



EFCOG Final Report

Evaluation of Risk Management Software

Project Delivery Working Group

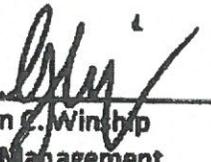
Risk Management Task Team

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Executive Summary

The Energy Facility Contractors Group (EFCOG) is a self-directed group of contractors of U.S. Department of Energy Facilities. The purpose of EFCOG is to promote excellence in all aspects of operation and management of DOE facilities in a safe, environmentally sound, secure, efficient, and cost-effective manner through the ongoing exchange of information and corresponding improvement initiatives.

The EFCOG Project Management Working Subgroup (PMWSG) established a Risk Management Task Team to promote, coordinate, and facilitate the active exchange of successful Risk Management programs, practices, procedures, lessons learned, and other pertinent information of common interest that have been effectively utilized by DOE contractors and can be adapted to enhance operational excellence and cost effectiveness for continual performance improvement by other DOE contractors.

As part of the EFCOG Risk Management Task Team activities initiatives are identified, prioritized and planned. The planned activities are established in advance of the fiscal year start as part of an EFCOG Project Delivery Working Group (PDWG) Annual Work Plan.

One such initiative is the investigation into the types of software being used throughout the complex with a goal of gaining insight into their strengths and weakness and formulating recommendations towards establishing a more standardized suite of tools for Risk Management applications.

This Final Report presents the results of this investigation and evaluations as well as recommendations made by the Risk Management Task Team. This report is Deliverable 2.4.1 of the EFCOG PWDG FY2018 Annual Work Plan.

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1.0 Purpose

Multiple software tools are being utilized for Risk Management throughout the complex. Some are commercial off the shelf (COTS) products, some are commercial products which are marginally customized for a specific application or site, while others are developed by DOE prime contractors to meet the individual needs of their programs and/or projects. While realizing that a “one size fits all” software is most likely unachievable, there are advantages to having a more standardized set of software products and providing guidance and recommendations on their use and application. The purpose of this initiative is to investigate the current software products both in use within the DOE Complex and others that are available commercially, identify and evaluate their strengths and weakness and provide useful recommendations to guide in the selection of Risk Management software.

The EFCOG FY 18 Work Plan item 2.4.1 is shown in Table 1-1:

Table 1-1 EFCOG FY17 Work Plan (Extract) Item 2.5.1

<p>2.4. Investigate the software products used throughout the complex, document their strengths and weaknesses and perform an evaluation of their functionality and application to specific uses</p>	<p>Helps standardize the use of software throughout the DOE Complex and provides guidance on what type of software will work for a specific need. As the costs and functionality of software vary greatly this will avoid unnecessary cost of procuring the incorrect software or a costly software product where a less expensive one will be adequate. Also matching the optimal software to the application ensures a more efficient and effective Risk Management process.</p>	<p>2.4.1 Using the roadmap issued as a deliverable in late FY17, and the results from the FY17 Risk Management survey, complete the study and issue a report with recommendations for the use of different software packages in different applications</p>
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This report satisfies the FY18 Work plan deliverable for 2.4.1.

2.0 Methodology

A roadmap was developed and utilized to plan the path forward of this initiative. The roadmap spanned multiple fiscal years and was a living document, maintained current during execution in concert with the applicable EFCOG FY Work Plan.

The final roadmap is presented in Attachment 1. Each Roadmap activity is described below.

2.1 Develop Survey

A survey was developed to gather Risk Management information from risk practitioners within the complex. Part of this survey focused on identifying the types of software being used, their application and pros and cons.

2.2 Activate Survey & Collect Data

Once developed, the survey was activated and routed through EFCOG and the DOE Complex. The survey ran for approximately 2 months and gathered risk management data from practitioners around the DOE Complex.

2.3 Assemble Data

Data was reviewed with the aim of listing software products used within the DOE Complex. This list of software formed the basis for further investigation.

2.4 Software Presentations

As part of the investigation process, when a commercial software product was identified as being used within the DOE Complex or as a viable software that is not currently being used, the software company was contacted and invited to present a webinar on their product. At the end of each webinar there was a detailed question and answer session with the presenter during which the Team was fully engaged in exploring the capabilities and limitations of the product.

2.5 Identify Groups of Software to be Evaluated

There will be no “One software fits all,” solution, however software may be categorized into functional groups and evaluated within these groups on an equal platform. The groupings developed by the Risk Management Task Team are as Follows;

- Analytical Software – Integrated Analysis
- Analytical Software – Discrete Risk Analysis (Cost)
- Analytical Software – Schedule Uncertainty and Discrete Risk Analysis
- Analytical Software – Estimating Uncertainty Analysis (Cost)
- Risk Register Software

2.6 Develop Software Requirements

As part of the software evaluation, any viable software product must meet basic requirements (perform as needed) before it becomes grouped and evaluated along with other software in the group. The basic requirements for each of the software groups were developed by the Risk Management Task Team and used to screen out those software products not fulfilling the basic requirements for that specific group. The software requirements for each group are presented in Attachment 3.

2.7 Develop Evaluation Criteria

Each software group was evaluated using criteria developed specifically for that group which addresses factors important to risk practitioners. The evaluation criteria for each group are presented in Attachment 3.

2.8 Develop Analytical Hierarchy

For each software group, each set of software evaluation criterion were assembled in a hierarchical structure to facilitate analysis and weighting. This is a standard methodology for evaluating alternatives. A software package specifically designed for alternative analyses was used to perform the evaluation. The software, Expert Choice Pro[®] provides an Analytical Hierarchy Process (AHP) capable of recording data in the form of weighted criteria and scoring and performing a synthesis of these data to arrive at rankings. As an example, Figure 2.8-1 shows the analytical hierarchy developed using Expert Choice Pro[®] for the Integrated Analysis Software Group.

