X-ACT PLATFORM

USING METRICS TO GUIDE DECISIONS

How to Guide

URMGROUP

Introduction

The systems that support modern business imperatives have become infinitely more complex as they evolve to support the 24/7, global demands of our digital age. As technological innovations pave the way for new, faster and more economical ways to meet the needs of system users, operational stability is becoming an increasingly difficult goal to achieve.

Today it is impossible to rely on intuition or experience alone to manage the millions upon millions of components, dynamic interactions and interdependencies that define a modern business system. It takes an army of business and IT consultants, architects, engineers, developers, technicians and monitoring tools to keep a system running smoothly and manage the continuous change cycles being driven by constantly evolving business requirements.

Despite all the brain power and technologies behind these experts, unanticipated events still occur if an organization cannot quantify the risk caused by dynamic complexity and determine when that risk will interfere with the operational stability of a system. No matter how much big data or experience businesses accumulate, it is not possible to determine how something that has never happened before might disrupt a system in the future unless new methods of prediction are employed.

Advances in analytics and emulation, backed by machine learning sciences and increasing computational power, are changing how businesses understand the dynamic complexity of a system and manage the resulting risk. Using the advanced analytics and emulation capabilities supported by X-Act® platform, users can now identify how dynamic complexity leads to system limits, diagnose the root cause of limits and determine the best remedial actions by weighing the benefits, complexity and cost of proposed solutions.

X-Act Platform Overview

The analytics and emulation capabilities supported by X-Act platform arm business and technology leaders worldwide with the foresights they need to confidently respond to changing system dynamics and clearly understand which (and when) preventive and opportunistic actions should be taken to ensure the continuous efficiency and cost effectiveness of operations.

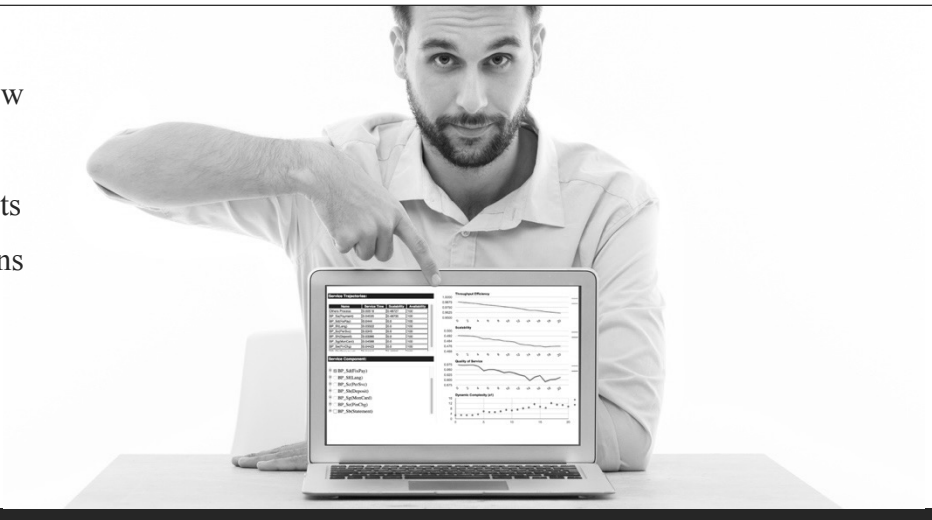
Using accurate, representative and reproducible models of business processes, applications and infrastructure, X-Act platform delivers an end-to-end emulation of a service that accurately represents the behavior of system dynamics. The emulation replaces structures, characteristics and behaviors by perturbations exerted on dynamic equations through multiple order perturbations on dynamic coordinates such as volume, service quality and cost. This is very complex math, but it is handled entirely by X-Act platform.

Once a system is transformed into an emulation, it allows users to quickly test and economically explore an unlimited number of scenarios that would otherwise be complex, expensive or even impossible to test on a real system. In comparison to other practices, such as simulation, emulation is superior in its ability to accurately replicate a system, but its biggest advantage is that it allows for the discovery of previously unknown patterns, which cannot be determined using any other method.

Now users can emulate risk because X-Act platform can mathematically reproduce unknowns that may happen under certain conditions. Once the emulation process is complete, X-Act platform users can change variables—such as volume, architecture and infrastructure or perform sensitivity predictions on changing process dynamics—to observe the outcomes (even when we have no historical record of these events ever happening).

Discovering the cause and effects of dynamic complexity is foundational to our universal risk management approach. Since conventional methods ignore the unknowns, risk often appears as a surprise that may potentially impact operational performance. To predict risk and anticipate the appropriate course of treatment, we must discover these unknowns and determine their current and future influence on system behavior.

X-Act platform users can identify how dynamic complexity creates system limits, diagnose the root cause of limits and determine the best remedial actions by weighing the benefits, complexity and cost of proposed solutions.



