

Emerging Technology in Public Finance

Public Financial System- Overview

Roles of Public Finance:

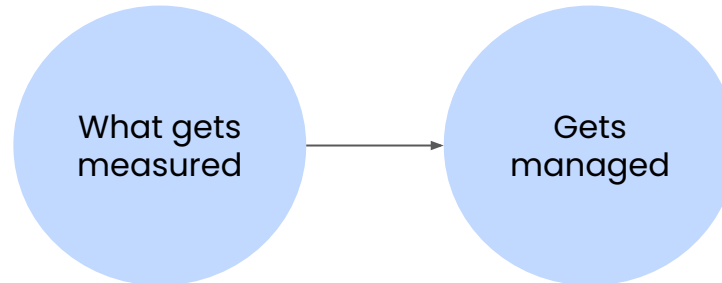
- **taxation and other resource mobilisation:** less about the tax rate than about the efficiency with which tax is collected and the reach of the tax net
- **debt and cash management:** efficiencies sought and proper risk management
- **budgetary process:** transparent and inclusive. Focus on outputs rather than on mere expenditure and related inputs, with strong accounting and reporting procedures
Line item budgeting > Performance Based Budgeting (outputs + outcomes) > Zero-based budgeting (fully 0 budget; no govt.) > Programme budgeting (common objectives clubbed together | expenditure would be planned and controlled by the objective)
- **accounting system:** clear rules on transparency and reporting, as well as enforceable sanctions for failure. Oversight should be established by internal mechanisms in the national treasury + external oversight by bodies like independent parliamentary committees, a public ombudsman, a free media and civil society, and an independent auditor-general
- **information systems**
- **internal and external audit**



Public Finance

WEAKNESSES IN RESOURCE ALLOCATION AND USE

- i. Poor planning (Top Down budgeting method)
- ii. No links between policy making, planning and budgeting;
- iii. Poor expenditure control
- iv. Inadequate funding of operations and maintenance;
- v. Little relationship between budget as formulated and budget as executed;
- vi. Inadequate accounting systems
- vii. Unreliability in the flow of budgeted funds to agencies and to lower levels of government
- viii. Poor management of external aid;
- ix. Poor cash management;
- x. Inadequate reporting of financial performance;
- xi. Short Term vision- just 1 year
- xii. Lack of a rigorous time phased budget (bi-weekly, monthly)



Budget Allocation

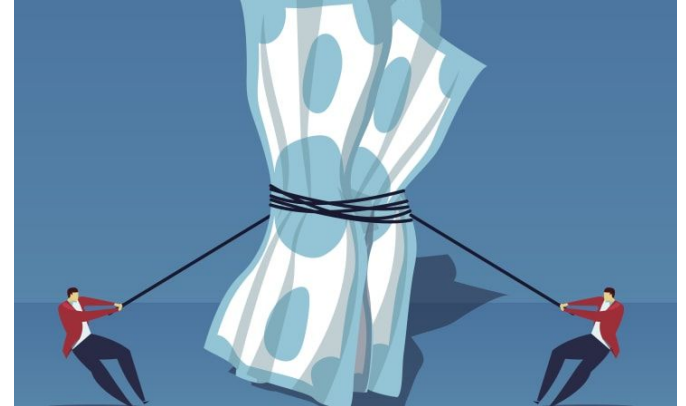
Weaknesses in the Budgetary System and Implementation



- Unrealistic budget proposals leading to frequent revisions
- Thin spread of resources leading to delays in implementation of projects
- Skewed expenditure pattern
- Inadequate adherence to the multi-year perspective and missing 'line of sight' between plan and budget
- No correlation between expenditure and actual implementation
- Mis-stating of financial position/Govt's financial position is unknown with reasonable accuracy at any given point of time
- Indiscriminate announcement of projects/ schemes not included in the plan/budget is regularly made, often without proper consideration and detailing

Weak budgetary controls

- deficiencies in revenue collection
- wastage of public resources
- inappropriate accounting
- poor returns on investments
- diversion of funds
- system deficiencies
- numerous instances of poor management of public resources



Getting the Budget Right- Overview

1. Systematic and timely release of all relevant fiscal information
2. Effective and influential role of all stakeholders involved: civilians, legislature
3. Making costs more transparent



How can technology help?