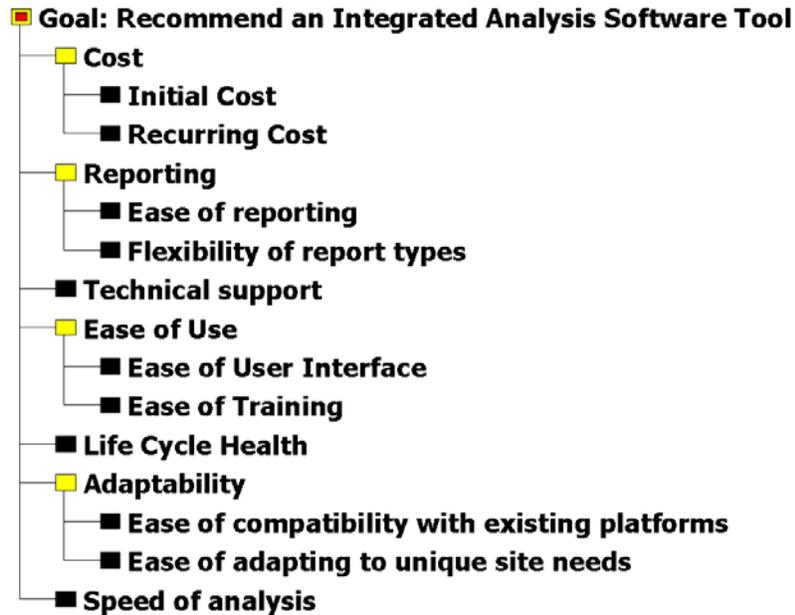


Figure 2.8-1: Example Analytical Hierarchy

2.9 Develop Scoring Guidance

Initially it was assumed that the number of software products to be evaluated in each group would be quite large and therefore a ratings system would need to be used to score products against each criteria. However, the number of software products was manageable, and a much quicker pair-wise comparison process was used.

2.10 Weight Criteria

Each criterion set used for each software group evaluation was then weighted to show the relative importance of each criterion. The resulting numerical weight would later be used in calculating the overall score for a software product, i.e., scores would be multiplied by the numerical weight of a criterion and then summed to obtain an overall score for all criteria.

A pairwise comparison process was used to develop the evaluation criterion weights. In this process the preference of each criterion was established relative to each of the other criteria using team consensus. The software then calculated a weight for each criterion based on these judgements. Expert Choice Pro[®] provided a visual representation in each of the preference judgements, an example of which is shown in Figure 2.10-1.

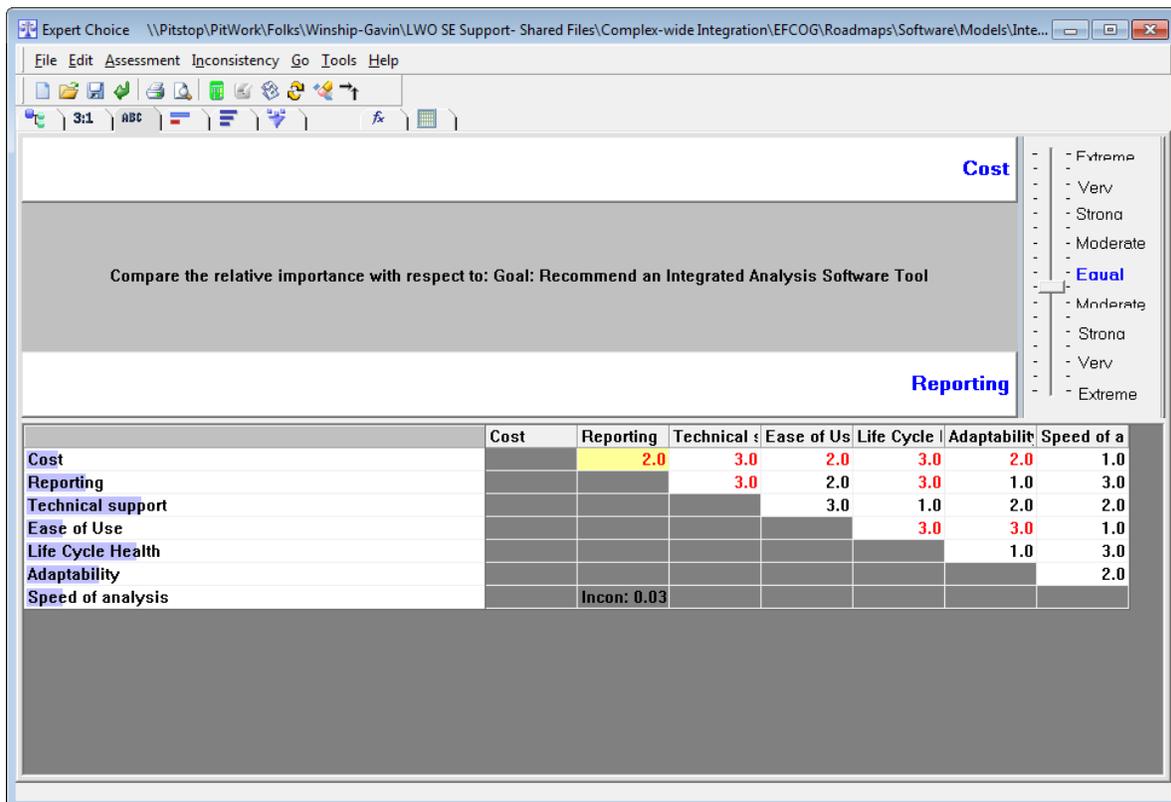


Figure 2.10-1: Example Visual Representation of Preference Judgements (Criteria)

2.11 Develop AHP Models

Using the weighted criterion, software products were then added for each software group to complete the AHP evaluation models. Figure 2.11-1 shows the AHP model for the Integrated Analysis Software Group as an example.