X-Act Platform Metrics Explained

The impact of dynamic complexity on business system dynamics is significant. Therefore, the predictive modeling, analysis and mitigation of dynamic complexity is critical for managing operational risk. To this end, X-Act platform supports the following fundamental parameters:

Dycom

Dycom represents the impact of dynamic complexity on business system metrics to express entirely the non-functional requirements that qualify and quantify the system dynamics. From this we can identify if the system is approaching an operational risk.

Dycom is a vector that represents the dynamic complexity metrics:

- Represents the degree of interdependencies
- Degree of dependencies that produce multiple impacts or feedback, for example, a feedback could be equivalent to *n* dependencies
- Degree of deepness (elements like priorities, locks, volumes, or discriminant factors, such as pay-in at the right moment, default payment, etc.)

From Dycom, we derive three more management indicators:

- **Complexity Index** (lost opportunity) is the loss due to the degree of dependencies. Computed by perturbation theory, it is a vector that shows the loss or gain in each business and system process.
- **Complexity Disruptors** (vector of causes) will be the causes that make dynamic complexity visible and eventually disruptive. It is shown as a vector (where the cause, impact and qualification appear one by one).
- **Risk Index** is an indication of risk exposure.

Risk Index

The Risk Index is a vector, mathematically derived from Dycom and artificial intelligence (AI). It represents the average availability of the system during an event. The orientation of the vector provides a good indication of the nature of risk. The gradient of the vector indicates whether the risk is internal or external through the mathematical definition.

Engineering Efficiency (E^2)

Engineering Efficiency (E^2) gives an indication of the ability of a system (company, IT-landscape, etc.) to change to more effective processing. It is defined via a function over time and will therefore indicate the ability to change system dynamics over time.

Aging Acceleration (A^2)

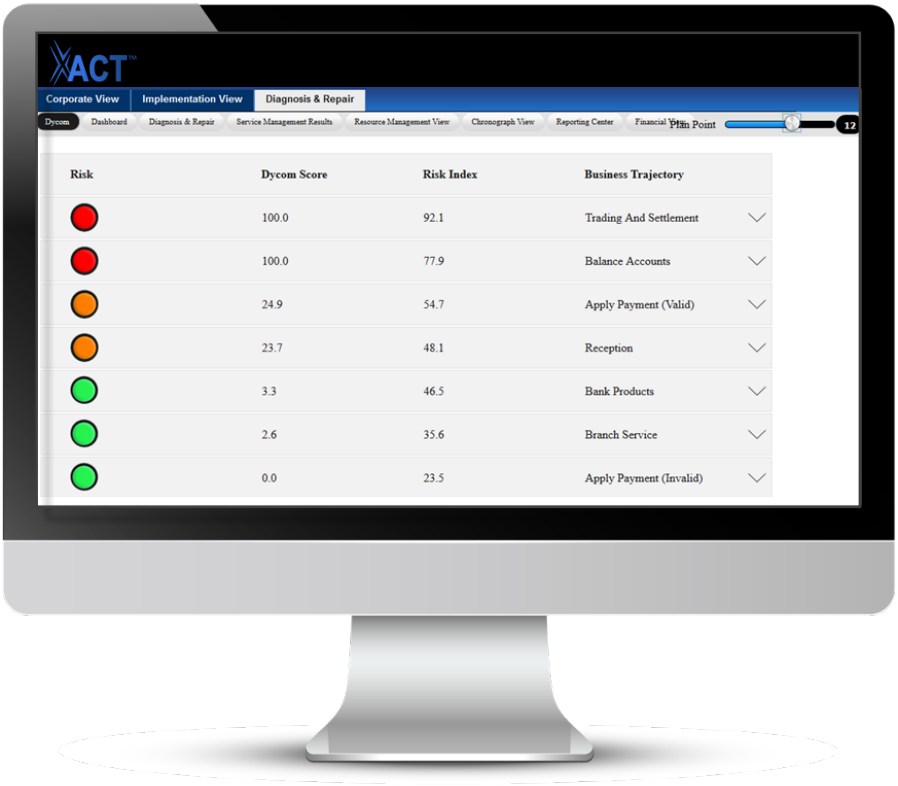
Aging Acceleration (A^2) indicates how fast a system deteriorates over time, since systems will get more and more complex if no preventive actions are taken. This may be caused by bad maintenance practices or additional functionality that has been implemented. Also, the development of new products (e.g. derivatives in a bank) may contribute to the deterioration of the system through additional complexity.

A^2 is mathematically defined by a decay function.

The X-Act Platform dashboard is color-coded to indicate the degree of problems found:

- Green indicates that no problems have been found
- Yellow should be considered as an alert that something may happen
- Red indicates a problem with an associated metric

Dycom and Risk Index are two of the most important metrics delivered through X-Act platform as they provide a high-level view of system health and risk with both quantitative as well as qualitative significance. Dycom and Risk Index scores appear in the X-Act platform reporting dashboards and help users understand if a current problem exists—or when a problem will arise using *what-if* scenarios. Additionally, the metrics help users anticipate the impact of any potential risk and explore remedial options.



