# Detailed Case Study

# Development of concept – data-driven risk-based *ex-ante* monitoring of public procurement

## Big data and data analytics-based online monitoring of public procurement

### Data-driven & risk-based methodology for monitoring digital procurement transactions using the Open Contracting Data Standard – Transformation and Analytics

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|  | **Lead Organisation**:  State Audit Service of Ukraine (SASU);  Ministry for Development of Economy, Trade and Agriculture (MDETA);  European Bank for Reconstruction and Development (EBRD). |  | **Location:** Ukraine |
|  | **Problem Statement:** In December 2017, the Public Procurement Law of Ukraine was amended to reform **ex-ante monitoring in the country**. The Law established the background for the innovative, data-driven and risk-based approach aiming to improve the public procurements digital transactions compliance to the Law and Public Procurements principles. The State Audit Service of Ukraine (SASU) became responsible for conducting monitoring for all public procurement procedures. In September 2018, the **official methodology** of compliance indicators, risk indicators and risk-prone procedures prioritisation **was approved** by the Ministry of Economic Development and Trade of Ukraine and SASU. | | |
|  | **Description:** This project aimed to demonstrate the **feasibility of a data-driven, evidence-based, and risk-based approach** to public procurement control. The assignment produced prototyped methodologies and digital tools, including a set of risk-indicators for Open Contracting Data Standard (OCDS) structured data. The proof of the concept was expected to result in the **conceptual design of the digitised monitoring process and surrounding IT infrastructure**, to identify main challenges and manage key stakeholders on their way to accept the new practice. | | |
|  | **Lessons learnt:**   * The SASU and the MDETA **should improve their capacity and knowledge** in public procurement risk management and risk assessment; * The motivation to introduce new changes to the monitoring of the public procurement should be based on a strong will to improve the processes in the way to deliver **positive results later on**; * The critical success factor to the risk-based monitoring approach is the **availability of appropriate software which should support the SASU in the monitoring of procurement performance;** * eProcurement system integration with the state official registers and other authorities will create **additional sources of information** which can be used for the development of indicators; * **Digitalisation of the procurement processes in the system** will enable more granular analysis from the risks identification perspective; * There is a need to **assess the performance of red flags and risk indicators** and to **seek opportunities to design and implement new indicators;** * Auditors needa **user-friendly risk indicators interface**, which will enable them to observe and analyse risky procedures in order to allow for improvements in the quality of monitoring and efficiency of the tools | | |
|  | **Cost:** ≈**€70 000** (the main factor impacting the cost of equivalent projects is the quality of the underlying data) |  | **Impact**: The concept that the **modern risk management process** can be implemented in the Ukrainian procurement monitoring ecosystem and that the procurement process risks **can be identified by applying automated red flags and risk indicators has been proven;** Authorised state control body (SASU) isenabled to perform its obligation prescribed by the Law via **online data-driven risk-based analysis and monitoring.** |
|  | **Human resources:** Project implemented by **EBRD and one consulting contractor**, providing expertise in risk management, business intelligence software, OCDS implementation, web applications and data analysis. |  | **Risks:** The **assumptions and judgments** made for the risk-based approach development need to be verified by peer auditors; **Data quality** is vitally important for the automated risk-based data analytical tool development;The SASU and MDETA should agree on forming a dedicated team for the administration of the tool as the **division of responsibilities** is not clear at the moment. |
|  | **Other requirements: Data available via OCDS API** | | |
|  | **Project timeline**: Nov 2018 – April 2019 |  | **Project status: In use by the SASU** since 2019 |
|  | **Email:** NiewiadE@ebrd.com |  | **Website:** Back-end solution, does not have a web site, all data are available via APIs |

#### Context and problem statement

In April 2016, the [Public Procurement Law](https://zakon.rada.gov.ua/laws/show/922-19) (Law) came into force in Ukraine. Together with the new Law, the **public procurement monitoring** procedure was introduced. The [State Audit Service of Ukraine](http://www.dkrs.gov.ua/kru/en/) was assigned as the governmental authority responsible for performing public procurement monitoring.

