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Use of AI and Automation in Government Procurement

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Artificial Intelligence and Automation

Artificial intelligence (AI) refers to computer systems capable of performing complex tasks that historically only a human could do, such as reasoning, making decisions, or solving problems.

Keywords: Learn, Adapt, Think.

Automation is the use of technology to perform tasks with minimal human assistance. It can also be defined as the technique of making a process, system, or apparatus operate automatically.

Keywords: Rule based, repetitive.

AI and Automation are complementary. Intelligent Automation

Implementing AI Solutions

Not a magic
bullet

Use case
based

Research
work

Better data,
better results

Time to
reimagine e-
GP

Foundational Blocks

More structured data

- Vendor clicked on tender A must be stored in machine readable format
- Terms of reference for IT security audit must be stored in a machine readable format (semi-structured data)
- Define desktop computer under various parameters such as RAM, CPU, Battery, Monitor and Warranty.

Procurement Codification

- CPV and UNSPSC
- IT security audit must be identified consistently by a unique code. Then, we can compute the count of security audit tenders advertised, level of competition in that domain, time taken to complete a security audit procurement and so on.

Foundational Blocks

Standards

- Procurement codification standard. CPV and UNSPSC are two separate standards.
- Definition of work experience
- Definition of spare capacity
- Variables to measure financial capacity of a vendor

De-duplicated vendor database

- Both vendors and procuring entity users have to be uniquely identified.
- This is a crucial requirement for analytics

Global Experiences (Sample)

- Department of Health and Human Services, USA used AI to identify demand aggregation opportunities (e.g., contract vehicles). Strategic sourcing by the State of New York is similar.
- Use of chatbox in responding to user queries and for providing insights about complex procurement documents – US Air Force, El Paso City Council, Kommers Sematic check tool, YPO (The UK),
- Predicting the likelihood of tender being successful – ProZorro
- Predicting the CPV code of a product – Prozorro, CAITY Australia,
- Fraud detection – Agency for Science, Technology and Research, Singapore.
- Predicting annual demand for products – PPS, Korea
- Use of historical data to analyze estimated value of new procurement – Belgium.

Source: EU web portal

AI / Automation Application in Pre-Tendering

Planning or Forecasting (buyer)

- Function: Auto-generate the Annual Procurement Plan (APP)
- User: Buyer
- Pre-requisites: APP created in the previous years, loaded in the e-GP system as structured data (procurement codification and procuring entity characterization).
- Type: Predictive
- Accuracy: Indicative. Human intervention is essential as the APP will need to be modified to fit the current year requirements.
- Benefits:
 - Efficiency – Time taken to prepare APP will get reduced
 - Effectiveness – Quality of the APP will improve as well when the machine recommends the insertion of certain items based on the previous year data.

AI / Automation Application in Pre-Tendering

Procurement Codification

- Function: A tool is required to assist the buyers in selecting a suitable code from the common codification standard, for assigning a unique code to a procurement
- User: Buyer
- Pre-requisites:
 - A common codification standard should be used by all the procuring entities
 - The quality of the model improves with time, and it is directly proportional to the number and type of goods and services already codified.
- Type: Artificial Intelligence (AI), Natural Language Processing (NLP) and Machine Learning (ML)
- Accuracy: 90% + accuracy is the target
- Benefits:
 - Consistency in the codification of products and services will improve significantly

AI / Automation Application in Pre-Tendering

Estimate Preparation – Unit level

- Function: Compute the estimate price of an item to be procured
- User: Buyer
- Pre-requisites:
 - Location specific price information for an item
 - The items must have been codified consistently using the common codification standard
 - Data about the following deviations must be saved from the previous years
 - Cost estimate and contract award prices
 - Contract award and contract completion prices
- Type:
 - Automation – when the estimate is prepared only based on the prevailing unit prices
 - AI based prediction – when the contract deviation data is taken as input
- Accuracy: Good, to the extent the unit prices are accurate and contract deviation data is available from the previous years
- Benefits:
 - Effectiveness – Accurate estimate helps in budget compliance