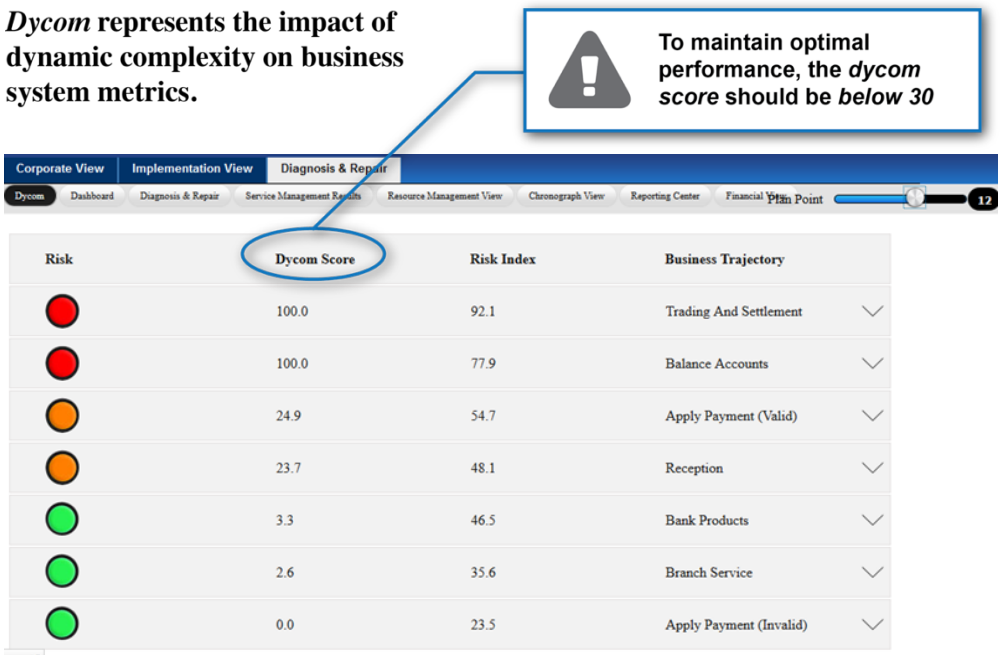
X-Act Platform
Dycom and Risk Index Dashboard

A high Dycom score lets users know that dynamic complexity is exerting a significant strain on the system. A high Risk Index score indicates there are not enough resources to meet system demands. When both Dycom and Risk Index are high, a risk may be imminent.

High Dycom score indicates that Dynamic Complexity is impacting system performance

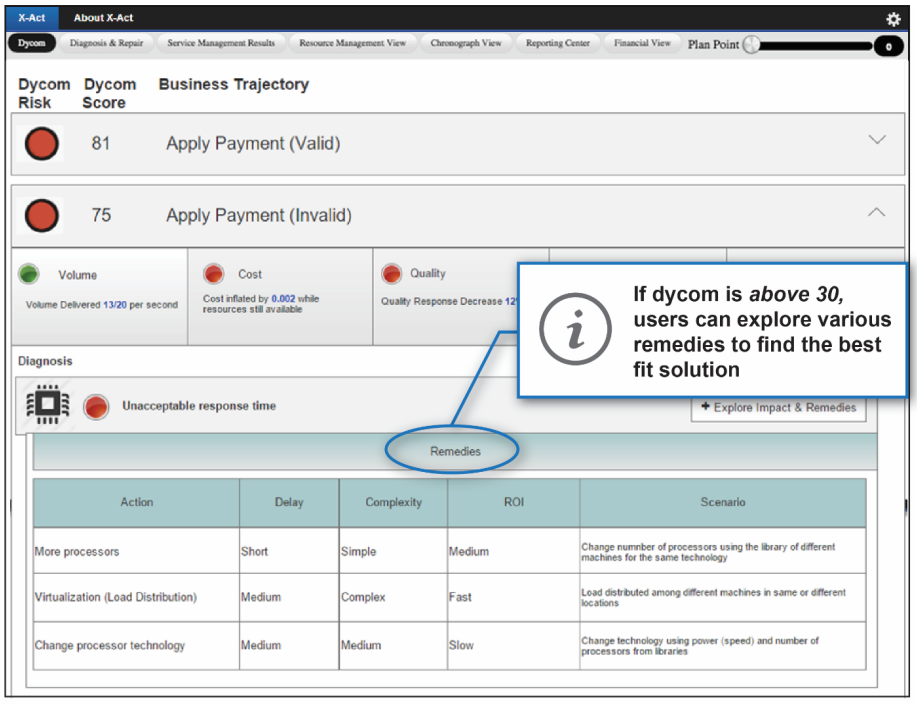
By changing the emulated system parameters within X-Act platform, users can predictively find which scenarios will cause a system disruption and evaluate the applicability of prescriptive solutions. This prepares the organization to proactively take any actions necessary to avoid future risk events.

