



Application Submission Attachments

Smart Labour Market Oversight Model

Best AI Application Adoption Category

Ministry of Human Resources & Social Development

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01

Project Overview

What it is: The Suspicion Control Engine is an intelligent system built on AI and advanced analytics technologies, aimed at detecting fraud and manipulation in the labor market. It analyzes data and behavioral patterns to identify suspicious activities in Ministry of Human Resources & Social Development services — such as work permit renewals, contracts, and visa issuances.

Key Beneficiaries

+5 Million

Establishments

+11 Million

Workforce

+90 Million

Work Permit Transactions

Multiple Agencies

Regulators & Decision Makers

In fulfillment of the Ministry of Human Resources & Social Development's role in shaping public policy for labor systems in both public and private sectors, and in pursuit of the strategic objectives outlined in Saudi Vision 2030 programs — comprising more than 12 targets — the Ministry launched numerous programs and initiatives. Among the most prominent is the Suspicion Control Engine, which contributed to Saudi Arabia's ranking of 16th in the IMD World Competitiveness Yearbook and 5th in the Labor Market pillar.

Key outcomes include: a decrease in unemployment to 7%, an increase in women's labor market participation to 33%, and over 47% of graduates entering the workforce within 6 months.

1 Ministry HR Strategy

Raise labor market compliance

Support labor market reforms

Improve working conditions for expatriates

2 National Transformation Program

Shift to smart government

Invest in emerging technologies

Empower society segments to enter the labor market

3 Human Capability Development Program

Align education outcomes with market needs

Increase women's participation

Improve youth readiness for the workforce

88%

Automation Rate

Automated 88% of suspicion control operations using AI, improving targeting accuracy and data quality, supporting AI-based decision-making.

90%

Cost Reduction

Reduced operational costs by 90% by cutting reliance on field inspections and redirecting HR toward higher-value tasks.

40,000

Hours Saved/Month

Saved 40,000+ work hours monthly (87% productivity boost) by automating processing procedures and intelligent case classification.

3 Days

Decision Cycle

Reduced decision cycles from 25 days to just 3 days, dramatically improving response time for critical cases.

Innovative Solution: An innovative solution developed to address fraud and non-compliance in the labor market by transforming data into an effective tool for detecting violations. The engine analyzes large volumes of operational data related to establishments and workers to detect abnormal behaviors indicative of manipulation or fraud.

Proactive Approach: The engine operates proactively — it does not wait for reports or complaints, but rather analyzes behavioral patterns of establishments to detect cases such as sham Saudization or illegal use of work permits.

Technologies Used: Large Language Models (LLMs), Natural Language Processing (NLP), and Advanced Analytics.

Additional Benefits: Beyond its regulatory role, the engine improves data quality and analyzes regulatory gaps, enhancing the Ministry's policy development capabilities.

Monitoring Suspicious Patterns in the Labor Market

The engine uses advanced models to analyze labor market dynamics, detecting patterns related to establishment and workforce behavior:

- Sham Saudization: Detecting establishments that suddenly hire large numbers of Saudis to benefit from Ministry services, then lay them off to avoid Nitaqat program policies.
- Profession-Activity Inconsistency: Detecting establishments employing workers in professions unrelated to their economic activity, indicating potential manipulation.

Intelligent Big Data Analysis

The engine has advanced analytical capabilities enabling it to explore millions of records from multiple sources and systems. It uses AI technologies and statistical analytics to identify suspicious behaviors and analyze user behavior, enabling detection of cases that are difficult to observe through traditional manual inspection.

Clear & Easy-to-Understand Reports

The engine provides analytical reports showcasing discovered violations, key statistics, and pattern analysis from multiple perspectives. Data is presented in a simplified, decision-support format.

Data Quality & Closing Regulatory Gaps

The engine goes beyond detecting violations — it also helps improve operational data quality by revealing weaknesses and gaps in existing policies and services. This enables more precise and flexible redesign of systems and policies, reducing gaps that could be exploited by establishments and individuals.

BEFORE

- Relied on manual complaints as main trigger
- Cases manually referred to field inspection teams
- Decisions based on inspector judgment — no unified standards
- No proactive AI analysis
- Inconsistent workflows; variable quality

AFTER

- Smart indicators from proactive data analysis
- Cases automatically identified and classified by severity
- Decisions based on AI models and unified standards
- Proactive AI and statistical analysis
- Integrated digital workflow; standardized quality

Previous Workflow Challenges

1. Complaints & Reports

Monitoring relied on manual complaints, without leveraging smart indicators derived from data analysis.

