

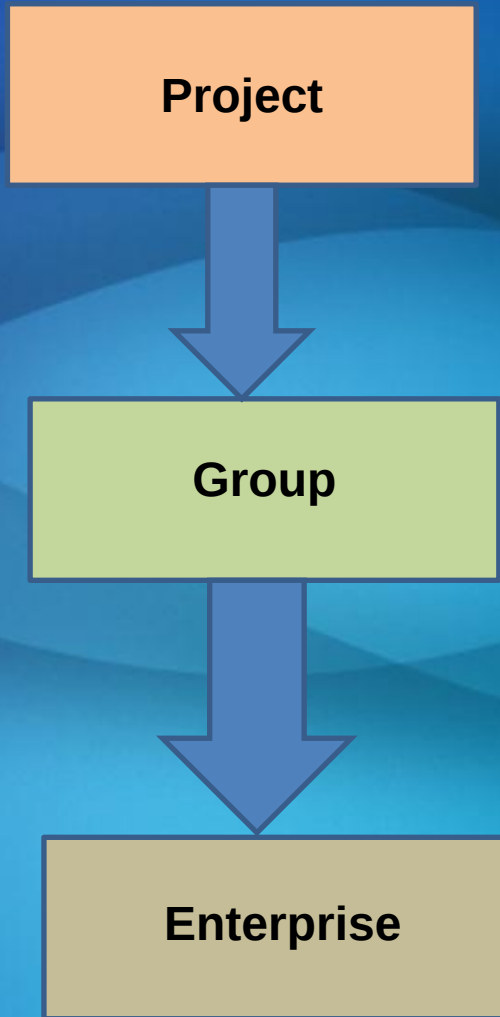
Quantitative Risk Analysis for the Real World

Enterprise Perspective



Mahendra Nath,
ANZ, Regional Sales Manager

Risk always
creates
compounded
effect across
any
organisation.



Palisade Corporation

- Over 250,000 Users Worldwide
- Over 2000 Companies in ANZ
- Taught at Top 20 University programs around the world
- Used by **93% of Fortune 100 Companies**
 - » **Founded 1984, Headquartered in Ithaca, New York**
 - » **Offices**
 - » London, Sydney, Rio de Janeiro, and Tokyo.
 - » **Clients**
 - » IBM, Procter & Gamble, AT&T, Microsoft, Ford, GE

Palisade Customers



National Aeronautics
and Space Administration

 **ERNST & YOUNG**

onesteel



JOHN DEERE

ING 

ANZ



origin

Fonterra
Dairy for life

Johnson & Johnson
Family of Companies

Sydney
WATER



GE Money

citigroup 
corporate and
investment banking

Procter & Gamble



Kimberly-Clark

PETRONAS



PRICEWATERHOUSECOOPERS 


BOEING

MetLife

wsn 
ENVIRONMENTAL SOLUTIONS

Palisade Customers – Oil/Gas/Mining

Schlumberger



Singapore Petroleum Co.



Petrobras



Palisade Customers – Finance & Insurance



1 RISK

2 Qualitative & Quantitative RISK

3 RISK Management

4 Real-time RISK Management

RISK is relevant only if affects your revenue, cost, brand, future directly or indirectly and most importantly your **top line growth / sustainability**



PRAGMATIC THINKING



What is RISK

Risk stops you from meeting your target

Risk is always financial in nature

Note: Brand/Reputation, Environmental, Project, Fraud and plethora of risk translates to direct or indirect financial loss irrespective of whether you are a state government body or public limited company.



Why do you Communicate Risk ?

How do you Communicate Risk ?

- Enterprise
- Group
- Division
- Project - Internal/External
- Team

What is Qualitative & Quantitative RISK

Qualitative Risk Thinking

ISO 31000:2009

Generic guidelines –

Design, Implementation & Maintenance of
Risk Management processes throughout an
organization.

Static Management Systems Approach – outcome of Qualitative Thinking

Processes and Procedures used to ensure that an organization can fulfill all tasks to achieve objectives...!



Static Paper Based Thinking & Reporting of Risk



FREE
Plagiarism
Report!

Future >>>Uncertainty >>>Risk

ISO 31000, 2009 – Risk Management

"the effect of uncertainty on objectives" .

NOTE: Quantitative Risk is the only known form of risk analysis that allows you to measure uncertainty

2 Main Perspectives on Risk

Quantitative Type –

Data is Hard, Rigorous, Credible & Scientific.

Qualitative Type –

Data is Sensitive, Nuanced, Detailed, & Contextual.

Fundamental Distinction

Data is '**Quantitative**' if it is Numerical

and

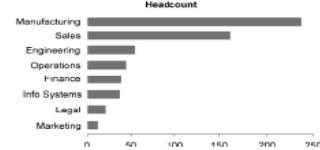
Data is 'Qualitative' if it is not.

Fundamental Differences in Reporting

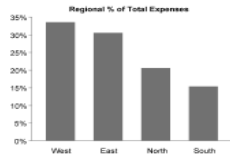
Time Series Relationships



Ranking Relationships



Part to Whole Relationships



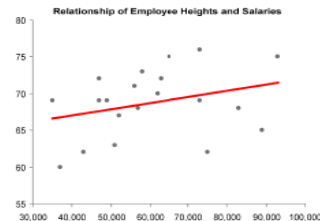
Deviation Relationships



Distribution Relationships



Correlation Relationships



Nominal Comparison Relationships



PARADISE

CITIZENS REWARDED FOR THEIR PIETY AND SUFFERING

NUCLEAR

FRUSTRATED AMERICANS ENDING THIS THING ONCE AND FOR ALL

PRAY FOR DEATH

EXPECT FATE WORSE THAN DEATH

IN PROGRESS

TERRORIST ATTACKS IN PROGRESS

OBVIOUSLY HIGH

THIS ISN'T DISNEY WORLD, FOLKS—IT'S IRAQ

ELEVATED

ALL VEHICLES ASSUMED TO BE CARRYING BOMBS, ALL CITIZENS ASSUMED TO BE SNIPING

CRYPTIC

LET ME PUT IT THIS WAY: I WOULDN'T TAKE ANY LONG DRIVES

GUARDED

SIGNIFICANT RISK OF SEEING YOUR CHILDREN BLOWN UP IN FRONT OF YOU

UNSETTLING

SOME SMALL-WEAPONS FIRE AND SCATTERED ROADSIDE BOMBING; FAIR CHANCE YOU WILL MAKE IT TO END OF DAY WITH ALL FOUR LIMBS

LOW

NO MAJOR ATTACK PLANNED ON YOUR HOUSE IN NEXT HOUR; CHANCE OF BEING BURNED ALIVE OR DECAPITATED ONLY 40 PERCENT

Fundamental Inter-relation

- All **Quantitative** data is based upon “qualitative judgments”
- All Qualitative data can be described and manipulated numerically (**Quantitative**).