Deep Learning: Keep check on monthly/bi-weekly expenditure to judge spending behaviour of any department/govt. Body

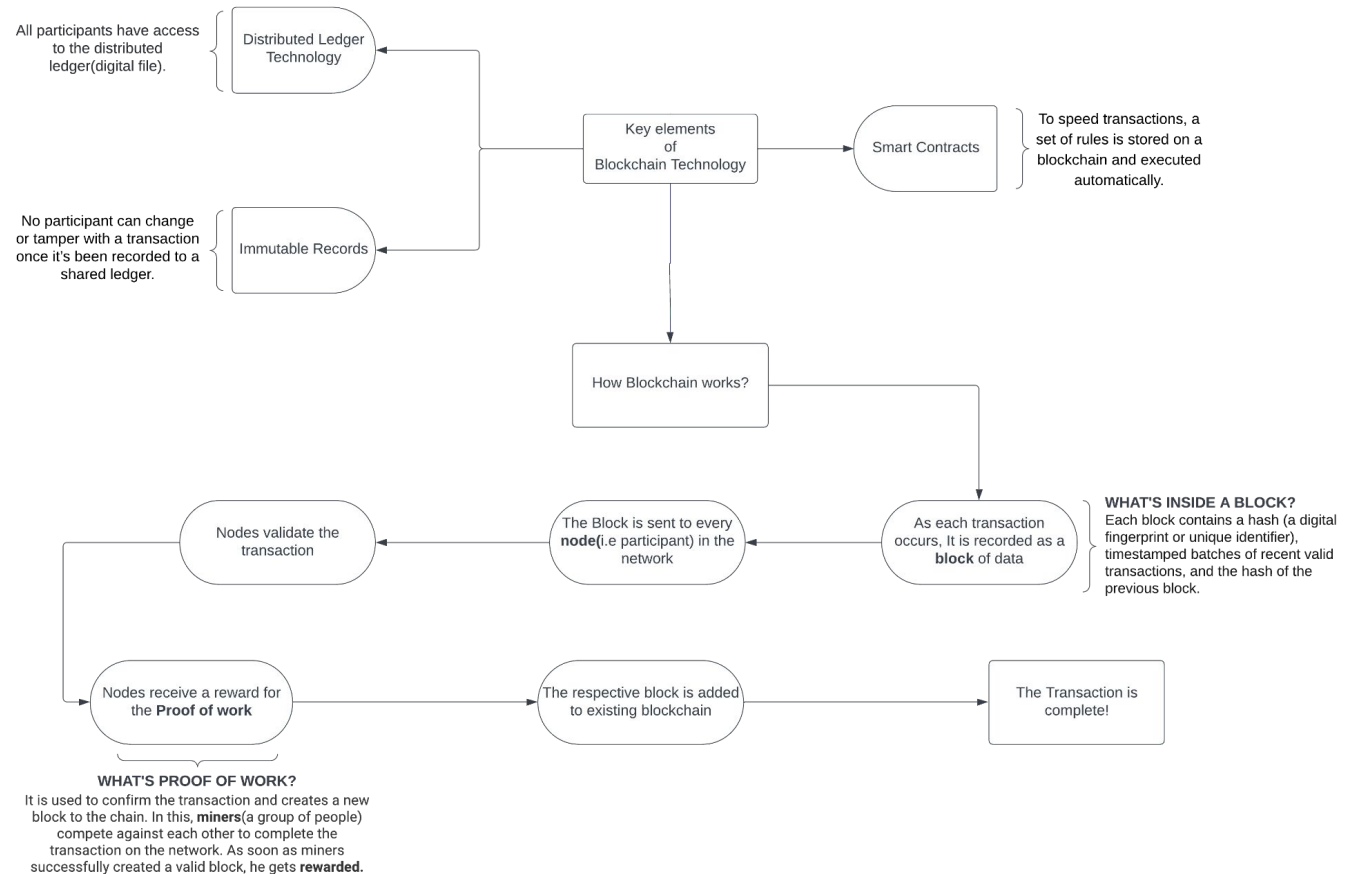
Automation: Automatically deduce money based on data collected to each entity and copy information to produce an automated expenditure report at the end of the fiscal year