***Dycom* represents the impact of dynamic complexity on business system metrics.**

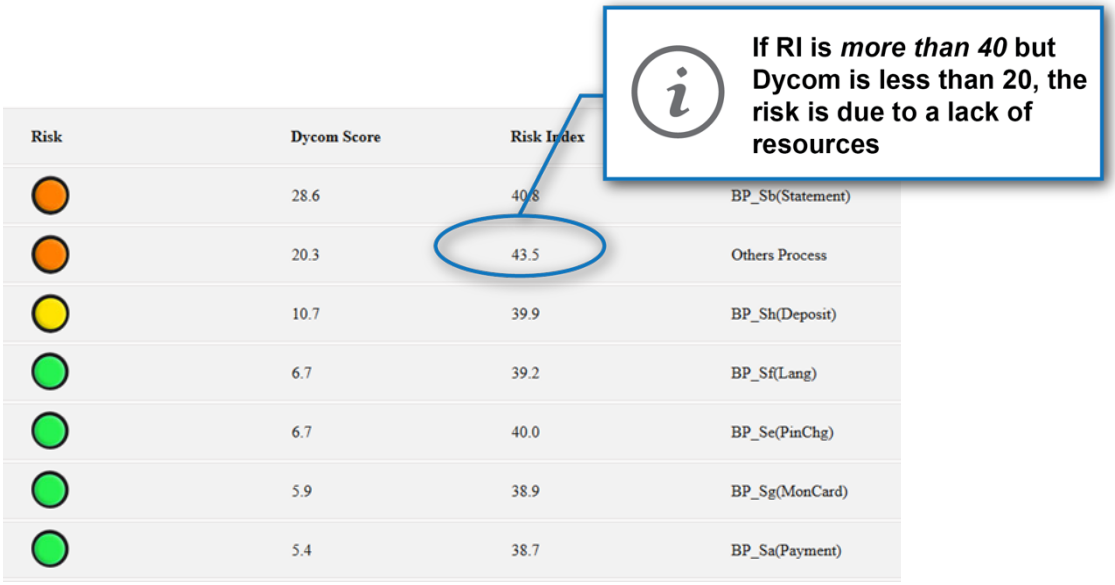


A Dycom score over 30 will lead to a reduction in throughput, meaning that the cost to deliver the same volume will begin to escalate.

Users can identify which steps should be taken to keep the Dycom score below 30 by reviewing the suggested remedies within the diagnosis dashboard.



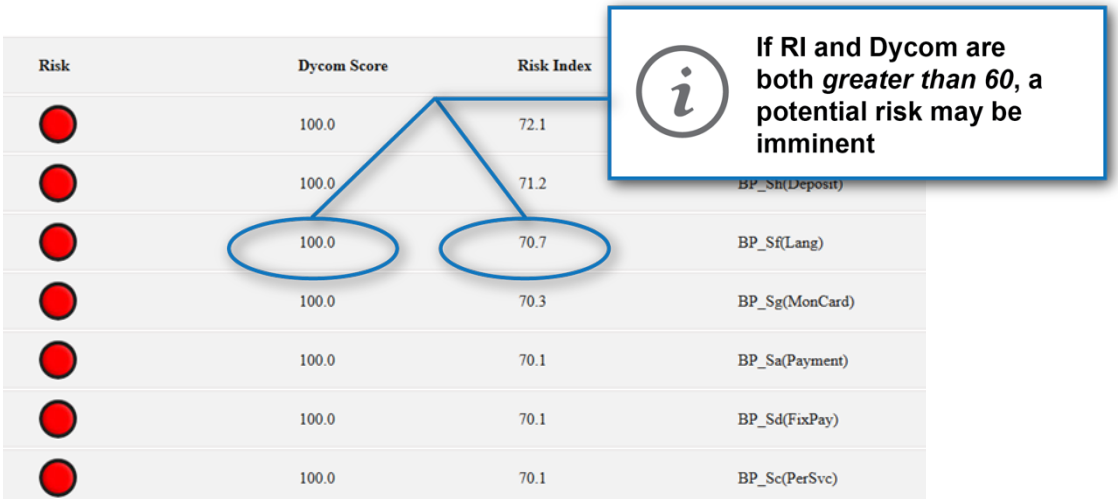
High Risk Index & low Dycom scores are due to a lack of resources



Risk	Dycom Score	Risk Index	
	28.6	40.8	BP_Sb(Statement)
	20.3	43.5	Others Process
	10.7	39.9	BP_Sh(Deposit)
	6.7	39.2	BP_Sf(Lang)
	6.7	40.0	BP_Se(PinChg)
	5.9	38.9	BP_Sg(MonCard)
	5.4	38.7	BP_Sa(Payment)

High Risk Index & high Dycom scores indicate a potential risk

High Dycom and Risk Index scores indicate a potential risk. If the problem persists, action should be taken immediately to avoid negative business outcomes.

