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XTRA™

Strategic Risk Management

Solve what's wrong. Prepare for what's next.

by Nabil Abu el Ata and Annie Drucbert

OVERVIEW

Today, most decision-makers function in a world of intense and rapid change. These dynamics hide risk and make it difficult to identify opportunities for improvement. The risk intelligence derived from X-TRA™ allows users to understand and evaluate how and when conditions may disrupt or improve the functioning of any business, economic, or natural system influenced by multiple complex processes, technologies, and/or environmental interdependencies.

X-TRA creates a digital twin of the physical target ecosystem to manage risk. This provides an easy and efficient way to explore the outcome of all possible time, stress, and operational scenarios—including scenarios that would be difficult to test in the real world or those without any historical precedent. By covering every variable that may directly or indirectly influence risk, the resulting analysis predictively covers known risks and leads to the discovery of unknown risks. This allows decisions to be made with confidence in the outcomes.

THE X-TRA ADVANTAGE

> The situational intelligence revealed by X-TRA makes it possible to identify problems before they occur and plan for improvements rapidly. These problems and solutions are unknown in other methods, which deliver predictions that are only valid under highly constrained conditions and at a specific point in time.

The systems-based approach of X-TRA allows for explicit recognition of feedback, interference, adaptation over time, and nonlinear behaviors that can turn a small influence into a large effect. This means that the hierarchical, mechanistic modeling solution used by X-TRA can identify complex cause-and-effect relationships horizontally and vertically across multiple scales and at any time. Combining patented graph analytics and machine learning, X-TRA identifies any circumstances that might impact the target ecosystem's cost, quantity, and/or quality performance. If a risk is discovered, X-TRA performs root cause analysis and implements pre-approved interventions or alerts system stakeholders of the risk and recommended actions.

	OTHERS provide hindsight.	**X-TRA provides foresight.**
Coverage	Static, closed loop environment	Dynamic, open environment
Inputs	Expert opinion Big data/system measurements	System interdependencies Limited high-fidelity data/system measurements Algorithmic data
Methods	Statistical model Pattern recognition	Mechanistic model Graph theory
Prediction	Approximate prediction of an outcome	Precise prediction of an outcome
Representation	Valid for under certain circumstances over short periods of time	Valid under any circumstance over longer periods of time
Risk exposure	Risk hidden if not represented in the data inputs	Risk exposed through sensitivity analysis
Risk intelligence	Know what will happen if past patterns/trends continue	Know what will happen if dynamics change

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HOW IT WORKS

A key advantage of X-TRA is that prior knowledge of what may cause a risk is unnecessary. X-TRA translates dynamics into mathematical expressions capable of delivering the same metric values that would result if real system measurements were taken under the same set of initial conditions. Only the variables and present conditions of a system need to be known to test how any future changes may impact the evolution of risk.

Once validated, the digital twin provides accurate analysis without a continuous feed of new data. By overcoming data fidelity and time dependency issues of alternative methods, X-TRA provides a powerful tool that can be used to add the missing context of complex processes, identify the root origin of risk, and control its evolution through well-planned and timely actions.

X-TRA identifies any conditions that will cause a system to deviate from a desirable or expected behavior through scenario analysis. Then, it monitors the system to ensure that actions are taken in time to avoid unwanted outcomes.