Machine Learning: Embed ML algorithm with DLT and automation to every entity's financial system to better the money allocation with time and need

Cloud Computing: Keep data in a central repository (either at the capital of each State or in Delhi), so that budget committee can access to gain insights on the data

Machine Learning: Use the spent amount vs the goals/objectives achieved to make more realistic budgets

How Blockchain Works?



Blockchain Technology

Funds transfer

Integrate blockchain for consolidation and transactions reconciliations



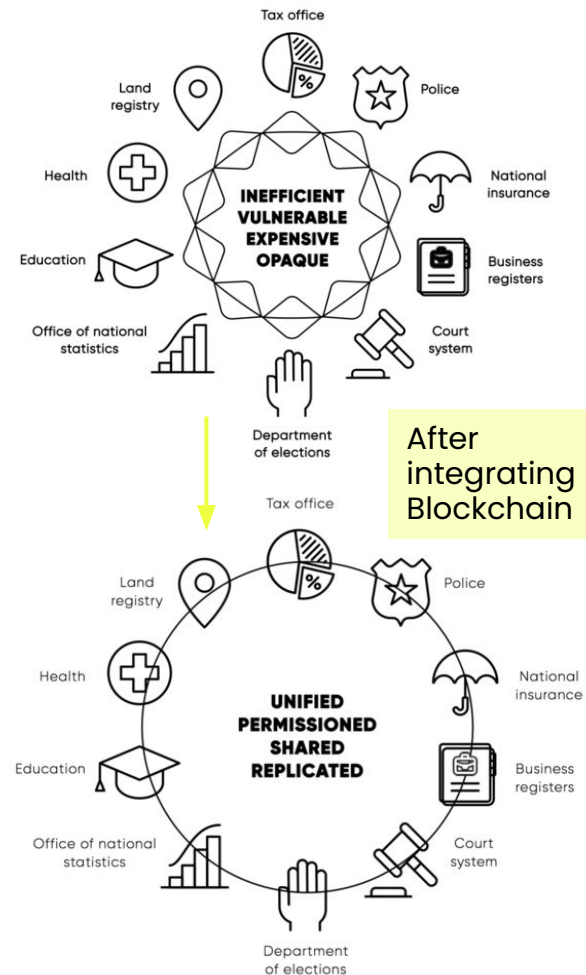
Keep different states/departments/grants color coded



Use APIs to communicate/ gather data between different entities

Benefits:

1. Fast, transparent, easier, cheaper decentralised system
2. All transactions can be accounted for better data processing
3. Solve for fund leaks at various levels



Cognitive Technology

ML proposes budget allocation to various states/departments based on past year's:

1. Requirements
2. Goals achieved out of the proposed goals



Embed cognitive technology to focus on volatile factors in the upcoming year for different sectors/states



Validate the allocation by human to achieve a holistic, realistic budget that would factor in future factors

Unlike artificial intelligence which fully controls a process to complete a task, cognitive tech serves as an assistant instead of the one completing the task without having to worry about the wrong decisions taken by the ML system.

Benefits:

1. Easy to adapt to semi-automated system
2. Data backed budget that can be tweaked to fit in upcoming factors



self learning system that uses ML, Data mining algorithms visual recognition neural networks.

Learns at large scale, reason with purpose and interacts with human abilities.