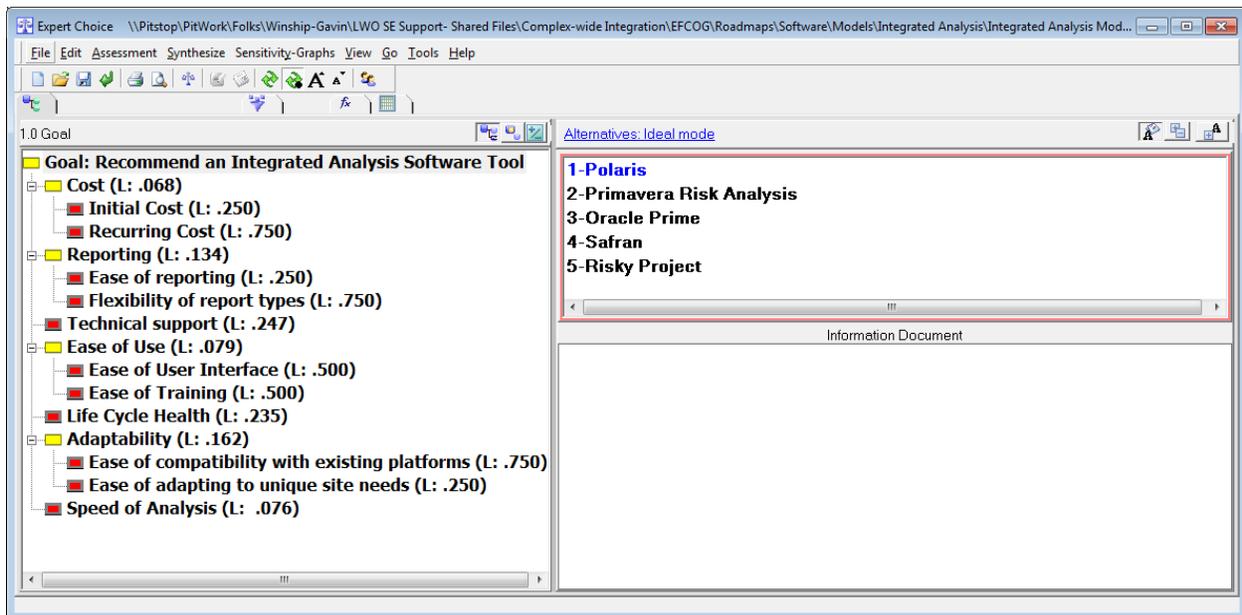


Figure 2.11-1: Integrated Analysis Software Group AHP Model

2.12 Bin Software into Groups

After the investigation of software products available, they were binned into the appropriate software groups for evaluation. (Previously Section 2.5 discussed software groups and Section 2.11 discussed adding the candidate software products to the evaluation model)

2.13 Assemble Data for Each Software

To compliment the demonstration of each software under consideration, software manuals and available fact sheets were assembled to allow each software to be evaluated for each of the criterion. These form the underpinning basis for the scoring of each software in each criterion.

2.14 Perform Evaluations for Each Group

As with the criteria weighting process, pairwise comparisons were made for each software group. This time between each software product within the group and for each criterion. These pairwise comparisons recorded how much a product was preferred or not preferred over each of the other products for a specific evaluation criterion. This was repeated for each evaluation criteria and for each

software group. The preference judgements were arrived at by consensus of the team. Expert Choice Pro[®] provided a visual representation in each of the preference decisions, an example of which is shown in Figure 2.14-1.

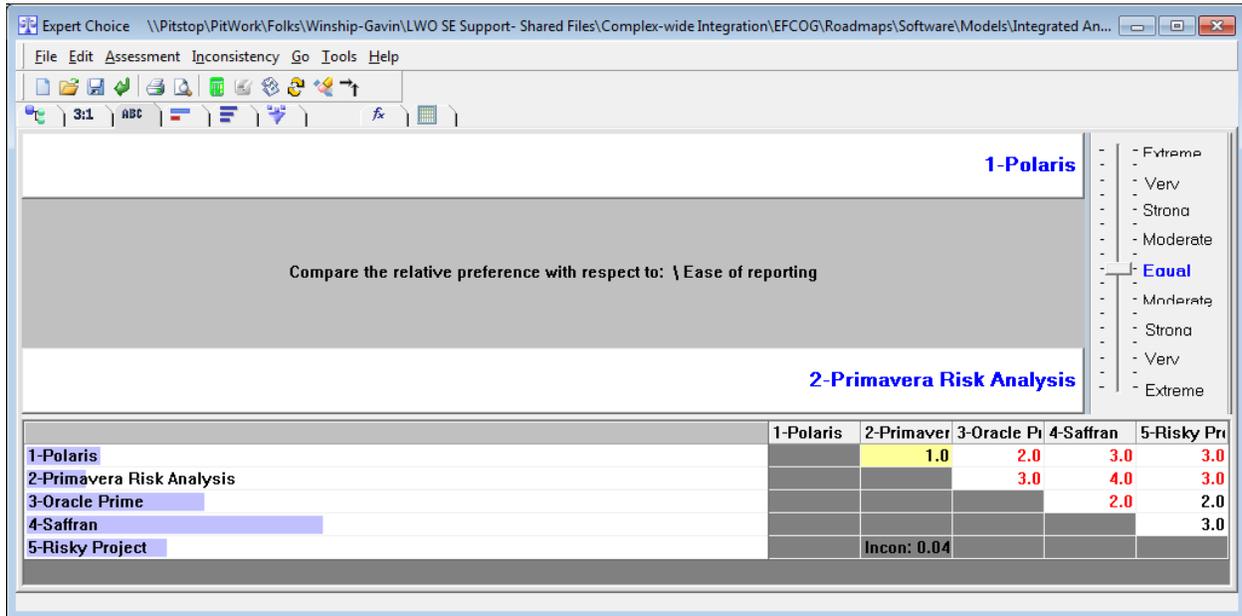


Figure 2.14-1: Example Visual Representation of Preference Decisions (Between Software Products)

Expert Choice Pro[®] then calculated a score for each of the software products based on these pairwise comparisons for each criterion. Each score was then multiplied by the weight of that criterion and summed to give a total score for each product. The scores were used to develop a ranking of software products for each software group.