2. Field Inspections

Cases referred to field inspection teams who visited sites manually to verify fraud or violations.

3. Corrective Report

Corrective action taken based on inspector judgment, lacking unified standards for detecting or classifying suspicion levels.

Impact of Challenges

- Inconsistency in case classification → reduced speed and accuracy of decision-making
- Delayed intervention → manual oversight increased risk of misclassification
- Limited coverage → high operational cost and resource constraints prevented detection of many violations

Ministry systems register over 90 million work permit transactions annually, with data for 11+ million workers across 5+ million establishments. This massive volume, combined with diverse data sources and systems, made monitoring complex. Sophisticated behaviors emerged that are difficult to detect through traditional means — requiring smart technologies capable of understanding deep data interconnections and proactively identifying violations.

+5 Million

Establishments

+11 Million

Workers

+90 Million

Work Permit Transactions

- Vast data volume — millions of records from contracts, wages, insurance, and permit renewal transactions are impossible to manually examine.
- Emergence of sophisticated behaviors that can only be detected through smart technologies understanding data interconnections.
- Fragmented data sources and diverse systems used in submission and tracking.

An innovative technical solution is required — a comprehensive model relying on AI and big data analysis, adopting AI algorithms and pattern analysis to proactively detect manipulation. The solution includes:

Multiple Data Sources

Data collected from work permit issuance and renewal systems, Ajeer and Qiwa platforms, support systems, and establishment databases. Data integrated via a Semantic Layer for concept unification and deduplication.

Data Lakes & Warehouses

Collect and store data from various systems. Data Lakes store raw structured and unstructured data; Data Warehouses organize structured data for analysis.

Behavior & Pattern Analysis

Aims to detect abnormal behaviors of establishments and individuals using AI to identify repetition or sudden data changes — enabling proactive detection of manipulation such as sham Saudization and occupation-activity inconsistency.

PREVIOUS OPERATIONS	CURRENT OPERATIONS
Relied on manual complaints as starting point	Relies on smart indicators from proactive data analysis
Reports manually transferred to field inspection teams visiting establishments	Suspicion cases automatically identified via analytical models, classified by severity
Decisions based on inspector judgment — subject to varying experience and personal estimates	Decisions based on data analysis and AI models, with unified standards ensuring fairness and accuracy
Relied only on inspection bylaws without advanced analytical tools	AI models and statistical analytics support bylaws and reveal patterns invisible to manual oversight
Absent digital flow; operations disconnected and manually managed	Integrated digital methodology enhancing workflow and execution speed
Wide variance in inspector performance due to differing experience levels	Standardized criteria via automation and smart analysis, improving quality and reducing variance

Alignment with Ministry Strategy & Digital Transformation Plan

The Ministry adopted an ambitious digital strategy approved by the Digital Government Authority in March 2021, aimed at delivering innovative and secure digital solutions. Five strategic objectives were established, one of which is: Shifting to Smart Government and Investing in Emerging Technologies. This objective is measured through the number of models where the Ministry leverages emerging technologies — targeting multiple models annually.

Digital Measurement Alignment

The 'Professional Examination' solution directly relates to Work Processes — a key pillar in the digital transformation measurement methodology — by presenting an innovative model integrating smart technology into professional competency evaluation. It automates assessment using AI and data analysis, enabling accurate and reliable testing aligned with labor market requirements. This contributes to improving recruitment processes and ensuring intelligent alignment of practical skills with approved standards.

Vision: Innovative and secure digital solutions for a vibrant, empowered community and a distinguished work environment for an attractive labor market.

Level 1 Objectives

1. Shift to Smart Government and Invest in Emerging Technologies
2. Create a distinguished experience that enhances beneficiary awareness and trust
3. Transform the Ministry toward a legislative and supervisory role

Level 2 Objectives

- 1.1 Elevate digital maturity level
- 1.2 Maximize data value and adopt emerging technologies
- 1.3 Protect Ministry digital assets via cybersecurity controls
- 2.1 Improve user experience and enhance business sector relations
- 3.1 Enhance operational efficiency and contribute to financial sustainability

The Ministry embraces an AI strategic direction across its operations to enhance ambition, pillars, and enablers:

Ambition	Pillars	Enablers
Effective • Responsive • Leading Aware • Sustainable • Exporting Qualified • Ethical • Investing • Collaborative	Research & Development Digital Innovation Culture & Change Governance	Qualified HR Change Management Support Responsible Governance National Compliance



02

Innovation & Development

The Agile methodology was adopted for this project, as it is best suited to adapt to continuous changes and efficiently apply emerging technologies. Project execution spanned 10 months across multiple phases, with weekly executive committee meetings and monthly steering committee meetings.