+ IDENTIFY
Predict the conditions that will cause a risk

+ ACT
Determine which changes or actions are needed

+ MONITOR
Identify new problems and apply right-time actions

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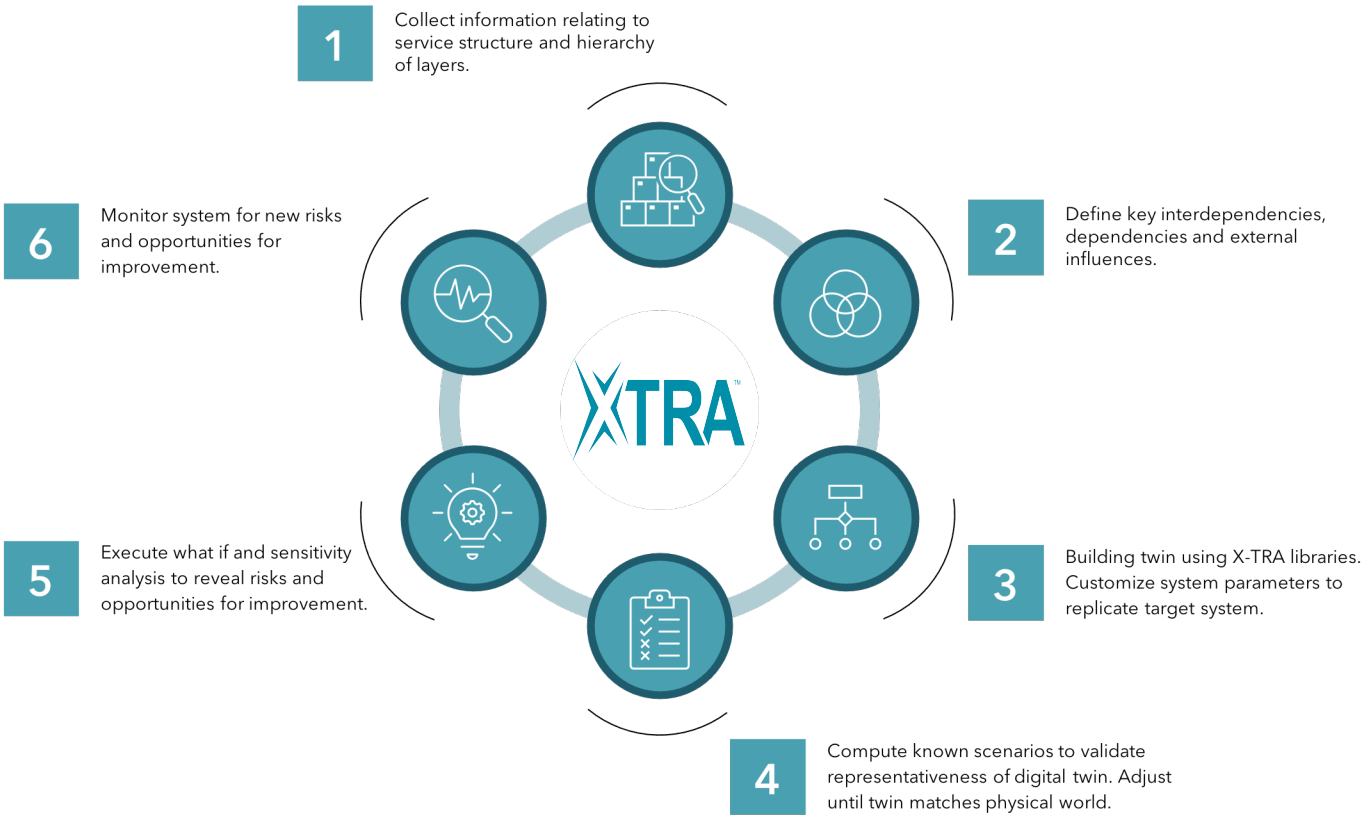
RISK DISCOVERY PROCESS



X-TRA supports a 6-step risk discovery process that starts with collecting information about the service structure and hierarchy of layers from subject matter experts and/or electronic records. Next, key interdependencies, dependencies and external influences are defined so a representative digital twin can be built using X-TRA libraries of pre-certified components. Then, customized as needed to replicate the target system digitally. This prepares users to compute a known scenario to validate the digital twin's accuracy, representativeness, and predictability.

Any differences between a real-world outcome and an X-TRA prediction provide an opportunity to reverse engineer the cause, typically resulting from missing definitions or the need to add new parameters at various levels of the model hierarchy. Identifying the missing determinants ultimately provides new insights and makes the unknowns known. Since changes can occur at any time, ongoing comparisons between the physical and digital twin provide a way to monitor risk and proactively take action to avoid unwanted outcomes.