Aniysizes the data input based on on images, text etc

Based on the analysis provides us recommendations, ressults etc

Automation/RPA

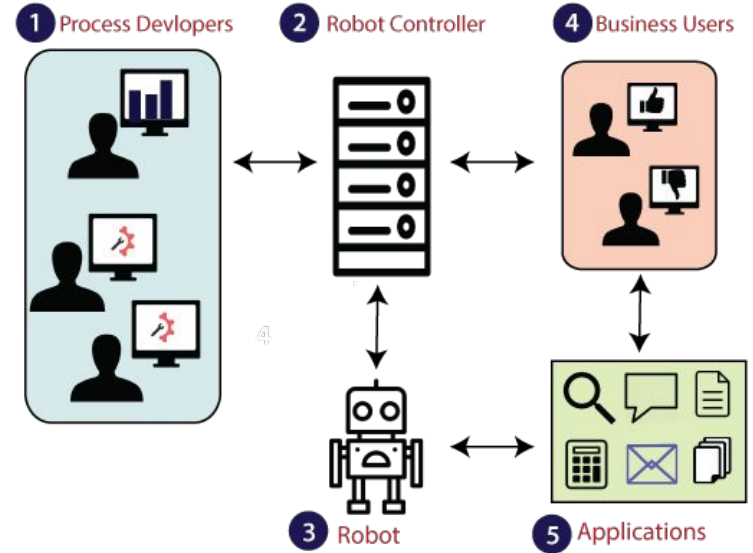
RPA can be used for mass transactions such as accountants payable and accounts receivable

Data collection, workflow and processes can be automated based on existing systems.

Budget amount should be rolled out to every entity on a quarterly basis keeping performance in check

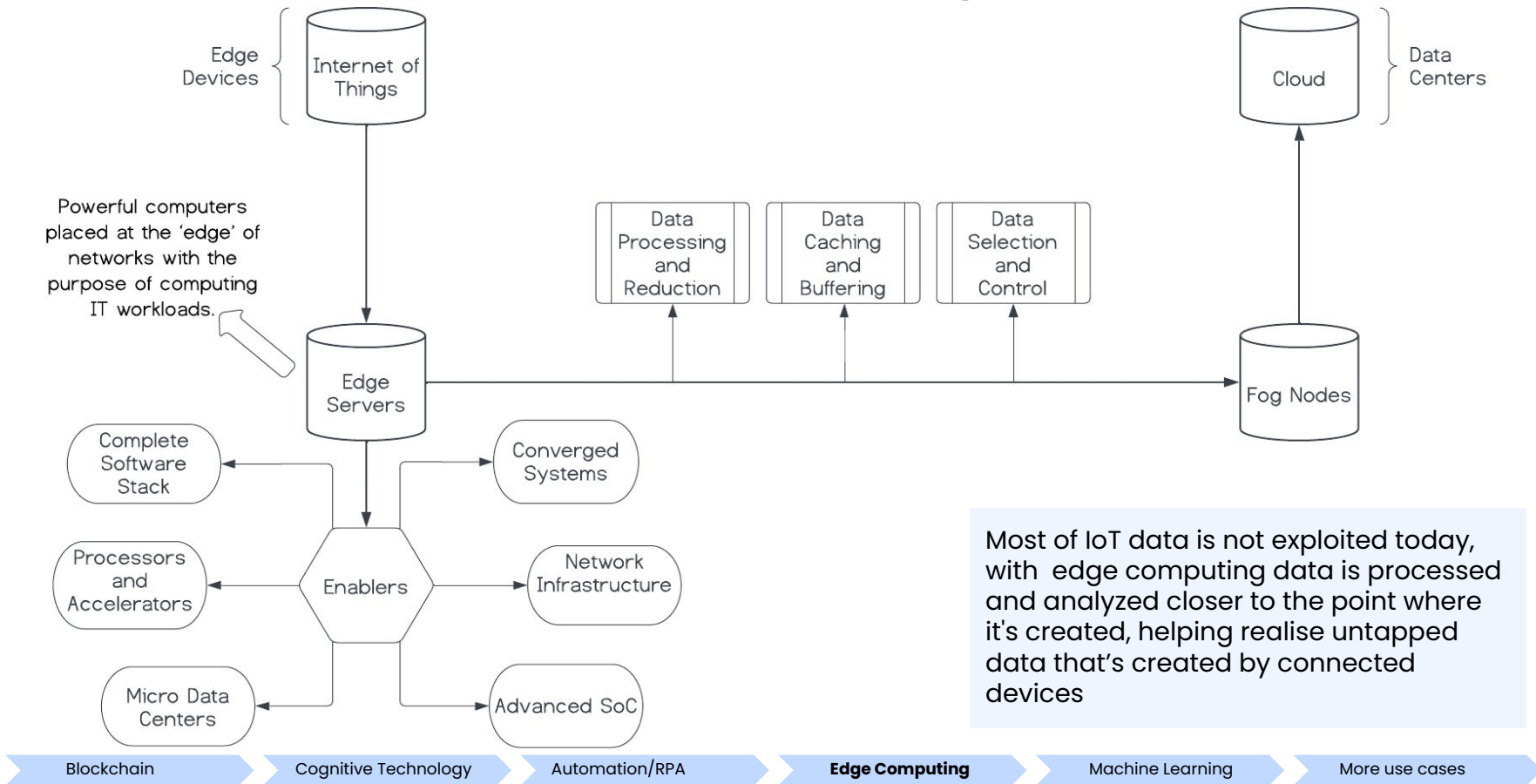
Benefits:

1. Easy access to financial data for internal auditing
2. More realistic idea of budget spend in the present year
3. Enabling data to suggest budget allocation based on previous years, leading to more realistic budget proposal



Machine learning is a subset of AI. ML uses mathematical models of data to help a computer learn without direct instruction, enabling a computer system to continue learning and improving on its own, based on experience.

How Edge Computing Works?



Machine Learning

Provision for changes in budget allocation on quarterly basis

Check on quarterly basis how scheme/departments are performing

Re-adjust the amount due in upcoming quarters based on performance

Provision for changes in budget allocation on quarterly basis

Benefits:

1. More efficient use of money, and related resources
2. Reduced chances of money leakage
3. Motive to outperform goals to increase funding

MACHINE LEARNING

A field of study that gives computers the capability to 'learn' without being explicitly programmed

Supervised Learning	Unsupervised Learning	Reinforcement Learning
Model is trained using labelled data	Model trained using unlabelled data	Model learns to take desired action through rewards and penalties
Labelled input mapped to known output	Identification of trends and patterns	No predefined data needed
Direct feedback loop	No feedback system	Reward-based feedback system
External supervision	No supervision	No supervision
Algorithms used: Linear Regression Logistic Regression KNN Support Vector Machine	Algorithms used: K-Means Apriori C-Means Associate Rule Mining	Algorithms used: Q-Learning SARSA Deep Q Network Soft Actor Critic
Primarily used to forecast outcomes	Primarily used to discover underlying patterns	Primarily used to learn a series of actions
Used in risk evaluation, forecasting, etc	Used in recommendation systems, anomaly detection, etc	Used for automation, optimization, etc

More Use Cases

IoT describes the network of physical objects (smart microwave, fitness bands, fridge, TV, footballs) embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.

Embed other data collecting devices with IoT like fax, ATMs

Enterprise resource planning (ERP) software offers single system solutions that integrate processes across the business. Such applications allow users

Integrate ERP system to existing IT infrastructure to allow more flexibility, but a centralized approach may be more efficient.

Most of IoT data is not exploited today, with **edge computing** data is processed and analyzed closer to the point where it's created, helping realise untapped data that's created by connected devices

Store all the extensive data locally for faster access and more timely analysis

Cloud computing is the on-demand availability of computer system resources (esp. data storage and computing power), without direct n active management by the user

Superficial, crucial, national/global use data should be stored over cloud



The background image shows a person's hands typing on a laptop keyboard. Overlaid on this are several digital and financial data visualizations. In the upper left, there is a network diagram with nodes and connecting lines. To its right is a bar chart with a blue line graph superimposed. In the lower right, there is a pie chart and a candlestick chart. The entire image has a blue and white color scheme with a semi-transparent brown band across the middle containing the text 'Thank You'.

Thank You