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Global Nuclear Detection Architecture Tool Improvements

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In the years between 1993 and 2012 the International Atomic Energy Agency (IAEA) confirmed 2331 reports of incidents involving nuclear and radioactive materials out of regulatory control. Of those 2331 reported, 419 involved criminal activity, 615 involved theft or loss, and 1244 involved other various unauthorized activity. In an attempt to mitigate these events, an emphasis has been put on threat assessments and risk informed approaches to nuclear security. To that effort, the IAEA has developed a risk assessment course meant to build expertise in nations in order to evaluate their risk of incidents involving nuclear and radioactive materials falling out of regulatory control.

Goal: Improving the current risk assessment tool associated with the IAEA risk course

Supporting Research Areas:

I. RISK ASSESMENT SOFTWARE

My research began by conducting an environmental scan of other risk assessment tools in existence. At the highest level, my goal was to find attributes in these tools that could improve the existing tool. I looked into the platforms they ran on, their intended application area, the level of expertise required to utilize the tool, how they represented their data, and a variety of other factors that can be seen in the chart below. Additionally, to provide more clarity about the tools' processes I searched for examples of these tools being used to complete full risk assessments.

II. QUALITATIVE RISK METHODOLOGIES

My next step was to look into qualitative methodologies. Our current tool is based off a quantitative methodology that does not fully meet its objectives. For example, an improvement would increase the ease of use and understanding for non-technical users. Many qualitative methodologies express risk in terms of low, medium, and high; they are best utilized in situations where theory, data, time, or expertise are limited. I found the process of these methodologies to typically contain: identification of assets, threats, vulnerabilities, and, at times, mitigations. For data sources, many of these methodologies rely on interviews, surveys, and subject matter expertise.

III. RISK COMMUNICATION AND VISUALIZATION

One of the key areas I believed the current tool lacked was in how it communicated results. Risk communication is a vital step in the risk analysis process. The successful communication of risks can allow for a better understanding of risks and identification of mitigations, while poorly communicated risks can lead to a lack of, or inappropriate, belief and/or action. Research into this topic lead me to the conclusion that visualizations need to be suited for the specific type of data being presented. By looking into generally accepted methods of risk communication, I identified examples of common visualizations. These examples can be seen below.

Tool Name	Creator/Supporter	Application Area	Methodology	Assessment Type	Output	Platform
HAZUS	FEMA	Natural Hazards	Probabilistic	Quant/Qualitative	Loss Estimation (monetary)	Windows-based Software
IQRAS	ItemSoft	Aerospace/ military/ medical	Probabilistic / Scenario based	Quantitative	N/A	Windows-based Software
VISAR® PriSM™	TSG Solutions	All-Hazards	Industry standards/ best practices	Quantitative	Security business plan / cost estimates	N/A
RENO	ReliaSoft	Decision Making	Probabilistic - Monte Carlo	Quantitative	Risk Index	Windows compatible software
CounterMeasures	Alion	Cyber/ physical/ chemical security	Consultant surveys	Quantitative	Risk mitigations	Web Based
ExpressBCP	Consultant	Any	Likelihood	Semi - Quantitative	Risk Rating	Windows
Wynyard Risk management	Wynyard Group	Information/ operational security	Scenario based	Qualitative or Quantitative	Mitigations & Action plans	Microsoft Silverlight Application

The consolidation of data collected from the above three categories allowed me to formulate ways in which to improve the risk assessment tool moving forward. An overview of two of the recommendations are listed below:

- Updating the methodology to incorporate individual facility assessments, economic losses, and mitigation identification.
- Building levels of analysis into the tool to accommodate countries' with varying levels of resources.