Note: This “inter-relation” is the epicenter of sophisticated risk management thinking.

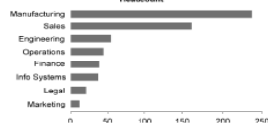


Qualitative & Quantitative - Dynamic Solution

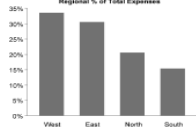
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Ranking Relationships



Part to Whole Relationships



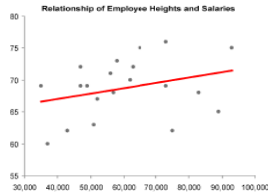
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Nominal Comparison Relationships



53589779323846264338327950288419716939937510582097494459230781640628620899862801
86513282306647093844609550582231725359408128481174502841027019385211055596444
097566593344612847564823378678316527120190914564856692346034861045432664821
00660631558817488152092096282925409171536436789259036001133053054882046655
7036575959195309218611738193261179310511854807446237996274956735188575272
624406566430860213949463952247371907021786094370277053921717629317675
7145263560827785771342757789609173637174684409012249534301465495
611212902196086403441815981362977477130707211349999998372978
553469083026425223082533446850352619103137838752886587
0428755468731159562863882353787593753217122680661
0106548586327886593615338182796823089957736
2454150695950829533116861727855889623192
563707660104710181942955596198946723192
289891521047521620569660740580381
16360093417216412199245
8720275596023648066
161452491921732172
62518983
8145

DATA

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RISK Management



Traditional Risk Management Steps

Step 1 - Risk Framework

Step 2 - Qualitative Risk Register

Step 3 - Quantitative Risk Analysis

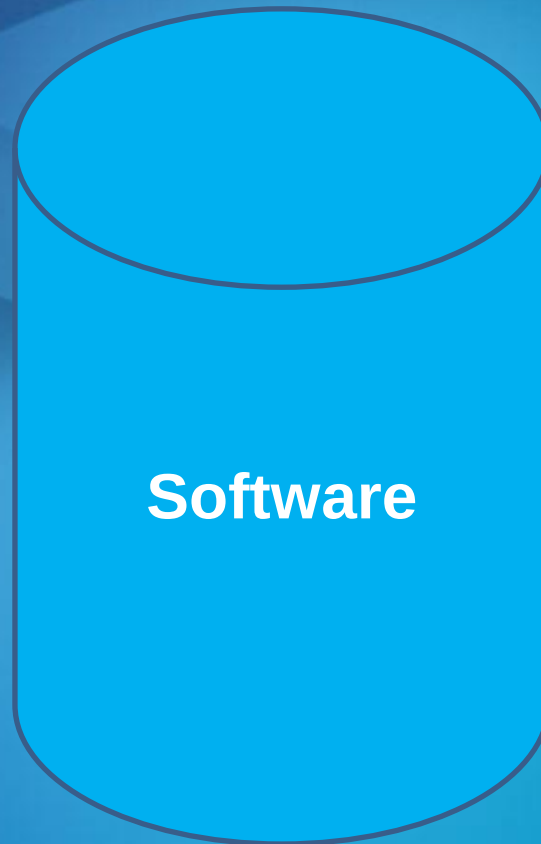
Step 3 –

Quantitative Risk Analysis – Why ?

Adding Insight to Enable Better Decisions



Introducing “The Power of Probability with Monte Carlo simulation”



Monte Carlo – Why ?



1. What are the chances my project will finish on time?
2. What are my risk inter-dependencies ?
3. What is the likelihood my project will finish under budget?
4. How much contingency do I really need?

What is Monte Carlo Simulation?

- » A sophisticated & proven computational technique used to determine the probability of different outcomes by running multiple trial runs, called simulations.....Infinite Outcomes !
- » Used Globally across every know Industry vertical.
- » <http://www.palisade.com/cases/>



Quantitative Risk Analysis ?

Monte Carlo Simulation ?

@ Risk ?

» **@RISK** (software) lets you analyze data that contains uncertainty using Monte Carlo Simulation.....proven method for “Quantitative Risk Analysis”

Applications of @Risk

- If you can Model your problem in Excel then you can use @Risk for all your risk analysis

Why @RISK?

- » Monte Carlo simulation, shows you scenarios that *might* occur, rather than a single “best guess”
- » Also *likelihood* of different outcomes occurring
- » To plan better Strategies, Mitigation Plans, Contingencies....

Why @RISK?

- To understand Contingency at granular level.
 - ❑ Probability of Occurrence Vs Single occurrence
 - ❑ How many times can this risk occur during the operation?