AI / Automation Application in Pre-Tendering

Defining Specification

- Function: Auto-generate the specification for an item or a complex BoQ.
- User: Buyer
- Pre-requisites:
 - Specifications must have been stored in the e-GP system preferably in a structured format (i.e., parameters (Monitor) and value (14.1 inch)) or at least stored as a whole in a separate data field.
 - The procurement in the e-GP system must have been codified using a common codification standard.
- Type: Natural Language Processing (NLP)
- Accuracy: Indicative. Requires human intervention.
- Benefits:
 - Less time taken to generate the BoQ
 - Build upon the previous knowledge stored in the e-GP system

AI / Automation Application in Tendering

Customized tender alerts to sellers

- Function: Sellers should be notified about “Relevant” opportunities
- User: Sellers
- Pre-requisites:
 - The procurement in the e-GP system must have been codified using a common codification standard.
 - The e-GP system should maintain a record the areas of bidders’ “interest” in the tenders.
 - Bidders should have a provision in the e-GP system to specify their interest using the common codification standard.
- Type: Automation, Machine Learning and Artificial Intelligence
- Accuracy: Somewhat accurate in the beginning and it will gradually improve with time, as more information about the bidders’ interest is recorded in the e-GP system.
- Benefits: Average number of bidders participating in a tender will increase

AI / Automation Application in Tendering

Work Experience as a Referenceable Record

- Function: The work experiences of suppliers is published as a referenceable record, which they can cite during online bid submission.
- User: Buyer / Seller
- Pre-requisites: The e-GP system must have a facility to report the suppliers' work experience in compliance with laid down standards (e.g., OCDS)
- Type: Blockchain
- Accuracy: Excellent and complete to the extent the sellers' experiences are available. The private sector experiences and those from neighboring countries may not be available as a referenceable record.
- Benefits:
 - The sellers can cite their work experiences as a web-link instead of uploading scanned documents.
 - The buyers can process this data and use it as an input for automating technical bid evaluation.

AI / Automation Application in Tendering

Quality of Competition

- Function: A facility is required to measure the number of unique sellers operating in a subject area.
- User: Sellers / Buyers
- Pre-requisites:
 - Each seller registered in the e-GP system must be uniquely identified.
 - Each procurement must have been codified using a common codification standard.
 - The competition data must be reported as a structured data.
- Type: Blockchain and automation.
- Accuracy: Excellent.
- Benefits: Quality of competition can be measured by number with unique suppliers / number of tenders. For example: Domain 1: $20/400 = 5\%$ In domain 2: $40 / 400 = 10\%$. The quality of competition in domain 2 is better. Government needs to make an effort to monitor and enhance the quality of competition in domain 1.

AI / Automation Application in Tendering

Probable Bidders

- Function: The e-GP system will auto-generate a list of probable bidders for a live tender open for bid submission
- User: Sellers / Buyers
- Pre-requisites:
 - The tender or items in the tender must have been codified using a common codification standard.
 - Data about the bidders which participated in “similar” tenders is saved in the e-GP system
- Type: Artificial Intelligence
- Accuracy: By its very nature, it is probable.
- Benefits:
 - Bidders can know about the competition upfront.
 - The e-GP system can target and inform the probable bidders about a newly advertised tender.
- Risks: Would the system be providing the information required to enable cartelization?

AI / Automation Application in Tendering

Predict the Winning Bid Price

- Function: The e-GP system will predict the winning bid price for a live tender open for bid submission. When a bid price is quoted, the system will predict the probability of the quoted price being the lowest after the bid opening is done.
- User: Sellers / Buyers
- Pre-requisites:
 - The tender or items in the tender must have been codified using a common codification standard.
 - Data about the bidders which participated in “similar” tenders is saved in the e-GP system.
 - Estimate value and the awarded bid price must be recorded preferably at the line-item level or at least at the tender level.
- Type: Artificial Intelligence
- Accuracy: By its very nature, it is probable.
- Benefits:
 - The sellers can tune their bid price in sync with the estimate price.
 - If the difference between the actual winning bid price and the predicted bidding price is high, the estimate preparation process and the procurement categorization logic needs to be evaluated
- Risks: The government will be influencing the bid price of the sellers. What if there is a high discrepancy between the winning bid price predicted by the government and the market reality?