2.15 Perform Dynamic Sensitivity Analysis

By altering the weighting of criterion it can be determined if the ranking can be impacted. If so, this will be factored into the recommendations made by the Team. A model’s results are considered robust if evaluation criteria weights can be altered by ± 10% and the top-ranking software product (s) is not displaced. A sensitivity analysis was performed for each of the software groups by increasing and decreasing the weight of a single criterion, resulting in the increase or decrease being proportionally distributed to the other criteria. This changes the scores and potentially the rankings of the products. Figure 2.15-1 shows criteria weights and software product ranking results and Figure 2.15-2 shows these same results with ranking changes when the weight of “Speed of Analysis” criterion is increased from 7.6% to 70.1%.

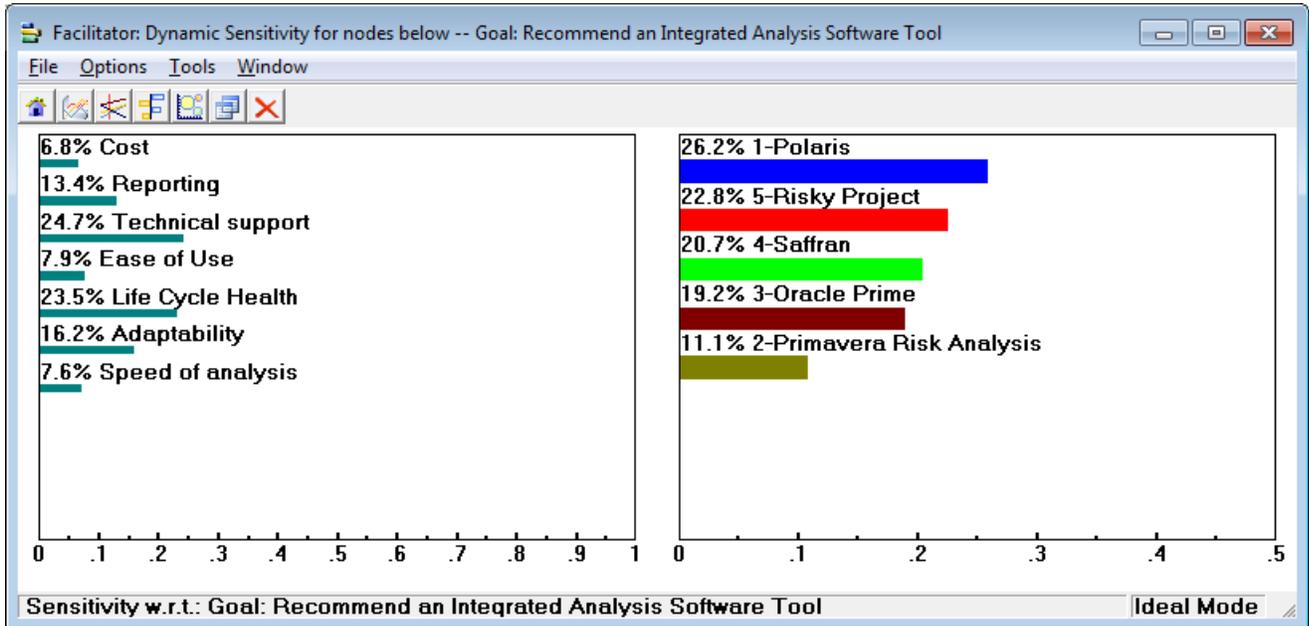


Figure 2.15-1: Rankings with no Criteria Weight Changes

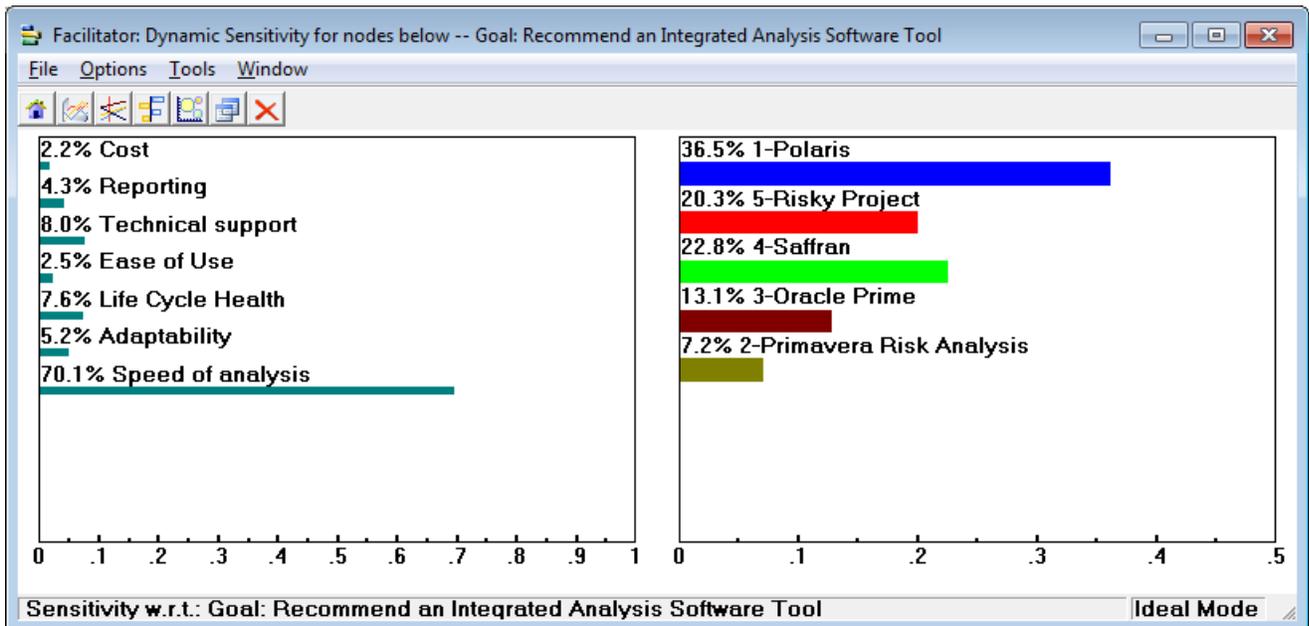


Figure 2.15-2: Rankings when “Speed of Analysis” is increased from 7.6% to 70.1%

2.16 Develop Recommendations

The team developed recommendations for the use of specific software for each of the Software groups.