Product Demo



Result in @RISK

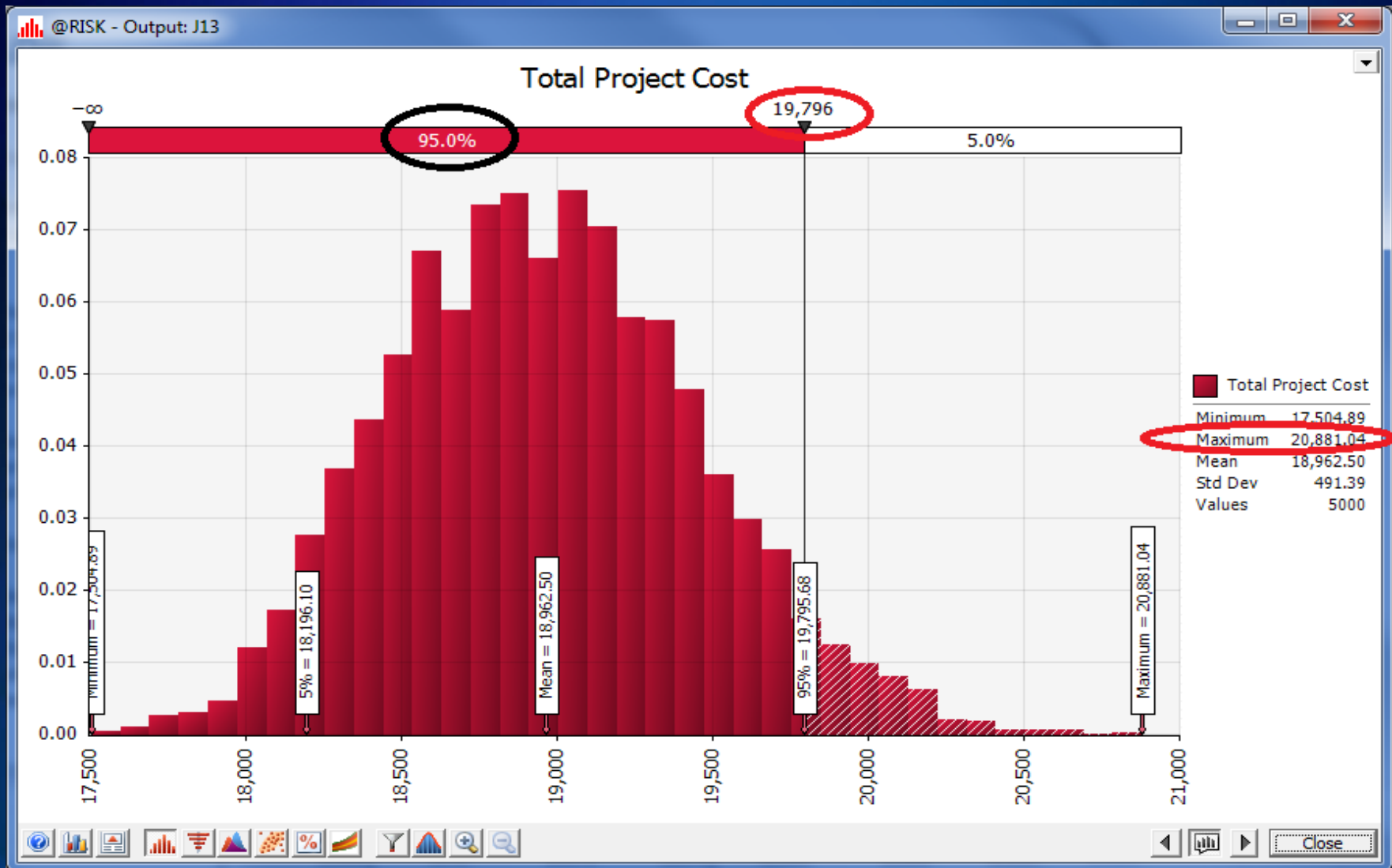


» Let's take a look at what @RISK can show you after running a Monte Carlo simulation on a project cost model.....

Learn @RISK in 5 mins

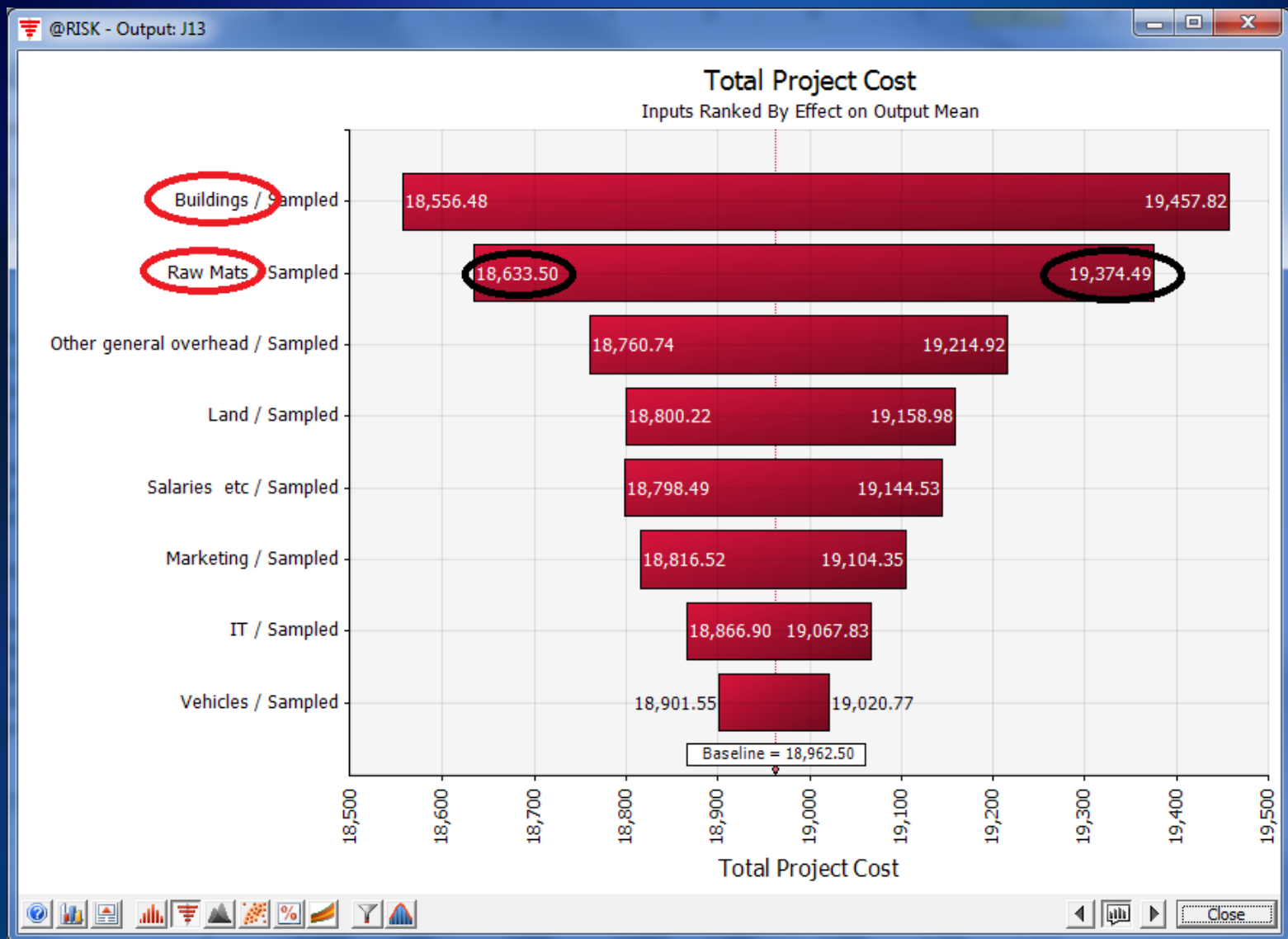


- » Learn @Risk in 5 minutes -
<http://www.palisade.com/QuickStart/EN/RISK/>
- » If you know Excel you already know @Risk
- » @Risk is used by 93% of Fortune 100.



Shows a 95% probability of cost less than \$19,796

Shows a maximum project cost of \$20,881



- » Shows ranked factors driving higher project costs, like building and raw materials.
- » Shows that, for instance, Project Cost varied from \$18,633 to \$19,374 as Raw Materials changed.

Benefits of @RISK

- » You may need 99% confidence that the project cost will be under \$19,800.
- » Now you know where to focus on reducing costs to achieve that, such as “building and material costs”.