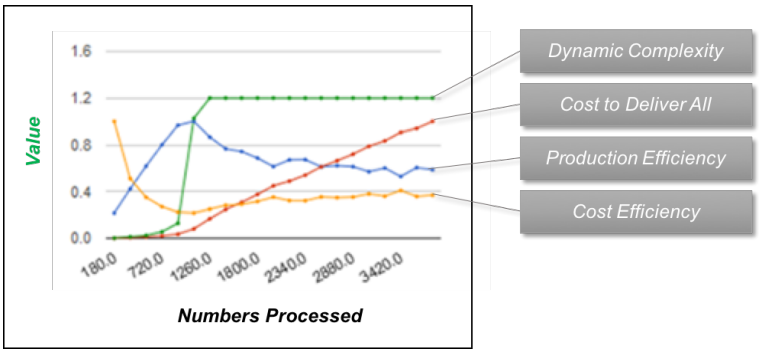


Risk	Dycom Score	Risk Index	
	100.0	72.1	
	100.0	71.2	BP_Sh(Deposit)
	100.0	70.7	BP_Sf(Lang)
	100.0	70.3	BP_Sg(MonCard)
	100.0	70.1	BP_Sa(Payment)
	100.0	70.1	BP_Sd(FixPay)
	100.0	70.1	BP_Sc(PerSvc)

Aging Acceleration

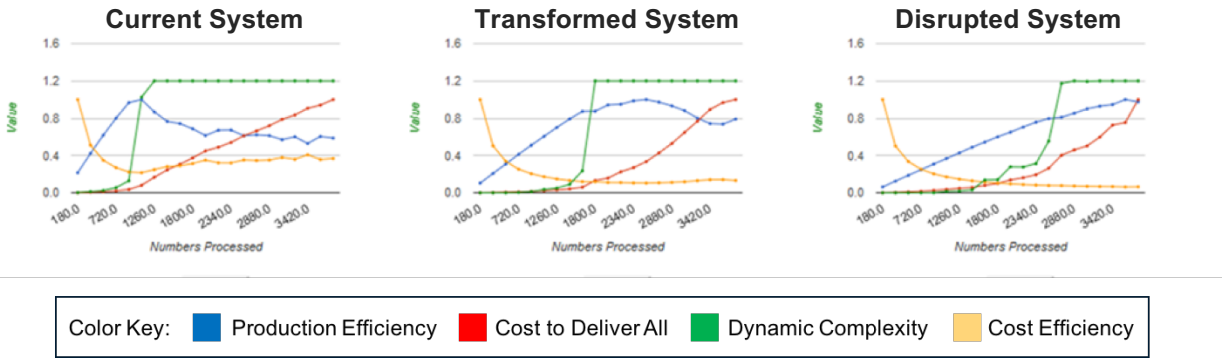
Over time a healthy business implementation will start to become less efficient in terms of cost, scalability and ability to deliver at the original capacity. This trend starts slowly, and then accelerates until it creates an operational risk. The degradation happens as a reaction to maintenance—including adaptive, competitive, technology and functional changes—when architectures are not updated to fight the effect of aging. This in turn translates into a loss in productivity, inflation of cost or degradation in time to deliver.

Aging Acceleration (A^2) is used in the calculation of results to provide an accurate prediction of how system aging will negatively impact the margin, income or quantities produced by the system. The aging trend is computed by comparing productivity, cost and time to deliver over a defined time to discover the origin that produces the negative effect. An A^2 higher than 50% suggests that a review of architecture and implementation is required, while an A^2 of 30% or less, indicates that an optimization effort should take place.



Engineering Efficiency

Engineering Efficiency (E^2) is used to measure whether a proposed engineering or transformation project will be able to decrease costs without negatively impacting the quality or quantity of units produced or full cost pricing. E^2 reflects the gain in terms of scalability, productivity and cost if the remedial actions proposed by X-Act OBC Platform were implemented—commonly derived by computing the actions necessary to inverse the aging trend and produce an efficiency gain. It may be possible for E^2 to exceed the original efficiency prior to the start of the aging trend, when considering upgrades in technology and management methods over time.



Engineering Dashboard provides metrics to help users diagnose risk and explore remedial options

The X-Act platform *Engineering Dashboard* provides the results reengineering teams need to create a systemic optimization, transformation or disruption action plan covering both the logical (architecture) and physical (system infrastructure) levels.