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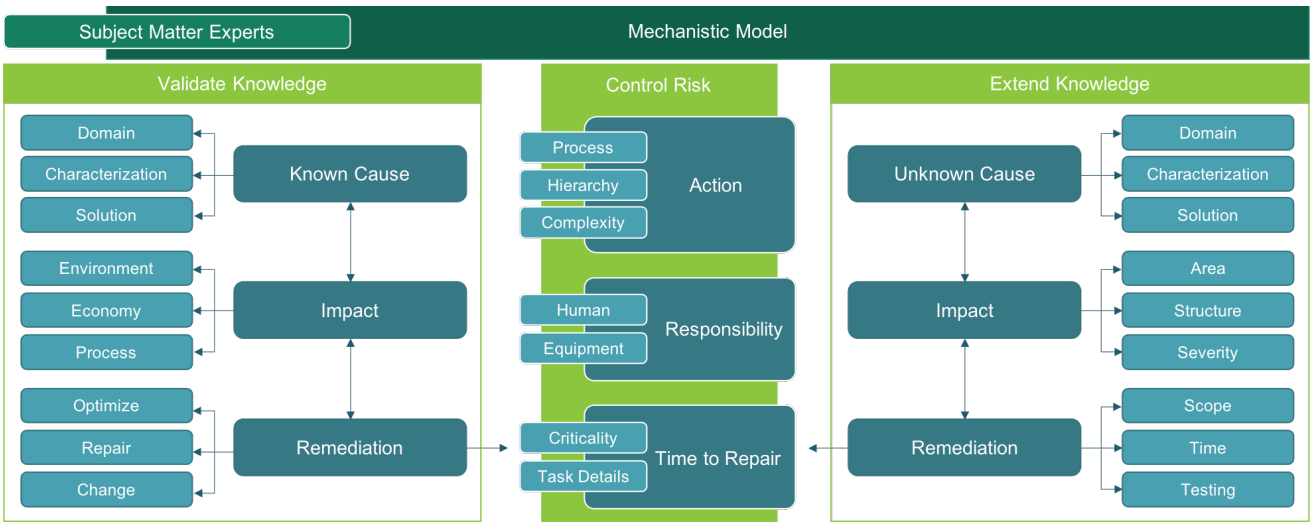
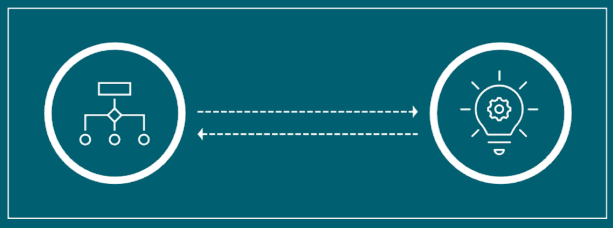
IMPROVE RISK KNOWLEDGE

The ultimate value of X-TRA is that it can quickly deliver to users something complementary and more complete than the current knowledge typically fragmented by domain. X-TRA provides the unifying framework to expose how interdependencies within and between multiple scales can amplify the risks over time or hide the solution. The X-TRA risk discovery process starts with known instances of risk, which are validated through the predictive platform and then enhanced through the accrual of algorithmic intelligence derived from scenario analysis.





The knowledge will be incomplete at the beginning of any risk discovery exercise, but as an iterative process, a relatively simplistic digital twin built from limited data and X-TRA library pre-modeled components can provide a good starting point. System changes or new insights can be added to the base dynamics' definition as the understanding of risk and the corresponding remedial actions evolves.

After the completion of the analysis, a new cycle begins, and model robustness improves. The outputs of X-TRA are used by ML algorithms both as transient inputs and as a validating framework. At the same time, machine learning helps improve the scalability of the digital twin produced by X-TRA by efficiently executing hundreds or even thousands of scenarios to identify new risk conditions and solutions. Information relating to the context and time-sensitive operating conditions that define risk and the best recourses to avoid the risk is stored in a continuously updated database as more risk maturity is gained.

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RESULTS

By providing time-dependent risk identification, X-TRA arms decision makers with the missing risk intelligence, they need to successfully navigate the modern world's complex dynamics and uncertainty. Businesses, governments, and researchers worldwide trust the multi-dimension risk analysis and AI decision-making capabilities delivered by X-TRA to make the right decisions at the right time.

Economy	X-TRA digital twin of 2008 economic crisis showed how to improve the accuracy of US Federal Reserve forecasting models
Supply Chain Management	X-TRA digital twin of French Postal Services supported strategic decisions and saved the organization $120M
Supply Chain Management	X-TRA digital twin of McDonald's 36,000 restaurant supply chain management system revealed an unknown risk that saved the company $170M
Supply Chain Management	X-TRA digital twin of Defense Authority showed how to improve the management of stock provisions and ballistic deployments
Production Intelligence	X-TRA digital twin of a French car manufacturer supported strategic expansion decisions and streamlined production leading to $30M in cost savings
Capacity Planning	X-TRA digital twin of COVID propagation identified resource criticality per countries and zones
Healthcare	X-TRA digital twin of cancer epidemiology showed how to improve cancer research, diagnosis, disease evolution and treatment intelligence
Environment	X-TRA digital twin of the ozone layer showed the influence multi-interdependencies have on global warming

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URM GROUP is committed to helping organizations mature their risk management practices to more effectively and agilely respond to risks that are growing in frequency and severity due to the dynamic complexity of our modern world. Through our research and applied use of graph technologies, we teach people how to proactively discover and control risks at the right time to avoid future surprises and unwanted outcomes. Our universal risk management methods arm business and government leaders with the foresight they need to respond confidently to changing dynamics and clearly understand which (and when) preventive and opportunistic actions should be taken to ensure the continuous efficiency and cost-effectiveness of operations.

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