According to the adopted amendments to the Law, the SASU may start the procurement procedure monitoring based on the **triggered automated red flags and risk indicators** **defined by the monitoring methodology**. In this regard, the Government of Ukraine requested EBRD to assist in **developing and piloting** respective **methodology** and **automated data-driven red flags as well as risk indicators tools** for electronic public tenders’ official monitoring by SASU.

To fulfil the Law requirements, the development efforts were organised **in two projects**. Under the first project, the electronic **Auditor’s Cabinet** had to be developed and attached to the Prozorro – an open-source OCDS open data electronic public procurement system of Ukraine. The SOE “Prozorro” team took ownership of this project.

The second project focused on the development of the **automated tool,** which can provide **online analysis** of the Prozorro public procurement Open Data and **reference it against developed red flags and risk indicators automated algorithms**. The results of the analysis had to be visible in the Auditor’s Cabinet to enable state auditors to decide on monitoring initiation according to the Law.

#### Objectives and vision

Working with the EBRD GPA Technical Cooperation Facility, the SASU and the [Ministry for Development of Economy, Trade and Agriculture](https://www.me.gov.ua/?lang=en-GB) (MDETA) aimed to develop the pilot product for automated red flags and risk indicator monitoring tool in orderto **translate the “red flag and risk indicators style” risk-based methodology into automated tools for the official monitoring**. The development of the tool served to **prove the concept** that it is possible for the **modern risk management process to be implemented in the Ukrainian procurement monitoring ecosystem** and that the **procurement process risks can be identified by applying automated red flags and risk indicators** to the procurement e-data and then addressed by authorised state bodies.

The EBRD-developed vision to achieve these objectives contained two primary workstreams:

* Development of a **concept** **with the initial set of risk indicators** and a **concept of procurement procedures risk-based prioritisation** for ex-ante monitoring of the electronic public procurement procedures by SASU, in accordance with the latest amendments to the Public Procurement Law of Ukraine; and
* Development of **prototypes of indicators engine** and **risk-based procurement procedures prioritisation engine** for monitoring public procurement by SASU.

#### Technological solution and implementation

To deliver this project, the EBRD team performed the detailed analysis of the main factors and stakeholders influencing the monitoring process, analysed available risk management frameworks that could be applied, reviewed relevant documentation, as well as conducted series of interviews and working meetings with the process key stakeholders. The investigation resulted in an established **methodology approach** and a clear **definition of requirements** for online monitoring risk indicators, risky procedures queuing and prioritisation.

The project team described **monitoring system architecture** and **data flow** for the following electronic tool elements:

* Prozorro integration module;
* Relational database;
* Analytic tables module;
* Indicators coded algorithm library;
* Indicators integration and calculation module (risks calculation engine);
* Queue module;
* Queue API.

Following the theoretical exploration, the developed methodology was embedded into the **prototypes of electronic tools**, which were successfully piloted by SASU with support of the EBRD. These e-tools included:

* **Risk engine application** which can perform red flags and risk indicators online automated calculation. The calculation is based on the referencing the public procurement procedures Open Data from the Prozorro system against designed red flags and risk indicators algorithms and stored in the library. Once the algorithm conditions are met, the **application marks the procurement procedure** with a respective red flag/risk indicators “positive” sign. This application checks the algorithms condition **periodically** and **updates the results**. The risk engine application also allows built-in **managing parameters** attached to the automated indicator, such as “likelihood” and “impact”.
* **Queuing and prioritisation engine** – the application which collects public procurement procedures with positive red flags and risk indicators (risky procedures)referenced by Risk Engine. This application **prioritises procedures in the queue** by using an algorithm of ranking procedures with risks based on the number of red flags and risk indicators, positive calculation results and procurement procedure value. This engine allows the of building procedures with risks prioritised queues for each region of Ukraine.
* **Application Programming Interfaces (APIs)** – created for querying information from Prozorro system and allows the querying of calculation results by Auditors Cabinet.