Benefits of @RISK



- » Knowing the max cost is \$21,000 helps plan contingencies with high level of “Insight”
- » Try different strategies and simulate again to compare & re-think outcomes
- » Allows to plan ahead – sophisticated decisions



- » *Add-in to Microsoft Excel*
- » *Works with existing Excel Models*
- » *Provides “Quantitative Risk Analysis” in Excel*
- » *Behaves like native Excel*
- » *User Friendly – Only Excel skills required*

Applications of @Risk

- Real Options Analysis
- Discounted Cash Flow Analysis
- Value – At –Risk
- Portfolio Optimization
- Cost Estimating – Project Risk
- Six Sigma & Quality Analysis
- Product Life Cycle Analysis
- Supply Chain Distribution

.....Great.....but we do not like Excel !

....You can still utilize sophisticated Risk Analytics

A blue cylinder with a black outline, representing a database or software component. The word "Software" is written in white text inside the cylinder.

Software

Client Brief

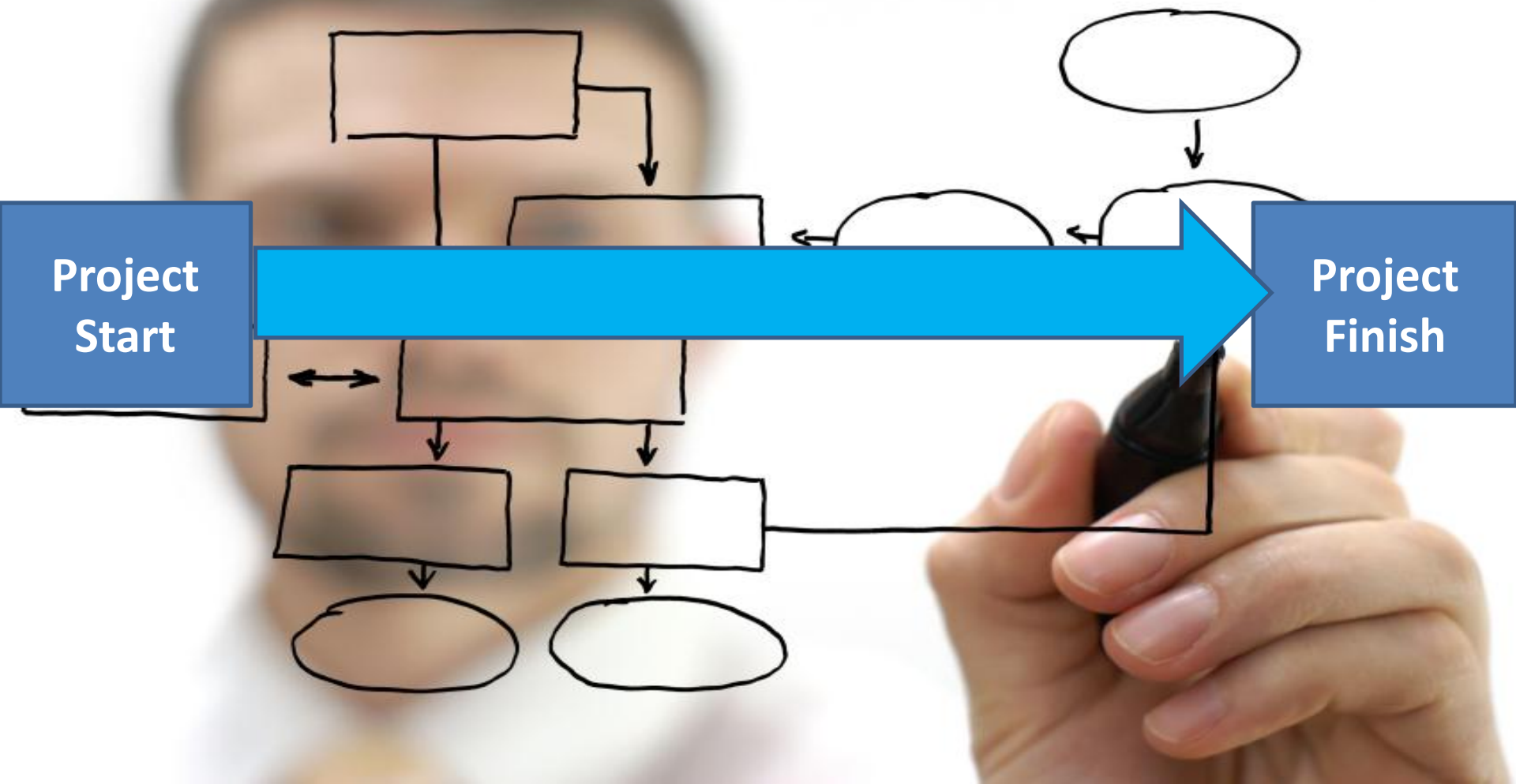
1. We want a sophisticated tool that tracks and allows us to mitigate RISK across the entire lifecycle of project.
2. We do not want to learn a new software or complex qualitative or quantitative risk methodology or analytics

Dynamic Solution

Good risk management also means **two way communication** with those affected, and **continually monitoring** what is going on.....NZ Society for Risk Management



Real-time Risk Solution for problems



Real-time RISK Management

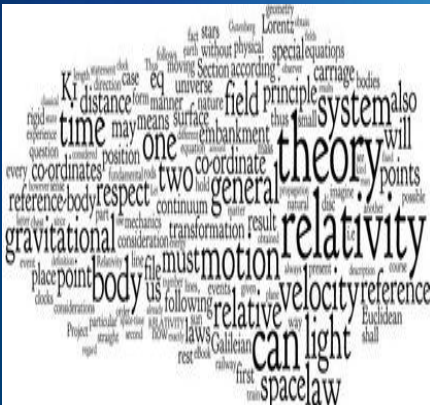


Theory

Forecasted Profit/Top Line/Revenue >>> **Real-time** Risk Management >>> Project lifecycle

Practice

Real-time Integration >>> SILOS and PROCESSES
>>> Mitigate Risks >>> Project Lifecycle.