1

Feasibility Study

2

Solution Evaluation

3

Technical Analysis

4

Development & Integration

5

System Testing

6

Launch & Operations

7

Feedback & Expansion

The testing phase of the 'Intelligent Suspicion Control Engine' is an essential step in verifying its effectiveness in detecting suspicion cases in the labor market. This testing aims to evaluate the engine's ability to analyze large and diverse datasets, identifying patterns and behaviors with high accuracy.

Criterion	Description	Measurement Method	Target	Test Result
Detection Accuracy	System's ability to correctly detect suspected cases	Correct cases detected ÷ total cases	≥ 90%	92.7%
False Alarm Rate	Cases flagged by system but found non-violating	False alarms ÷ total alarms	≤ 10%	7.3%
Case Processing Time	Time from detection to referral for inspection	Average time in hours/days	< 24 hours	40 min
System Integration	Success of technical integration with databases	Technical assessment	Full success	Full success ✓

After multiple trials and tests across different large language models, the Gemini model achieved the highest efficiency and accuracy in the Occupation-Activity Matching Engine — one of the suspicion control patterns. Models are selected based on data type, analytical purpose, and accuracy in handling Arabic language and local context.

GPT

Accuracy: 87.9%
Speed: 12 sec/resp
Tested

GROK

Accuracy: 88.4%
Speed: 11 sec/resp
Tested

Gemini

Accuracy: Highest
Speed: Best
★ Selected

LLAMA

Accuracy: Tested
Speed: Evaluated
Compared

Gemma-3-27B

Accuracy: Tested
Speed: Evaluated
27B params

1. Innovative Technical Solutions

- Advanced Big Data Analytics — explores millions of records, revealing patterns invisible through traditional methods
- Proactive Suspicious Pattern Detection — dynamic behavior analysis for establishments and workers
- Intelligent Case Classification — AI algorithms (LLMs) classify cases by severity level
- Unified Analytical Standards — combined AI and statistical indicators create fair, consistent framework

2. Proactive Services for Beneficiaries

- Clear & Easy-to-Understand Reports (Visualizations & Dashboards)
- Improved Operational Data Quality — internal data improvement and platform integration
- Resource Optimization & Reduced Field Intervention — automatic case detection minimizes manual inspection
- Enhanced Response Efficiency — early detection enables immediate action before violations escalate

1. Continuous Model Training (AIOps/MLOps)

The innovative solution relies on continuous training without rebuilding the entire system — ensuring adaptability to regulatory changes and new violation types.

2. Flexible & Scalable Architecture

Modular system design allowing new data sources to be added to the cloud infrastructure, with automatic scaling of data warehouse size and processing capacity.

3. Flexible Integration Mechanism (ETL tools)

Seamless integration with existing Ministry systems (Ajeer, Qiwa) ensuring efficient data flow and avoiding duplication of effort and cost.

Business Sustainability: Steering committee (monthly) + Executive committee (bi-weekly) + 3-year roadmap for pattern expansion + Continuous training for support team.



03

Technology Use & Governance

AI was comprehensively integrated into the Suspicion Control Engine to enhance oversight efficiency, improve processing quality, and proactively detect manipulation cases.

Large Language Models (LLMs)

Used in the Occupation-Activity Matching Engine to analyze alignment between worker occupations and establishment economic activities. Gemini model selected for highest efficiency and accuracy with Arabic language and local context.

Classification & Regression Models

Analyzing millions of records to discover behavioral patterns, classify cases by severity level, and generate real-time reports supporting fast, transparent decision-making.

Advanced Big Data Analytics

Time Series analysis, Classification and Clustering techniques to detect unusual or illogical changes — facilitating detection of potential manipulation or fraud cases.

Data Visualization & Dashboards

Interactive dashboards and multiple display modes help oversight teams and decision-makers review discovered cases clearly and quickly, supporting data-driven intervention.

Advanced Data Analytics

Example: Statistical clustering, Descriptive Statistics

Artificial Intelligence (AI)

Example: Large Language Models (LLMs)

Data Engineering

Example: ETL/ELT Pipelines

Visualizations & Dashboards

Example: Bar/Line charts, Interactive dashboards

The proposed architectural solution relies on multiple tools and technologies to detect abnormal patterns using advanced data processing and AI models, within a secure cloud environment (Google Cloud Platform — GCP), certified as 'Class C' by the Communications, Space & Technology Commission (CST), with strong encryption and data security standards (ISO 27001, AES-256).