2.17 Issue Final Report

This final report contains the results of the software investigation, analysis, criteria weighting, scoring, sensitivity analyses, recommendations and conclusions.

3.0 Discussion of Results

3.1 Risk Management Survey

The results of completed Risk Management survey (Reference 6.1) provided insight into the different software products being used within the complex, but more importantly, showed that sites were not using the same software products, and in some cases, contractors were using different software products at the same site. Additionally, there were cases where the survey indicated less than full satisfaction with the software selected by the Risk Management organization. This confirmed both the need for standardization (where practical) and the need to be able to make informed decisions when selecting software for Risk Management applications.

3.2 Software Groupings

Based on the results of the survey, Risk Management software products were assembled into groups based on the function they performed. These functions ranged from performing a fully integrated and refined analysis to derive schedule margin and cost reserves to analyzing individual elements i.e., Schedule Uncertainty, Schedule Risk, Cost Risk and Cost Uncertainty. A final group was added for Risk Register software. These groupings are as follows:

- Analytical Software – Integrated Analysis
- Analytical Software – Discrete Risk Analysis (Cost)
- Analytical Software – Schedule Uncertainty and Discrete Risk Analysis
- Analytical Software – Estimating Uncertainty Analysis (Cost)
- Risk Register Software

3.3 Software Evaluations

With the exception of Oracle Primavera Risk Analysis, Oracle Crystal Ball and @Risk, all the analytical software packages were demonstrated by the software vendor in webinars which lasted approximately 2-3 hrs. These webinars also included a detailed question and answer session at the end of each presentation where the Risk Management Task Team members could participate with the vendor's technical staff. The majority of the Team were very familiar with Oracle Primavera Risk Analysis and Oracle Crystal Ball, therefore, it was not considered necessary to have a demonstration of those software packages. For @Risk a trial version was provided to the team for their evaluation. Generally,

additional documentation was either assembled or provided by the software vendor to allow evaluation of the software (References 6.2 through 6.9). Prior to the demonstrations of the software, functional requirements were developed for each of the analytical software groups (Attachment 3). These criteria were the functions the software product was required to perform when used for that specific group's purpose. These requirements were discussed during the webinars to ensure they were met by each software product.

After the investigation and grouping of analytical software products, evaluation criteria and where necessary sub-criteria were established for each group (Attachment 3). An AHP model was developed using Expert Choice for each group and the criteria weighted by using Expert Choice Pro[®]. Pairwise comparisons were performed for all analytical software products for each criterion and sub-criterion and the resulting synthesized scores used to rank the software products for that specific group. Dynamic sensitivity analyses were performed to identify if any weight changes could significantly change the ranking order of the software products.

In all AHP models, cost was the lowest weighted evaluation criterion. The software costs ranged between \$1100 - \$9500 with average annual support costs between 0-\$2000. Although it appears to be a large range the actual costs are relatively small when compared against other typical project costs, so the low weight of this criterion was justified.

The risk register software products were also presented by the software provider's technical staff. As all team members were already familiar with Microsoft Excel and Access, these software products were not demonstrated. The additional documentation for the risk register software products are found in References 6.10 and 6.11. A simple Team review and discussion was used to evaluate the Risk Register software products.

The following Sections 3.3.1 through 3.3.5 discuss the results of team evaluations for each software group.

3.3.1 Analytical Software – Integrated Analysis

The following software products met requirements for this group and were evaluated:

- Polaris
- Primavera Risk Analysis
- Oracle Prime
- Safran
- Risky Project

After identifying the software products to be evaluated in this group, the criteria from Attachment 3 were used to develop an AHP model and then were weighted. The results were as shown in Figure 3.3.1-1.

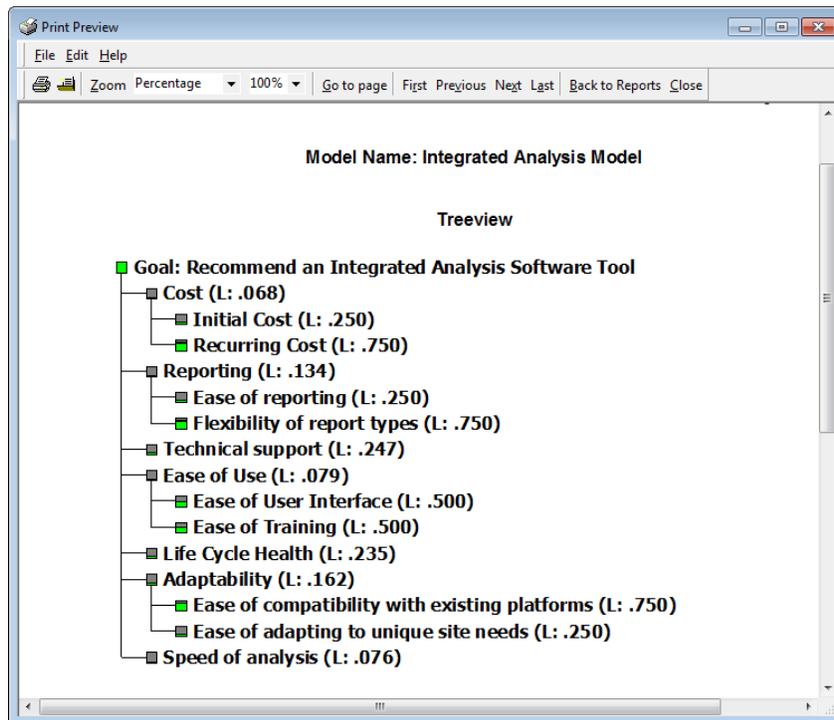


Figure 3.3.1-1: AHP Model for Analytical Software – Integrated Analysis

After the model had been completed, the software products were added as alternatives and evaluated for each criterion using a pairwise comparison process. After all evaluations were completed, the synthesized result in the form of a score for each option was used to develop a ranking. These results are shown in Figure 3.3.1-2.