All prototypes were transferred to the Prozorro system administrator for management, maintenance and further development in line with the dedicated official methodology evolution.

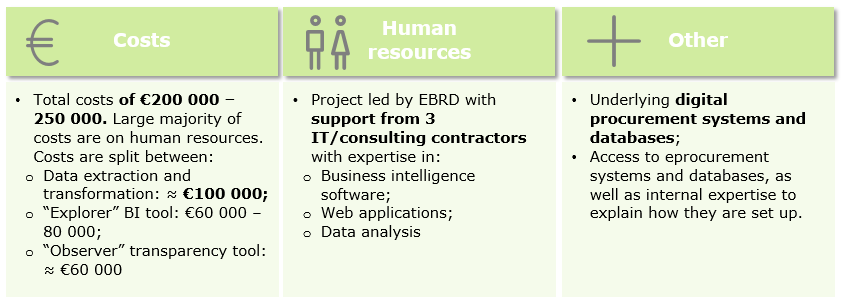
#### Results and future expectations

The proof of the concept **provided a vision of ex-ante monitoring on comprehensive scale** in line with the Law provisions, **demonstrated the feasibility** of the risk-based and data-driven approach to monitoring of public procurements in the Prozorro environment and **verified that designed methodologies and developed tools had practical potential**.

The Prozorro **successfully launched the innovative pieces of technologies** – **Indicators engine** for automated calculation of data-based risk indicators and **Prioritisation engine** for automated selections of procedures with a high-risk score for monitoring by the SASU – that can yield significant benefits to the Prozorro ecosystem and its controls environment by combining risk management concept, Open Data opportunities and up to the minute data analytics technologies.

Finally, the SASU took the designed methodologies as a basis for the official decree on public procurement monitoring, **which was approved in October 2018**. Ukrainian state auditors developed their basic capacity to deliver the newly introduced responsibilities, and **for the year 2019, they covered by monitoring 6% in quantity and 20% in value of above threshold public procurement transactions**.

#### Costs and requirements



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| * Total costs **of** ≈**€70,000** for the development of the concept of risk indicators and prototypes of risk-based indicators and transactions prioritisation engines for the ex-ante monitoring of public eProcurement | * Project led by the EBRD with **support from one IT/consulting contractor** with expertise in:   + Risk management;   + Business intelligence software;   + OCDS implementation;   + Web applications;   + Data analysis. | Data available via OCDS API |

The development of the risk indicators concept as well as prototypes of risk-based indicators and transactions prioritisation engines for the ex-ante monitoring of public eProcurement cost about **€70 000**. The **breakdown of costs** is roughly as follows:

* A developed concept with the initial set of risk indicators for ex-ante monitoring of the electronic public procurement tenders by the State Audit Service of Ukraine, in accordance with the latest amendments to the Public Procurement Law of Ukraine – roughly **€20 000**.
* A developed concept of online procurement procedures risk-based prioritisation for ex-ante monitoring of electronic public procurement tenders by the State Audit Service of Ukraine – roughly **€10 000**.
* A developed prototype of online risk indicators engine for monitoring electronic public procurement by the State Audit Service of Ukraine – roughly **€20 000**.
* A developed prototype of online transactions queuing and prioritisation engine for monitoring electronic public procurement tenders by the State Audit Service of Ukraine – roughly **€10 000**.

In terms of the **human resources required for the project**, the EBRD worked with one IT consulting contractor with expertise in risk management, BI software, data analysis, OCDS implementation and web applications development.