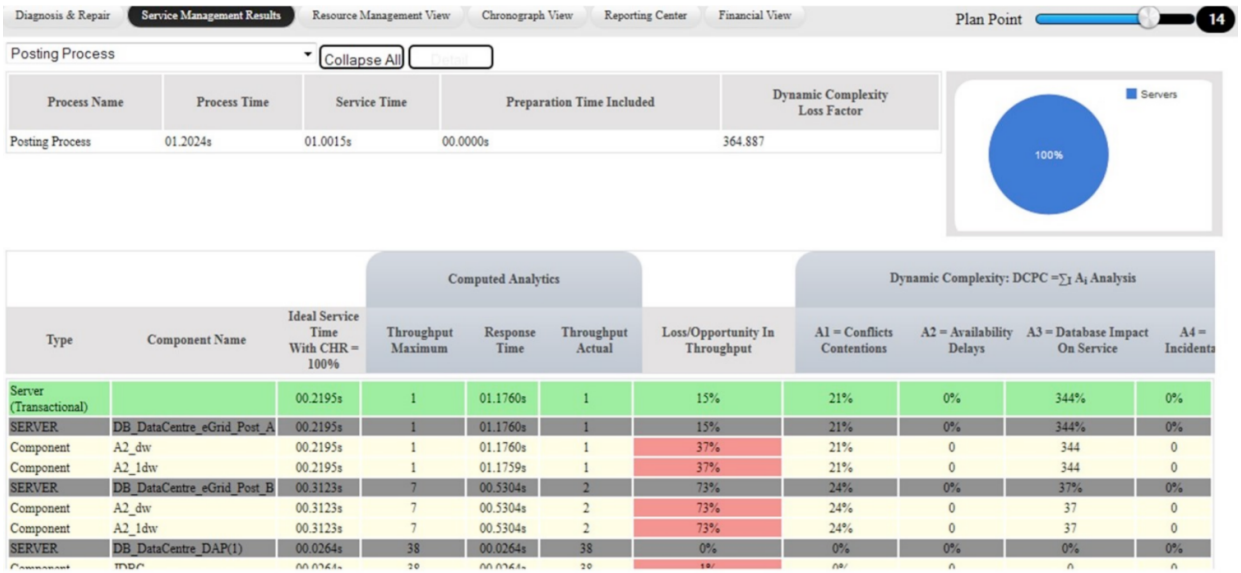
Key Indicators	The color-coded indicators in the left column of the dashboard communicate the status of availability, throughput, data access efficiency and dynamic complexity.
Productivity Index	Shows the maximum, ideal throughput that would be delivered if the system was free of dynamic complexity related issues.
Cost Variation	Shows the optimal cost in a stable, ideally loaded environment. A lower cost may be possible if favorable mix can be achieved.
Efficiency Ratio	Shows the resources consumption by the productivity ratio.
Batch Efficiency	Determines the batch window to process, move or service the demand sequence.
Complexity Gradient	Expresses the non-business related activities that consume additional resources and impact quality and throughput.
Risk Index	Exposes risk due to the presence of dynamic complexity and/or lack of resources.

In this case, the Complexity Gradient went up to 200, which means that the business has reduced access to resources and the scalability is substantially reduced for future business, but the system did not hit the singularity point since the Risk Index is very small at 0.741.

Complexity Index represents lost opportunity due to the presence of Dynamic Complexity

Complexity Index is computed by mathematical emulation and supports the analysis provided in the X-Act platform *Service Management Results* tab, which is accessible from the *Engineer Dashboard*. It represents lost opportunity due to contentions, conflicts, management overhead and combinatorial factors provoked by the presence of dynamic complexity.

The screenshot below shows a case where dynamic complexity was monopolizing resources that were supposed to produce more business, but instead resources were lost in conflicts due to dependencies and internal influences (database delays). Column A1 shows conflicts due to dependencies and Column A3 shows the external influencers, which represent the degree of interdependencies. Lost opportunities due to dynamic complexity are color coded in red.



Complexity Index Further Explained

This metric quantifies risk and shows the cause and effect relationship. If the predicted value of the Complexity Index is 20, it may mean that the company will produce 20% less cars than expected or the time to deliver will be extended by 20%. It could also represent a degradation in cash flow or an extension in ROI by 20% more time. Obviously, 100% Complexity Index represents the ultimate risk, singularity, and chaos.