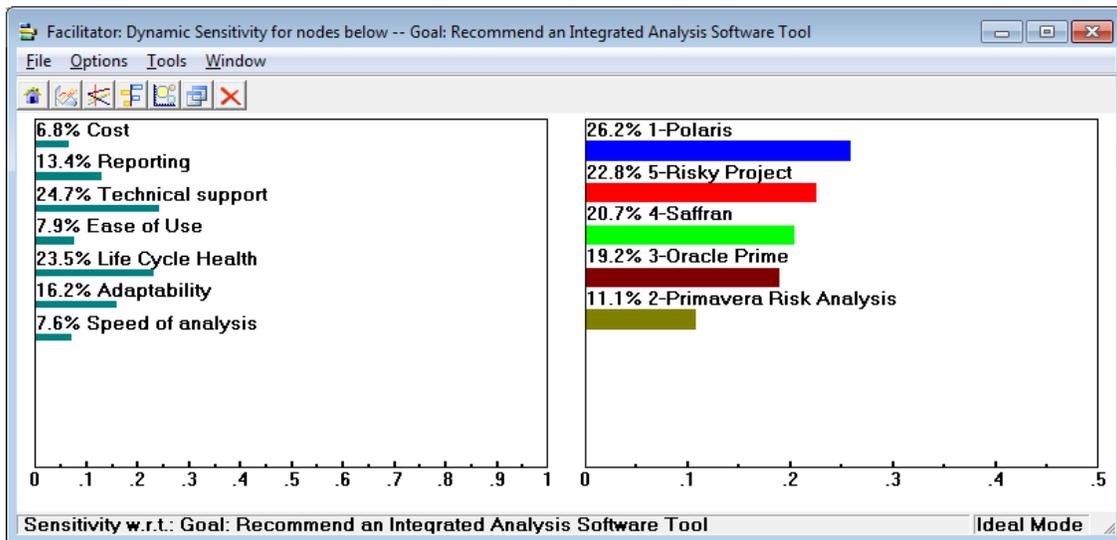


Figure 3.3.1-2: Analytical Software – Integrated Analysis (Results 1)

Subsequent to the evaluation which showed Polaris as the top-ranking software tool, Booz Allen Hamilton announced they were removing Polaris from public availability and after honoring existing contracts, it would no longer be available to current users. Polaris was then removed from the analysis model and the results are shown in Figure 3.3.1-3:

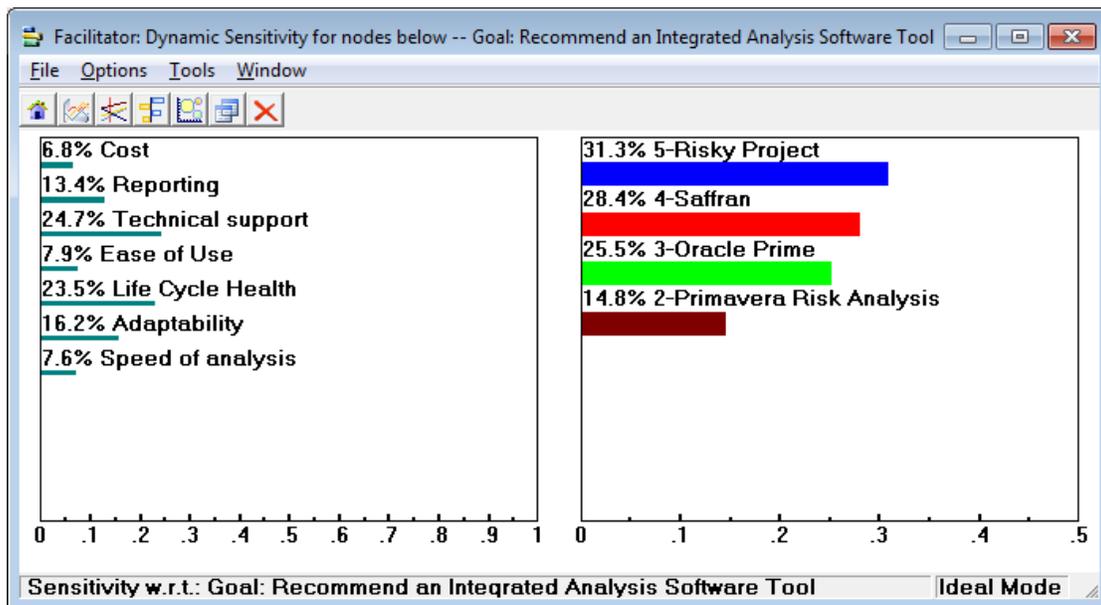


Figure 3.3.1-3: Analytical Software – Integrated Analysis (Results 2)

When evaluating these software products, team discussions and data reviewed worthy of note were:

- Primavera Risk Analysis will continue to be technically supported but will not be developed any further. Eventually it will become obsolete and be replaced by Oracle Prime
- Oracle Prime is cloud-based and may have cyber security issues for use at DOE sites
- Oracle Prime appears to align with Oracle P6 for a toolset, whereas Risky Project (a Microsoft product) appears to align more closely with Microsoft Project as a toolset.

A sensitivity analysis was then performed by dynamically increasing and decreasing each weight value for each criterion and observing the change in ranking. Significant changes had to be made in the criteria weights to change the position of the top two rankings, therefore this model and solutions were considered robust.

Validation

Although the demonstration and software specifications showed all the software possessed the required functionality, the top two ranking software products (Safran and Risky Project) were subjected to a validation test before completing the evaluation. A P6 project file and a Microsoft Project file were used with trial versions of the software products. The schedules were resource loaded and after uploading were assigned ranges to schedule and costs as well as discrete risks in terms of schedule and cost impact.

Risky Project: It was discovered that Risky Project required a version of Microsoft Project to be installed on the same platform before it would successfully upload and perform analyses. P6 files could not be successfully uploaded into Risky Project. After contacting the Risky Project technical support group, it was determined that this feature is in beta testing and was intended to be available in the near future.