The project's technical environment was governed and protected through application of international standards in quality management, information security management, services management, and business continuity:

ISO 27001

Information Security Management — protecting confidentiality, integrity, and availability of information through ISMS.

ISO 20000

IT Service Management — improving quality of IT services and achieving beneficiary requirements compliance.

ISO 9001

Quality Management Systems — designing and improving quality in service design and operations.

ISO 38500

IT Governance — ensuring governance of the technical environment throughout all stages of development, implementation, launch, and operations.

ISO 22301

Business Continuity Management — ensuring continuity of service delivery and rapid system recovery in disasters.

ISO 31000

Risk Management — ensuring risk management to minimize risks and avoid their impact on projects and products.



04

Performance & Achieved Impact

Service Quality Improvement

AI enabled proactive detection of inconsistent and suspicious cases — such as sham employment or occupation-activity mismatches — based on intelligent analysis of millions of records, raising procedural credibility and improving regulatory fairness.

Enhanced Decision Accuracy

Cases classified by severity using advanced AI models, reducing reliance on personal estimates and accelerating decisions with higher reliability and transparency.

Improved User Experience

Automated most monitoring and verification steps without direct manual intervention, accelerating the procedural cycle and reducing processing time. Regulatory bodies receive real-time alerts and clear indicators.

Optimized Resource Management

AI adoption saved 40,000+ work hours monthly, reduced operational costs by 90%, and redirected resources toward priority cases only.

Establishments & Workforce

The engine reduces irregular practices harming compliant establishments and distorting fair competition. It limits ghost employment and sham Saudization, positively impacting genuine employment opportunities for national workforce.

Decision Makers & Policy Developers

Enables decision-makers to make decisions based on real indicators from pattern and behavioral analysis in the labor market. Helps review and update regulatory policies by revealing exploited gaps.

Regulatory & Supervisory Bodies

An advanced empowerment tool for Ministry oversight teams, enhancing proactive fraud detection through data-driven analytics. Provides precise digital and analytical evidence supporting investigations and required actions.

Total Beneficiaries: 3+ million establishments • 10+ million employees in Saudi labor market

88%

AUTOMATION RATE

Achieved 88% automation rate in suspicion control operations

Precise Targeting

Instead of blanket random oversight, suspicion cases are targeted precisely based on advanced data models, raising accuracy and reducing field operations.

Improved Data Quality

Enhanced data recording and analysis methods, leading to more accurate information and improved overall decision-making efficiency.

AI-Supported Decisions

Oversight teams now work with smart reports and near-real-time indicators, accelerating decision cycles and improving immediate response to critical cases.

SAR 2,250,000

MONTHLY COST SAVINGS — 90% Reduction

Reduced operational costs by SAR 2,250,000/month through eliminating expensive field visits and enabling precision targeting of violations.

Reduced Traditional Oversight Operations

Reduced reliance on costly field visits and manual inspections — saving significant costs related to transportation, accommodation, and human resources.

Optimized Oversight Resources

Directing inspection teams only to classified cases improved resource reuse, reducing excess operational expenditure.

Improved Visa Issuance Efficiency

Supported more accurate eligibility decisions, facilitating issuance of 100,000+ visas with higher quality and lower cost than traditional system.

40,000 Hours

SAVED MONTHLY — 87% Productivity Boost

Saved 40,000+ work hours monthly. Case review and decision time reduced from 25 days to just 3 working days.

Process Automation

Most suspicion cases are now automatically detected and classified without human intervention, drastically reducing required work hours.

Intelligent Case Classification

Establishments classified based on smart indicators, enabling targeted focus on critical cases and improving human effort distribution.

Accelerated Procedures

Cases can now be reviewed and decided in 3 working days instead of 25, dramatically accelerating the regulatory procedure lifecycle.

BEFORE

- Relied on manual complaints to initiate regulatory oversight
- Field visits to manually verify information at establishments
- High likelihood of missing many cases due to limitations of human-only monitoring

AFTER

- Proactive analysis of employment data to detect unusual changes
- Smart indicators detect establishments that suddenly hire ~30 Saudis in an unusually short period, then later lay them off
- Automated detection and escalation via AI systems and advanced analytics — no field visits or complaints required



Thank You