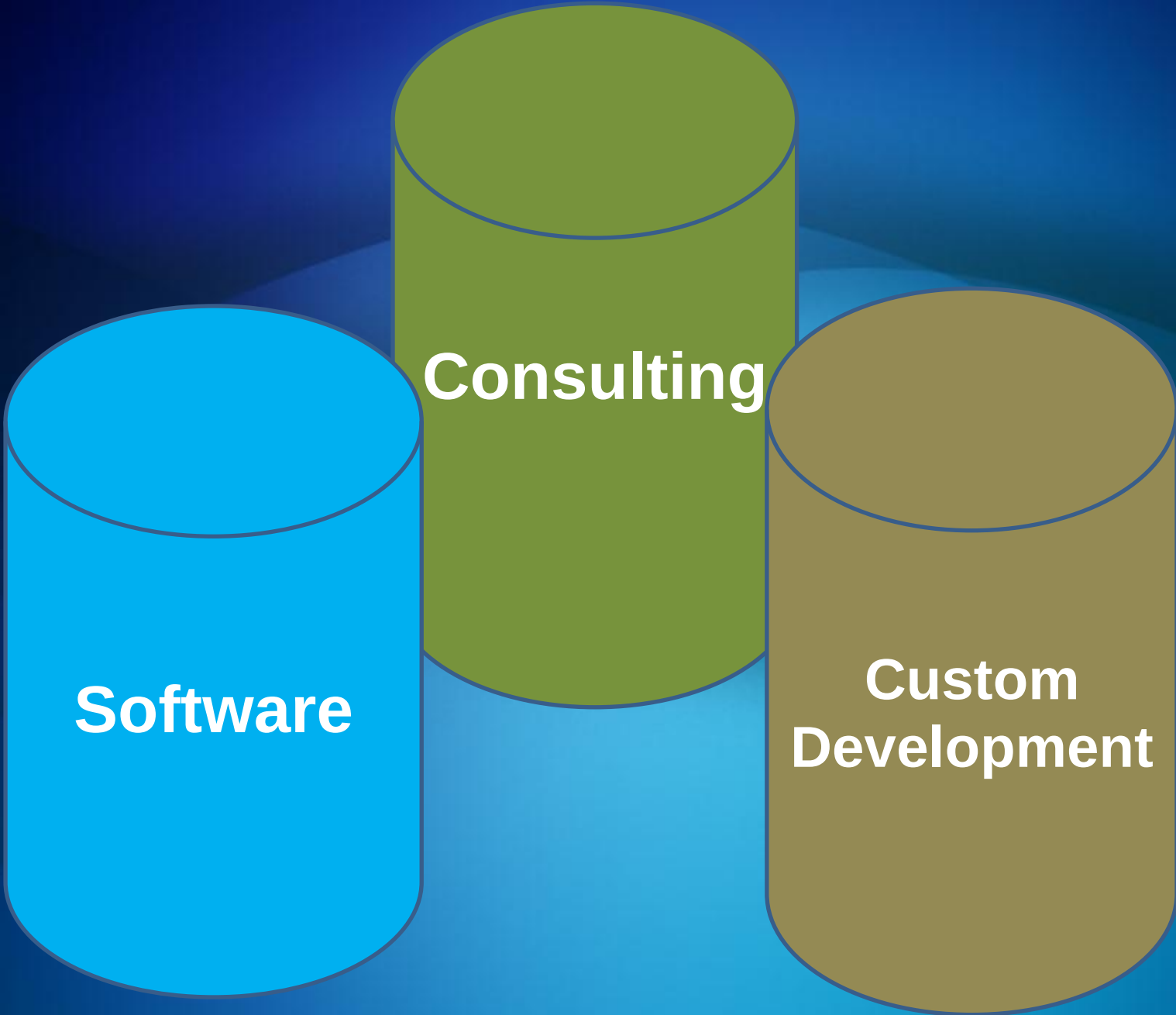
Solution Thinking:

- 1 We want real-time Risk Profile
- 2 Track Mitigation Steps in real-time
- 3 Live Risk Updates & Reports



Real-Time Solution aligned to Top Line Growth.





Software

Consulting

Custom
Development

Solution

- » Incorporate Monte Carlo Risk Analysis into a User-friendly, Qualitative Interface
- » Produce tailored Reports and Charts
- » Standardize use of Risk Management
- » No need for users to learn “New Software”

Is Risk Management an I T Project ?

No software in the world can THINK for you !

Front End

Risk Register Model

Risk Selector

Risk Definition & Allocation

Code: 1

1 of 10 Risks

Risk Event: 1-Consequential damages

Category: Contractual Risks

Division: I & E

Probability-Impact matrix

Likely to Occur

Near Certainty					
High Likely					
Likely					
Low Likelihood					
Not Likely					
	Very Low	Low	Med	High	Very High

Risk/Opportunity Level

Probability of Occurrence

75 %

Impact

☒ Percent Chance%

☐ Actual Impact (\$,Hours)

☐ Overwrite (Justify reasons below)