Expected Output

Actual Output

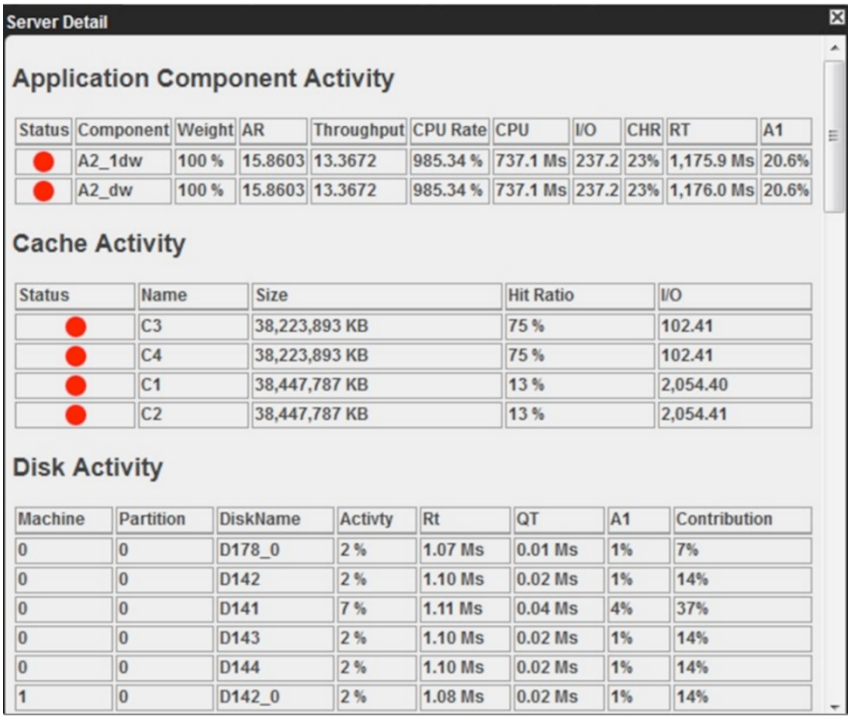
Complexity Disruptors represent the causes that provoke the propagation of risk

The Complexity Disruptors represent causes that provoke the propagation of risk due to dynamic complexity. These causes may be direct or indirect, internal or external, dormant and appear under certain conditions or represent a design deficiency. Sciences such as biosciences, chemistry, system dynamics, nuclear physics, radiative transfer, optimal control and IT applications are full of disruptors that impact dynamics. Knowing them is a guarantee of risk limitation—not knowing them can lead to incorrect diagnosis or reactive fixing of problems.

The X-Act platform screenshot below shows the case of an IT business system in which the Complexity Disruptors were the database design, memory size and SQL verbs.

A red circle in the status column indicates a critical status for the corresponding component.

A CHR lower than 70% should be considered unacceptable for businesses that wish to maintain best practices in alignment with our optimal business control (OBC) methodology.



Server Detail

Application Component Activity

Status	Component	Weight	AR	Throughput	CPU Rate	CPU	I/O	CHR	RT	A1
●	A2_1dw	100 %	15.8603	13.3672	985.34 %	737.1 Ms	237.2	23%	1,175.9 Ms	20.6%
●	A2_dw	100 %	15.8603	13.3672	985.34 %	737.1 Ms	237.2	23%	1,176.0 Ms	20.6%

Cache Activity

Status	Name	Size	Hit Ratio	I/O
●	C3	38,223,893 KB	75 %	102.41
●	C4	38,223,893 KB	75 %	102.41
●	C1	38,447,787 KB	13 %	2,054.40
●	C2	38,447,787 KB	13 %	2,054.41

Disk Activity

Machine	Partition	DiskName	Activty	Rt	QT	A1	Contribution
0	0	D178_0	2 %	1.07 Ms	0.01 Ms	1%	7%
0	0	D142	2 %	1.10 Ms	0.02 Ms	1%	14%
0	0	D141	7 %	1.11 Ms	0.04 Ms	4%	37%
0	0	D143	2 %	1.10 Ms	0.02 Ms	1%	14%
0	0	D144	2 %	1.10 Ms	0.02 Ms	1%	14%
1	0	D142_0	2 %	1.08 Ms	0.02 Ms	1%	14%

The screenshot shows a typical impact of computed dynamic complexity in which the delivery of business is reduced—in this case only 13.3 out of the 15.8 requested events per second are being served.