AI / Automation Application in Tendering

Automated Bid Evaluation (e-Catalogue)

- Function: The system automatically evaluates the bids received as per the e-Catalogue information uploaded by the bidders.
- User: Buyer / Seller
- Pre-requisites:
 - The product / service details must be defined in the e-GP system as a set of parameters (e.g. Monitor) and acceptable values (e.g., 14.1 inch and 15 inch).
 - Tender should be identified by a unique code from the unified procurement codification system.
- Type: Automation
- Accuracy: Compliance confirmation will be accurate to the extent the declaration by the seller is correct. Post qualification evaluation of the e-Catalogue can be done to confirm.
- Benefits: Bid evaluation gets expedited and is objective

AI / Automation Application in Tendering

Automated Bid Evaluation

- Function: The bids will be evaluated automatically as per a laid down formula, specific to certain types of non-catalogue procurement.
- User: Buyer / Seller
- Pre-requisites:
 - The list of data fields required to evaluate the financial and technical capacity of sellers must be identified, domain wise.
 - Tender should be identified by a unique code from the unified procurement codification system.
 - The external IT systems should report the data in a machine-readable format, preferably as a Blockchain record.
 - A formula for automated technical bid evaluation should identify the variables and their weightage allocation, specific to a certain procurement category.
- Type: Automation and Blockchain
- Accuracy: Suitable for certain types of non catalogue procurement, to the extent the bid evaluation formula aptly evaluates the sellers' abilities and the data provided by the external IT systems is accurate.
- Benefits: Bid evaluation gets expedited and is objective

AI / Automation Application in Tendering

Fraud Detection

- Function: The system verifies whether cartelization or any fraudulent or red flag behavior happened in a tender
- User: Buyer / Internal audit agency
- Pre-requisites:
 - A record of the data about past tenders should be available in the e-GP system
 - Sellers and buyers should be identified by a unique ID
- Type: Artificial Intelligence
- Accuracy: Somewhat accurate
- Benefits: When fraudulent behavior is known, the government can take suitable remedial measures.

AI / Automation Application in Post-Tendering

Contract Monitoring

- Function: The system compares the planned dates vs the actual dates to identify pattern in the project implementation delays
- User: Buyer
- Pre-requisites:
 - A record of the planned date and actual date should be stored in the e-GP system
 - The contract should be codified using a unified codification system
- Type: Machine Learning
- Accuracy: Good
- Benefits: When there are delays in a certain procurement category or by a certain buyer, suitable remedial measures can be taken. In subsequent contracts, planned dates can be defined in sync with the reality.

AI / Automation Application in Post-Tendering

Pattern recognition in contract cost variation

- Function: The system will find out the patterns if any in the contracts with cost variation (i.e., contract award and the contract completion)
- User: Buyer
- Pre-requisites:
 - The contract should be codified using a unified codification system
 - A record of the contract award price, contract variation and the final contract value should be maintained in the e-GP system.
- Type: Machine Learning
- Accuracy: Good
- Benefits: When contract variations are found in a certain type of contracts, suitable remedial measures can be taken to minimize the occurrence of such events.

Implementing AI Solutions

- A Research and Development set-up needs to be established
- Use cases have to be individually identified
- Solutions have to be implemented on a case by case basis
- Continuous impact assessment needs to be done to evaluate effectiveness of the AI solutions
- Data standardization needs to happen
- e-GP needs to re-designed to capture key data required by the AI tools to produce better quality insights.
- Most important: Insights generated by the AI system must be channelled into policy making.

THANK
YOU