MIN 10

MIN

Most Likely 20

Most Likely

MAX 30

MAX

☒ Risk☐ Opportunity

Cost Elements Affected by Risk Event

☐ Total Contract Cost without Contingency☐ Section SubTotal☒ Cost Element

Section

PRO FORMA PCS DATA

☐ TOTAL REVENUE

☒ REC. CREDITS

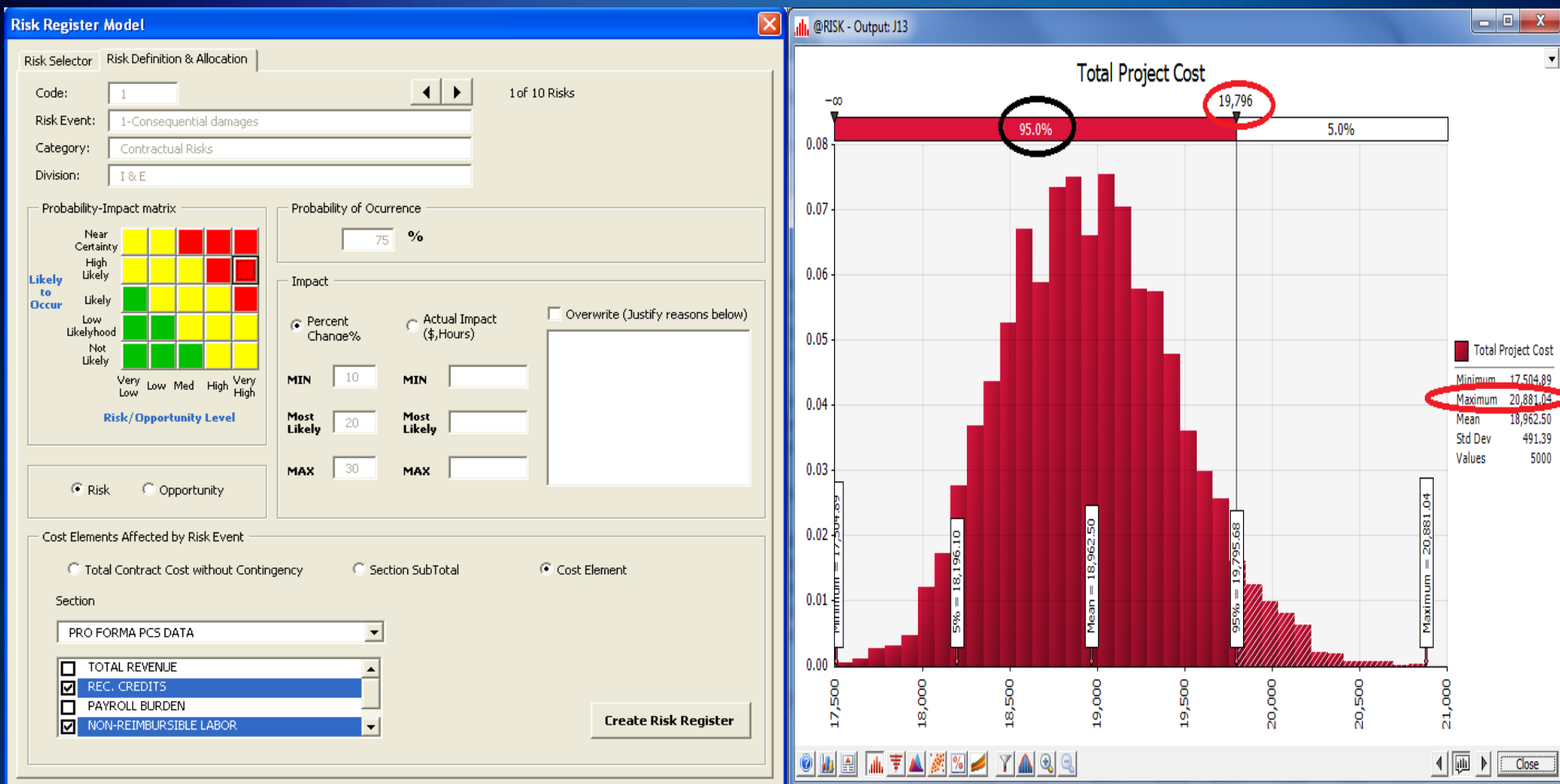
☐ PAYROLL BURDEN

☒ NON-REIMBURSIBLE LABOR

Create Risk Register

Qualitative

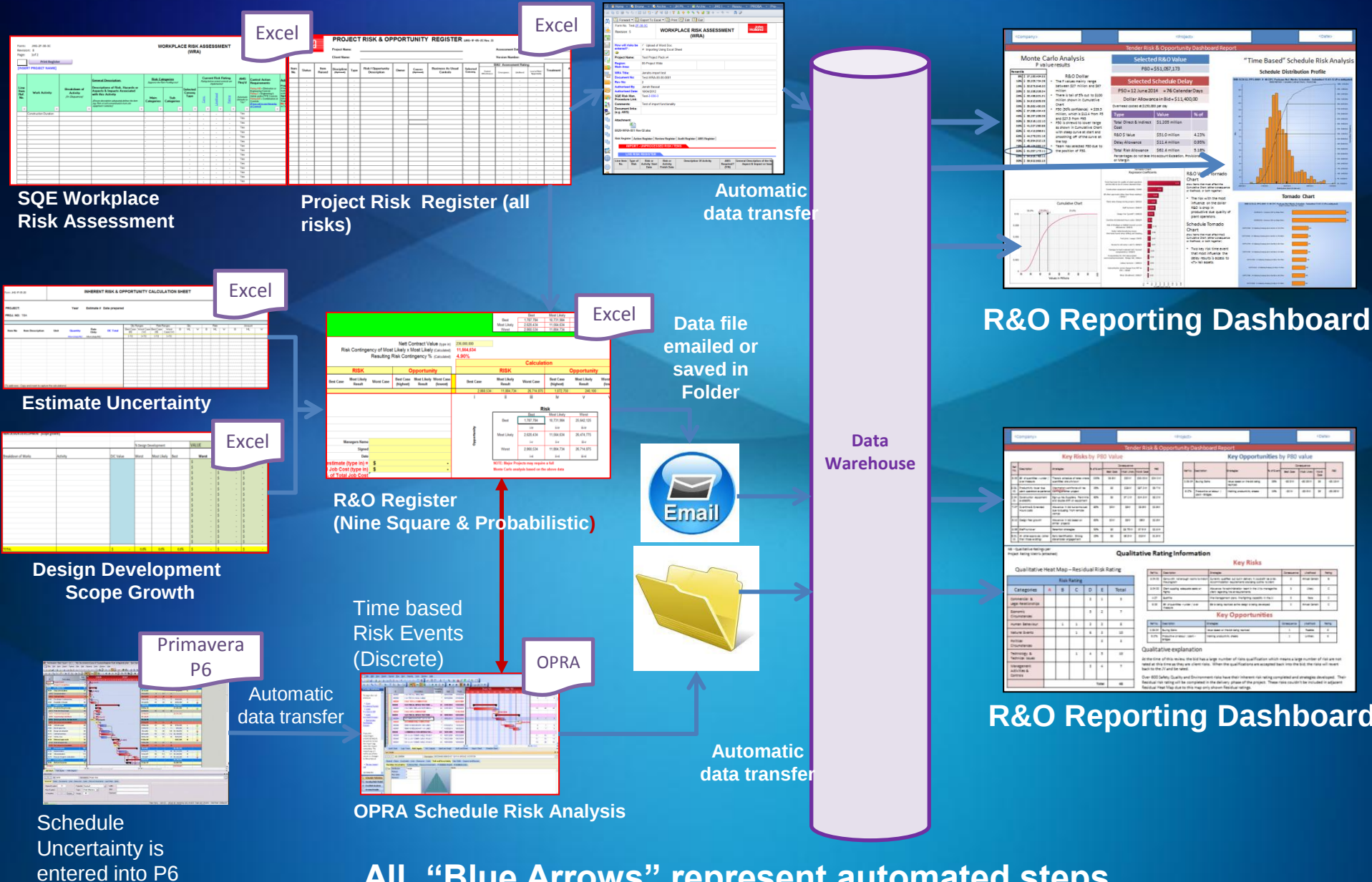
Front End & Back End



Qualitative & Quantitative

Risk Management - Enterprise Problem

Desired future



Palisade - End to End Solution Steps

Software>>Consulting>>Custom Development

Software

Mighty River Power

Genesis Energy

Solid Energy New Zealand

Beca Carter Hollings

Transfield Worley

OMV New Zealand Limited

Ngai Tahu Holdings Corporation

SINCLAIR KNIGHT MERZ

Train Champions & Model Owners

*** Desktop & Network Version**

Consulting

Risk Register >> Stochastic Register >> Model

Custom Development

Integration

We can **integrate sophisticated analytics at back end** to offer “User Friendly” interface for non-excel users.