#### Risk and mitigation

* During the project implementation, **critical assumptions were applied when identifying the level of the risk attributable** to each procurement procedure with positive red flags and risk indicators calculation results. To maintain a flexible approach, these assumptions were translated to the developed monitoring tool as **variables which can be adjusted to the required level**. It is expected that the SASU will assess the appropriateness of the current assumptions and values and suggest required changes. Moreover, these **assumptions should be reviewed periodically as a part of the risk and monitoring performance assessment process** (at least twice a year).
* **Data quality is vitally important to any automated risk-based data analytical tool**. The low level of confidence in the data utilised by monitoring tools significantly decreases the chances of those tools being widely used by its intended users. The **data quality issues** that were encountered and the **limited sources of the data** reduced the options to develop and implement a range of automated red flags and risk indicators which could be used for effective identification of risks associated with the procurement process. In this regard, a **system of sound Data Quality Management should be established**, which will be able to identify and address data quality issues and opportunities for improving the level of overall data quality in the eProcurement system.
* **The SASU and MDETA should agree on forming a dedicated team for the administration of the tool** as the division of responsibilities is not clear at the moment. Ideally, this team should consist of IT personnel who will be supporting the operation of the tool and rectifying any outage or other system failures.

#### Challenges and lessons learnt

Some lessons that can be taken from this project and suggestions of what could be done to improve the monitoring concept, methodology and developed technologies include the following:

* **The SASU and the MDETA should improve their capacity and knowledge in public procurement risk management and risk assessment.** A risk-based approach should be applied to assess the effectiveness of the public procurement process. The automated red flags and risk indicators should be mapped to the respective risks and be used to identify those risks and address them through the monitoring procedures.
* **The motivation to introduce new changes to the monitoring of the public procurement should be based on a strong will to improve the processes in the way to deliver positive results later on**. For this purpose, in addition to the development of the risk management framework, the SASU and MDETAshould build a clear vision on their desired results and develop KPIs to be able to assess these results. The new methodology is the joint responsibility of the SASU and MDETA, and both these state authorities should be accountable for its successful performance.
* The critical success factor to the risk-based monitoring approach is the **availability of appropriate software which should support the SASU in the monitoring of procurement performance**. We believe that MDETAhas the opportunity to provide necessary support while developing software required by the Law. However, the functionality of this software should not be limited by the high-level requirements captured in legal documents. Therefore, the SASU and MDETAshould closely cooperate and develop the software with functionality that will support procurement monitoring to the highest standards.
* Prozorro system integration with the State official registers and other authorities will create **additional sources of information** which can be used for the development of indicators. For example, integration with State Treasury will allow the **tracking of each contract’s cash flow** and provide **valuable insights on contract performance**. Integration with the State legal entities will enable the creation of red flags and risk indicators based on information from this register to **identify connections between process participants** andto **verify their legal entity status.**
* A lot of critical procurement processes in the Prozorro system **are still manual, and only scanned documents are attached**. The technologies which can analyse scanned documents are expensive and deliver little benefits. Therefore, **digitalisation of the processes in the system** will enable more granular analysis from the risks identification perspective and help to achieve full digitalisation of the public procurement system. For example, contracts are manually signed, and scanned copies attached to the contract record in Prozorro, and this should be updated to enable the creation and signature of electronic contracts in the Prozorro system.
* **A working group of analysts and risk experts should be created** to meet periodically and perform an assessment of the conditions within the procurement system of Ukraine. This team should facilitate the **assessment of the performance of the red flags and risk indicators** and **seek opportunities to design and implement new indicators** which will be able to detect other risks in the public procurement system of Ukraine.
* There is a need to create an electronic library with **detailed guidance on how to perform monitoring efficiently and effectively**. This library should contain supporting documents in an electronic format.
* Auditors need an **analytical infrastructure which will enable analysis and reporting** on public procurement procedures that have been monitored and which will increase transparency and accountability of the SASU. It could be achieved by a simplified process for the publication of monitoring reports and their structured analysis.
* There is a necessity for **analytical** **infrastructure to conduct a granular analysis** of Contracting Authorities, suppliers, regions and so on using historical data on calculated risk indicators and risk assessment **which will enable the comparison of results on red flags and risk indicators calculations with monitoring instances initiated and conclusion made**.
* Auditors needa **user-friendly risk indicators interface**, which will enable them to observe and analyse risky procedures in order to allow for improvements in the quality of monitoring and efficiency of the tools.