Safran: Safran uploaded both P6 and Microsoft Project files without issues and performed well with the analysis.

3.3.2 Analytical Software – Discrete Risk Analysis (Cost)

The following software products met requirements for this group and were evaluated:

- Primavera Risk Analysis
- Oracle Prime
- Safran
- Risky Project
- Oracle Crystal Ball
- @Risk

After identifying the software products to be evaluated in this group, the criteria from Attachment 3 were used to develop an AHP model and then were weighted. The results were as shown in Figure 3.3.2-1:

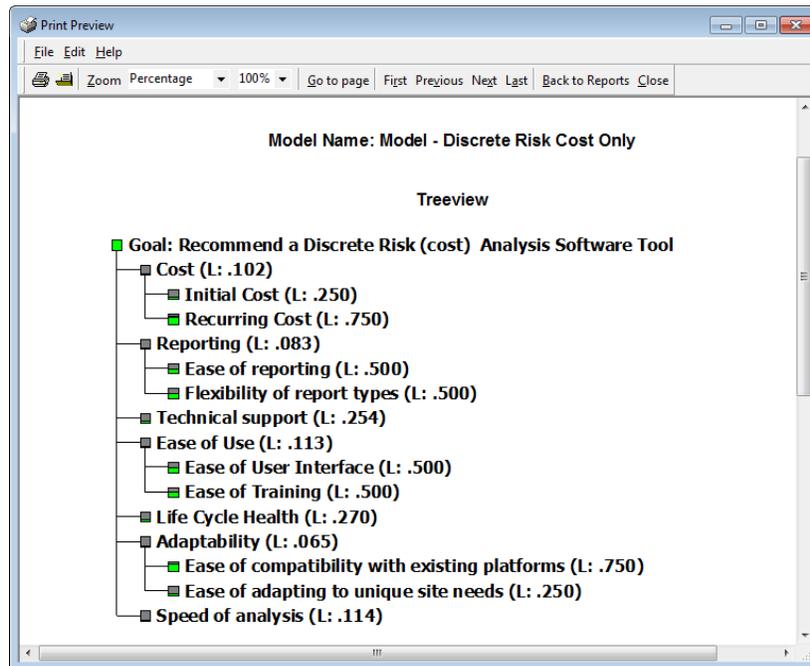


Figure 3.3.2-1: AHP Model for Analytical Software – Discrete Risk Analysis (Cost)

After the model had been completed, the software products were added as alternatives and evaluated for each criterion using a pairwise comparison process. After all evaluations were completed, the synthesized result in the form of a score for each option was used to develop a ranking. These results are shown in Figure 3.3.2-2

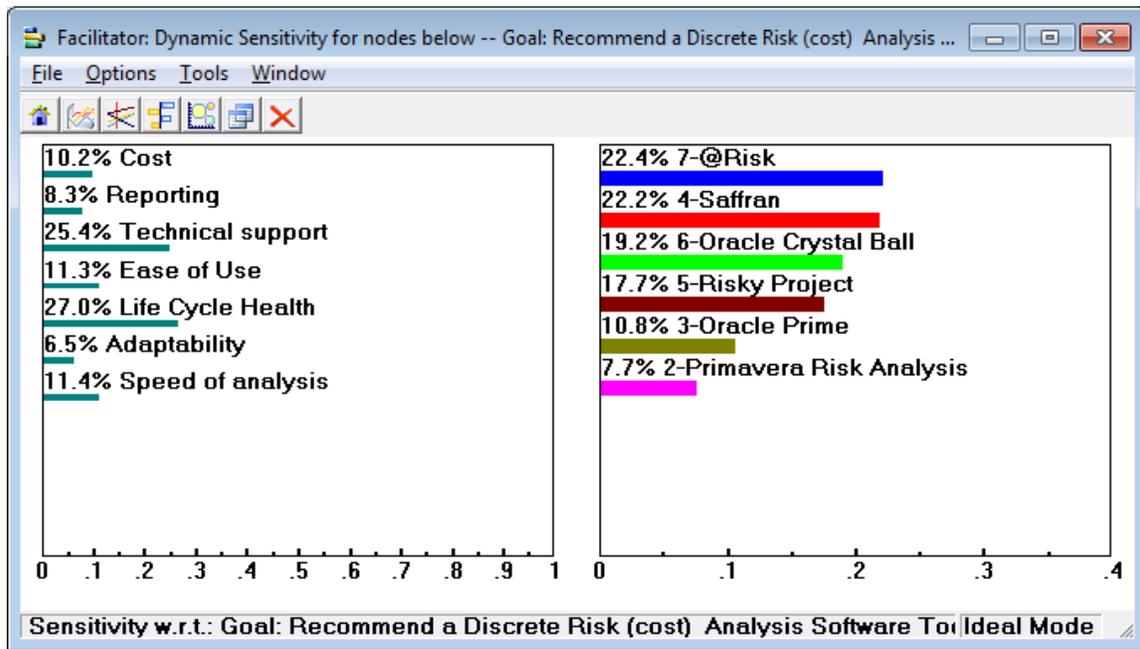


Figure 3.3.2-2: AHP Model for Analytical Software – Discrete Risk Analysis (Cost) (Results)

When evaluating these software products, team discussions and data reviewed worthy of note were:

- Primavera Risk Analysis will continue to be technically supported but will not be developed any further. Eventually it will become obsolete and be replaced by Oracle Prime
- Oracle Prime is cloud-based and may have cyber security issues for use at DOE sites
- The more simpler tools @Risk and Crystal Ball were the easiest to use
- Oracle product technical support scored low, but for these simpler software applications, little if any technical support is typically needed

A sensitivity analysis was then performed by dynamically increasing and decreasing each weight value for each criterion and observing the change in ranking. Significant changes had to be made in the criteria weights to change the position of the top three rankings, therefore this model and solutions were considered robust.

Validation

Although the demonstration and software specifications showed all the software possessed the required functionality, the top three ranking software products (Safran, Oracle Crystal Ball and @Risk) were subjected to a validation test before completing the evaluation. Oracle Crystal Ball and @Risk performed well and although Safran performed the analysis, it was more complex to model just cost risk impacts.

