# Graph Machine Learning Recommender POC for Public Safety Agency

## The Challenge

A government agency responsible for regulating and enforcing occupational safety sought to build a content recommender proof-of-concept (POC) that leverages semantic technologies to model the relevant workplace safety domains. The agency aimed to optimize project planning and construction site design by centralizing information from siloed and unstructured sources and extracting a comprehensive view of potential safety risks and related regulations. Automatically connecting and surfacing this information in a single location via the recommender would serve to minimize time currently spent searching for content and limit burdensome manual efforts, ultimately improving risk awareness and facilitating data-driven decision-making for risk mitigation and regulatory adherence.

## The Solution

The agency partnered with EK to develop a knowledge graph-powered semantic recommendation engine with a custom front-end. Based on the use case we refined for construction site project planners, we redesigned the agency's applicable taxonomies and developed an ontology that defined relationships to model the recommendation journey from the user's inputs of construction site elements to the expected outputs of risks and regulations. With data loaded into the graph from taxonomy values and structured historical data, EK leveraged machine learning (ML) and natural language processing (NLP) techniques to extract data from the agency's large volume of structured data and generate risk recommendations from user input combinations. EK iterated upon these processes to enrich the data and fine tune the risk prediction models to achieve even more accurate results. Then, based on low-fidelity wireframes collaboratively developed and validated by the client, EK's software engineers created an interactive front-end for users to view the results and provide feedback, and ultimately deployed the application on cloud infrastructure.

Lastly, in addition to the design and development of the initial POC, EK collaborated closely with the client to assess future uses for the application, as well as methods for improving performance and utility. Potential paths for improving the application include developing user feedback mechanisms, expanding the dimensions of analysis for work sites, and expanding the scope of the application to support additional use cases. EK provided the agency with clear recommendations for next steps and paths forward to build upon the POC and further optimize construction site design and planning.

# Content Management Strategy for an International Retailer

## The EK Difference

EK employed its extensive experience in taxonomy design, ontology design, and data science with specific expertise in the development of recommender systems to capture and model the semantic content of the construction safety domain. Throughout the engagement, EK prioritized close collaboration with the client's core project team and involved their subject matter experts and stakeholders in taxonomy, ontology, and wireframe design sessions, iteratively soliciting their feedback and domain knowledge to ensure the final product would properly reflect the language and subject matter for the agency's use case. EK also provided transparency into the development of the recommender, providing thorough technical walkthroughs of the solution. This ensured the agency had all the knowledge required to make informed decisions regarding next steps to scale the solution following the end of our engagement.

## The Results

The graph-powered recommender solution delivered at the end of the engagement was a compelling POC for the client to consider for long-term application and scale. The recommendation engine provided coherent recommendations in a centralized location to reduce manual efforts for end users and displayed related regulations and supporting metrics to facilitate context-based, data-driven decision-making for construction site planners at the agency. The tailored roadmap to refine and expand the solution offered clear guidance for further data and system improvements to increase the overall utility of the recommender. With this POC and the accompanying roadmap, the agency has a tangible and effective solution with a path to scale to achieve widespread buy-in from across the organization and address more complex use cases in order to maximize the value of the recommender.

This project was an example of EK's Knowledge Graph Accelerator offering, delivering the POC to the client in 4 months.



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