Custom Development



» Platform options

- Excel Add-in
- .Net technology: Windows or Web-based application
- RDK allows deployments outside of Excel (.NET) that can be integrated with ERP systems

» Interconnection with major databases

» Fully customizable

» Low time-to-market

- Prototype-and-release
- Iterative, evolving approach



Integration with ERP

» Select Asset Management

- Australia-based financial customer
- High complexity tool for Portfolio Management
- Involved direct and bidirectional connection with financial assets databases of the customer



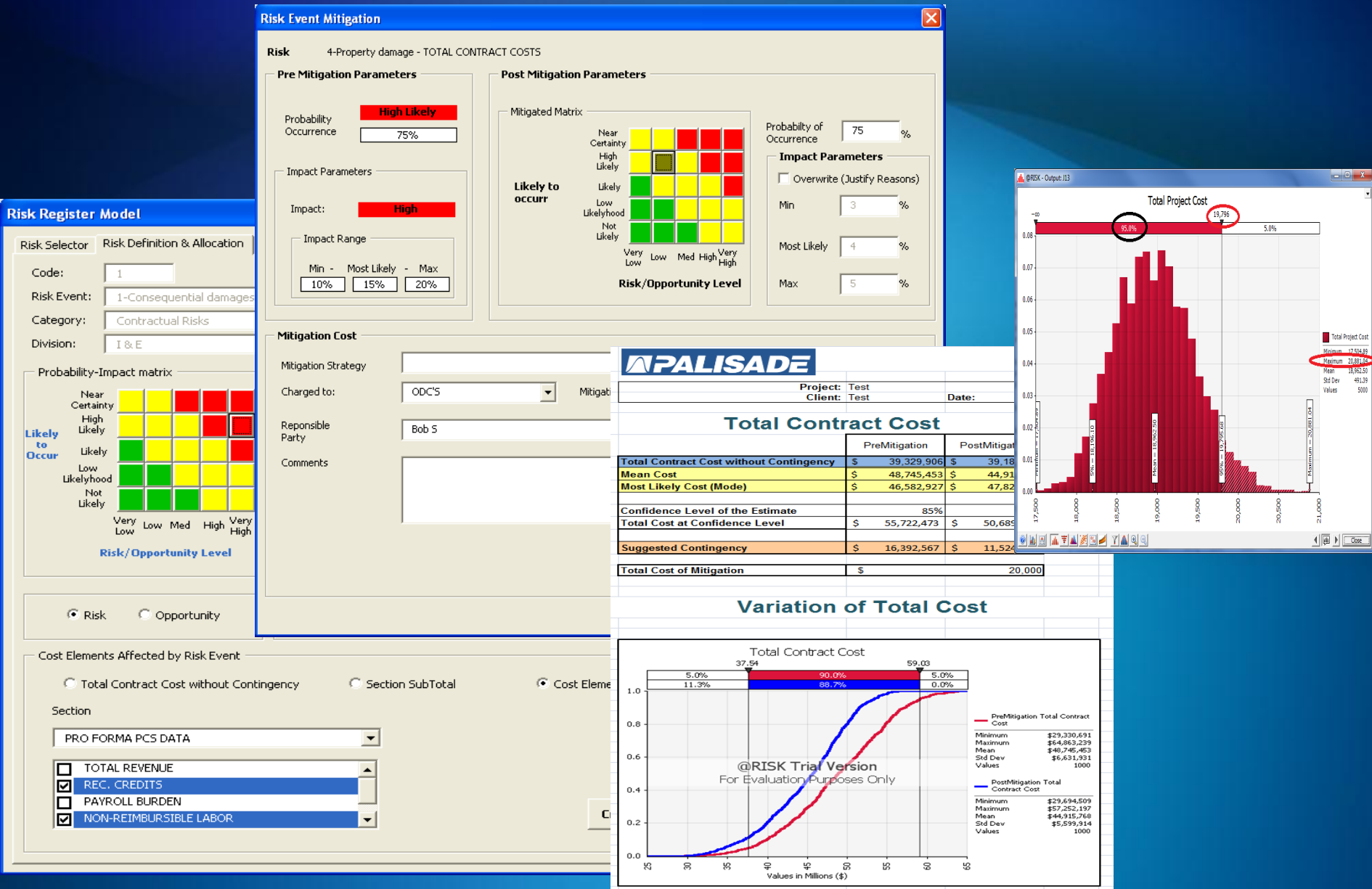
Integration with ERP

» MethodWare

- Integration with its Enterprise Risk Assessor (ERA) software
 - Its suite is also a GRC
 - This is an Enterprise Risk Management software
 - Risk Register : Operational
- New Zealand based company



Risk Register, Event Mitigation, Variation in Total Contract Cost & Risk Output



Interpretation of Results: Discussion

» Allowance for contingency

- Select confidence level appropriate with risk tolerance
- Subtract deterministic cost from cost at confidence level

» Prioritize risk mitigations

- Evaluate most serious risks
- Price mitigation measures
- Rerun mitigated scenario
- Analyze cost vs. benefit

Mitigation

Double Click on Risk Event that you would like to mitigate

Cost Schedule

Code	Category	Element	Corr. Coef.	Mitigated?
C2.a	Labor Productivity	Availability and/or productivity of skilled labor	0.403	☐
S1.a	Labor Productivity	Availability and/or productivity of skilled labor	0.357	☐
C1.a	Design Issues	Errors and/or changes to design packages require rework	0.345	☐
P3.c	Support Systems	Throughput and availability of Water Recovery System	0.336	☐
P3.a	Support Systems	Availability of Facility Control System	0.238	☐
S2.a	Process Systems	Difficulty to systemize Feed Preparation System to benchmark throughput and availability	0.219	☐
S2.b	Process Systems	Difficulty to systemize Primary Reactor System to benchmark throughput and availability	0.205	☐
S3.a	Support Systems	Difficulty to systemize Facility Control System	0.19	☐
C3.a	Fabrication	Difficulty to fabricate performance test and/or deliver Feed Preparation System	0.188	☐
S2.c	Process Systems	Difficulty to systemize Secondary Reactor System to benchmark throughput and availability	0.179	☐

Run Mitigation Exit

Risk Event Mitigation

Risk
C2.a Category Availability and/or productivity of skilled labor
0.403 Mutually exclusive