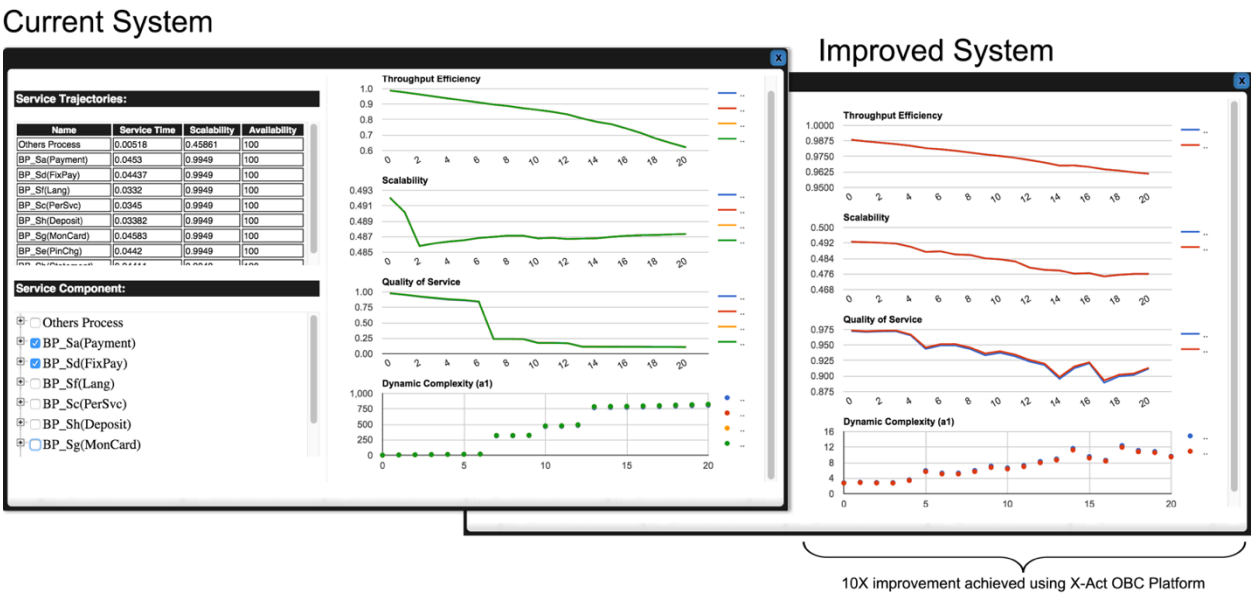
The computation indicates that the database management system is not able to deliver in a timely manner the requested data and some of the data must be fetched at a much slower service (from the disk subsystem) with a much slower response time (RT) than if the request had been served directly from the memory (adding a few micro-seconds to the RT).

The computed cache hit ratio (CHR) represents the amount of data in memory that did not move to the disk subsystem in this case the CHR of 23% represented a risk to the business.

Optimizing Outcomes

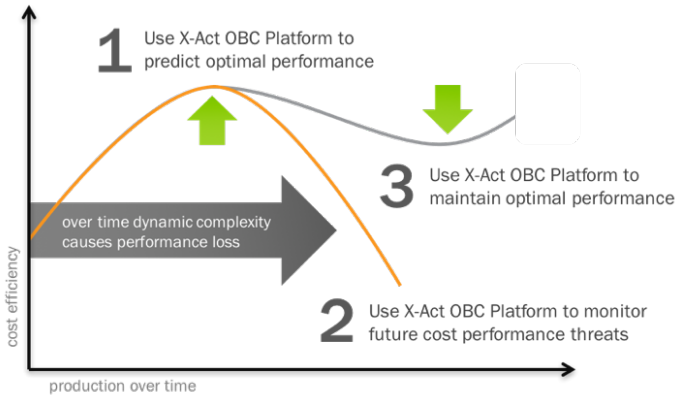
Optimal productivity equates to the delivery of business goods or services at a minimum cost, while maintaining acceptable service quality. Through our research and use of X-Act platform, we know that once we move beyond the point of optimal productivity, any additional increase in volume will cause a deterioration in productivity and an escalation in cost. Additionally, the enterprise is running sub-optimally before the optimal productivity point is reached.

To maintain a position of optimal productivity, X-Act platform can be used to create a knowledgebase of optimization actions that are predefined, evaluated and ready to use in any situation when the predictive analysis shows that the metrics of the system are moving away from the desired position.



By using the predictive and prescriptive emulation capabilities offered by X-Act platform, users can:

- Monitor the systemic enterprise characteristics and behavior in near real time
- Identify the root cause of any eventual limitation
- Use the predefined risk patterns to intervene at the right time with the right cure
- Continue to mature risk management programs by generating new patterns



Conclusion

Users of X-Act platform can mathematically predict risk events through system emulation to discover under which conditions dynamic complexity will absorb resources and takeover the planned yield, thereby deteriorating the expected quality and quantity while inflating costs. These foresights are necessary to improve the maturity of risk management practices because when *risk* is out-of-control, any manifestations of unwanted system behaviors will otherwise appear as a surprise—leaving an organization no choice but to reactively manage the risk.

If decision makers wish to proactively manage risk, they must be able to predictively examine the evolution of their business. If a persisting prediction confirms that the maximum productivity is about to be reached, the business should be prepared to either take immediate action before the degradation occurs or accept the limit and adjust business goals until reengineering is possible. In all cases, X-Act platform can help business leaders evaluate their remediation options and choose the optimal solution.

About URM GROUP

URM GROUP provides the technology and consulting services many of the world's most recognizable brands depend on to optimize opportunities and comprehensively control risks across complex business and IT systems. With patented generative intelligence technology, X-Act platform provides a revolutionary way to quickly and predictively pinpoint hidden sources of risk within business ecosystems and know which actions should be taken to meet business goals. Leaders within financial services, retail, manufacturing, transportation, healthcare and governments use X-Act to ensure the continuous efficiency and cost effectiveness of operations and make informed decisions relating to a wide range of strategic objectives—from digital transformation, cost management, mergers and acquisitions to supply chain management and production performance.

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