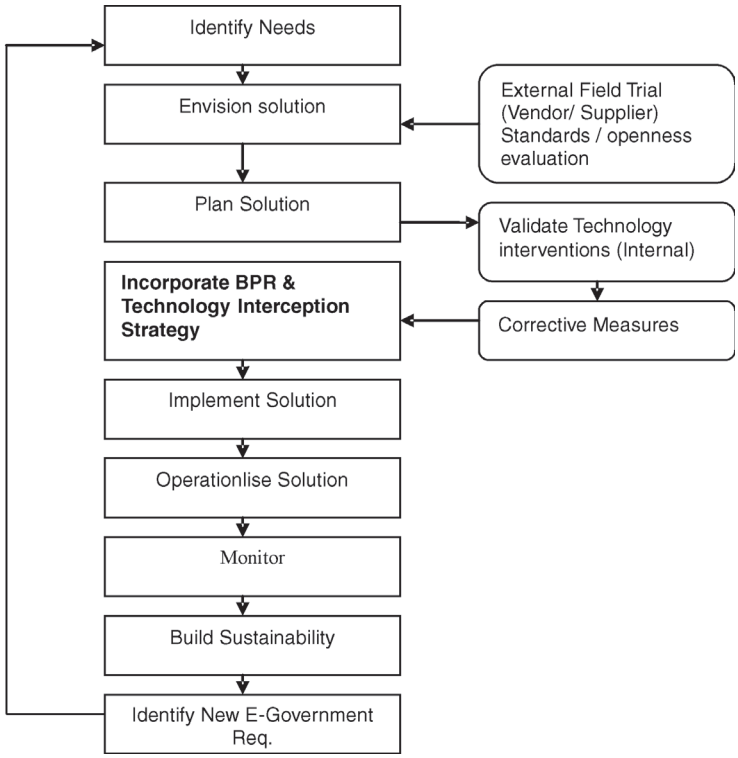


Figure 4: The Continuum expansion of e-government applications

Note:

1. The Judicial wrangling over IPR rights between LG Electronics and 4G Systems in the award of contracts and its implementation being delayed backed with another historical event in the delay of implementation of 1000 school project and the judicial verdict coming mid school year puts a lot of strain on the stakeholders. The Court in both cases ruled in favour of the bid winners and complimented the government in ensuring transparency.
2. Newer technology intervention like mobile for health will also necessitate in future the judicial system to gear up on challenges such as non response liability claims by patients etc.

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