Pre Mitigation Parameters

Impact Parameters Pre Mitigation

Probability of Negative Impact 0.25

P90 Value of Addition in Change 0.15

Impact

IMPACT

PROBABILITY

45% 35% 25% 15% 5%

5% 10% 15% 20% 25%

Post Mitigation Parameters

Impact Parameters Mitigation

Probability of Negative Impact 0.15

P90 Value of Addition in Change 0.10

Opportunity Parameters Pre Mitigation

Probability of Opportunity Benefit 0.25

P10 Value of Reduction in Change 0.25

Opportunity

BENEFIT

PROBABILITY

45% 35% 25% 15% 5%

5% 10% 15% 20% 25%

Opportunity Parameters Mitigation

Probability of Negative Impact 0.15

P10 Value of Reduction in Change 0.10

Mitigation Cost

Mitigation Strategy Negotiate agreements with unions

Responsible Party Management

Mitigation Cost \$ ☐ Fixed ☐ Uncertain 5% 500,000 50% 1,000,000 95% 2,500,000

Comments

Ok Cancel

» Cost Estimation

- » In this example, @RISK is used for cost risk analysis and estimation.
- » The application prompts the user for a three-point estimate for each cost item in the project as a way to recognize uncertainty in these cost elements.
- » A risk register is created using a simply colored grid interface. Next, because in real life costs are seldom independent of each other, the user is able to set up correlations between related cost elements.
- » Finally, the user can define external risk events that will affect the total cost of the project.
- » After entering this information, the application runs an @RISK simulation and presents results in tables and graphs. The results can be used to identify risk drivers and map out mitigation strategies.

Cost Estimation Model - Risk Management

The screenshot displays a Microsoft Excel spreadsheet titled "US_DT_E_WS_798 Cost Risk Analysis Draft.xlsm". The spreadsheet is divided into several sections, including a header for "ACME INDUSTRIAL GROUP Cost Risk Analysis", a "Risk Analysis - Palisade Corporation" dialog box, a "Risk Events" list, and a "Results" section with a bar chart.

The "Risk Analysis - Palisade Corporation" dialog box is open, showing the "Risk Selector" tab. It includes fields for "Code" (1), "Risk Event" (Liquidated damages), and "Category" (Contractual Risks). The "Probability of Occurrence" is set to 75%. The "Likelihood-Consequence Matrix" is displayed, showing a grid of colored squares representing different risk levels. The "Impact" section shows "Total Cost %" and "Values" (MIN: 275, MAX: 550).

The "Risk Events" list includes:

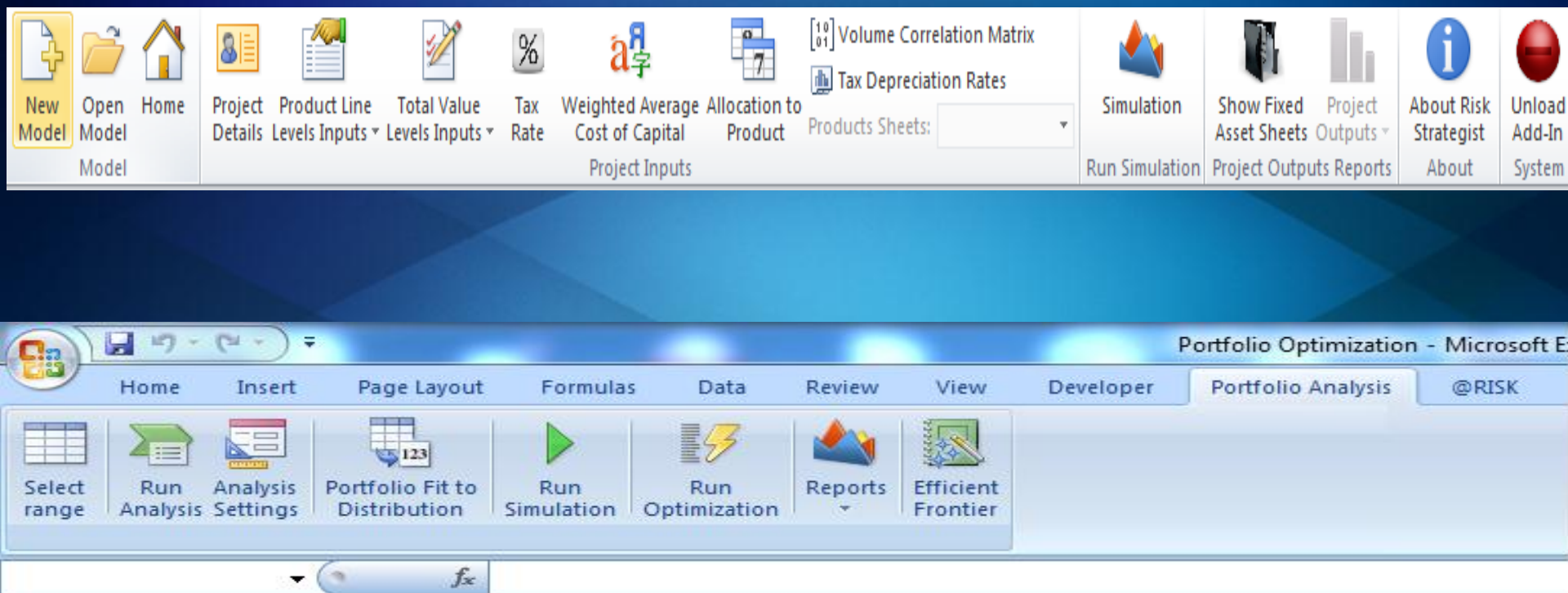
- ☐ Fixed date schedule obligations
- ☐ Lack of force majeure clause
- ☒ Latent defects clause
- ☒ Onerous changes clause
- ☐ Third party injury and damages

The "Results" section shows a bar chart with the following data:

Item	Results	Value
Item 1 / Results / \$353	0.20	
Item 1 / Results / \$353	0.20	
Item 2 / Results / \$354	-0.16	
Item 3 / Results / \$355	-0.16	
Item 4 / Results / \$356	0.15	
Item 4 / Results / \$356	0.15	
Item 4 / Results / \$356	0.15	
Item 4 / Results / \$356	0.15	

The bar chart shows the distribution of results, with a maximum value of 3603.0848, a mean of 1359.3626, and a standard deviation of 772.0807. The chart is titled "Sample Model" and includes a legend for "120%" and "100%".

Client Specific Ribbon



Custom Development

EMC²

 **BorgWarner**

 **SELECT**
ASSET MANAGEMENT

SAIC

PARSONS

 **NS**
NORFOLK SOUTHERN®

 **methodware**™

AMGEN®

 Kansas State University


Unilever

 **SJI**

 **Human Factor
ANALYTICS**
Managing the Human Factor

 **Henkel**

 **ASML**

 **Coca-Cola
Hellenic**
Passion for Excellence

 **SUCAMPO**
PHARMACEUTICALS, INC.

THE LEGACY ENERGY GROUP, LLC

**Question everything until you can
integrate Qualitative & Quantitative
Risk and align with your TARGET !**



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