3.3.3 Analytical Software –Schedule Uncertainty and Discrete Risk Analysis

The following software products met requirements for this group and were evaluated:

- Primavera Risk Analysis
- Oracle Prime
- Safran
- Risky Project
- Acumen Risk

After identifying the software products to be evaluated in this group, the criteria from Attachment 3 were used to develop an AHP model and then were weighted. The results were as shown in Figure 3.3.3-1:

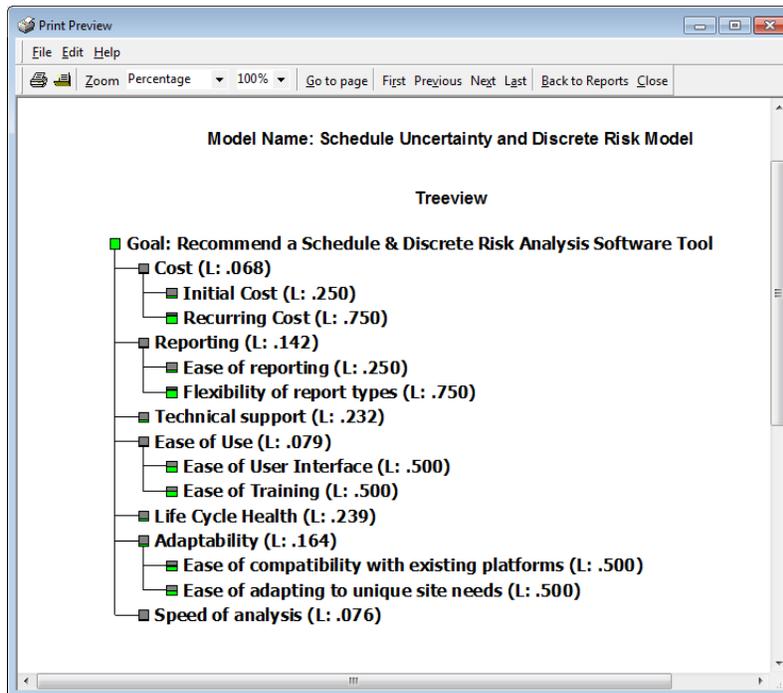


Figure 3.3.3-1: AHP Model for Analytical Software – Schedule Uncertainty and Discrete Risk Analysis

After the model had been completed, the software products were added as alternatives and evaluated for each criterion using a pairwise comparison process. After all evaluations were completed, the synthesized result in the form of a score for each option was used to develop a ranking. These results are shown in Figure 3.3.3-2.

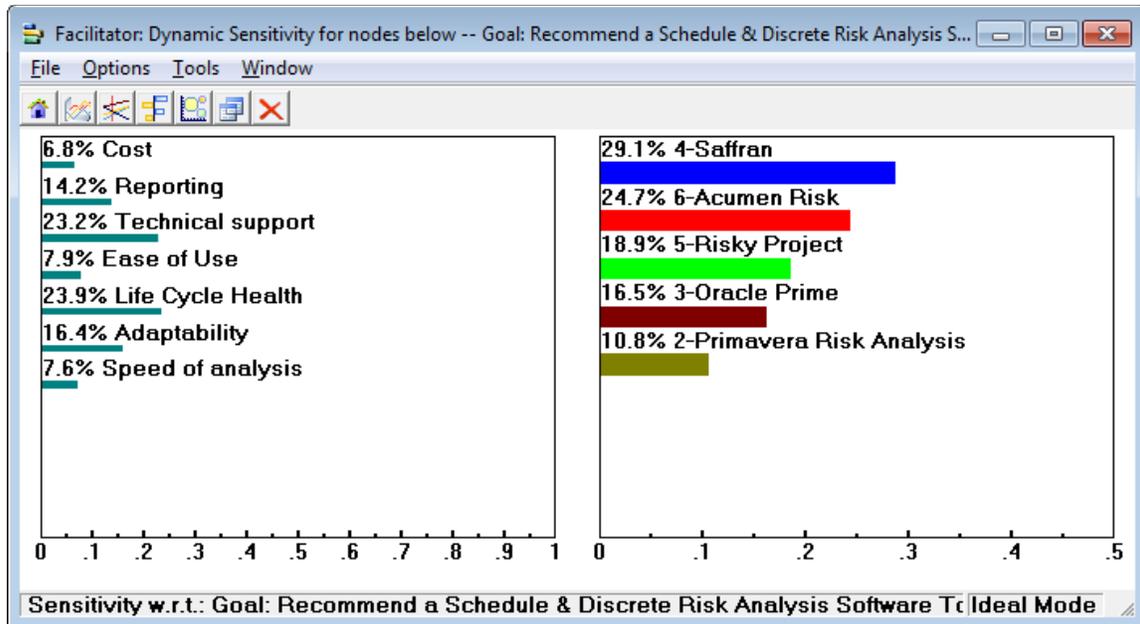


Figure 3.3.3-2: Analytical Software – Schedule Uncertainty and Discrete Risk Analysis (Results)

When evaluating these software products, team discussions and data reviewed worthy of note were:

- Primavera Risk Analysis will continue to be technically supported but will not be developed any further. Eventually it will become obsolete and be replaced by Oracle Prime
- Oracle Prime is cloud-based and may have cyber security issues for use at DOE sites
- Oracle product technical support scored low, but for these simpler software applications, little if any technical support is typically needed
- Oracle Prime appears to align with Oracle P6 for a toolset, whereas Risky Project (a Microsoft product) appears to align more closely with Microsoft Project as a toolset.
- Acumen Risk does not allow the use of a three-point risk impact distribution

A sensitivity analysis was then performed by dynamically increasing and decreasing each weight value for each criterion and observing the change in ranking. Significant changes had to be made in the

criteria weights to change the position of the top three rankings, therefore this model and solutions were considered robust.

Validation

Although the demonstration and software specifications showed all the software possessed the required functionality, the top two ranking software products (Safran, and Acumen) were subjected to a validation test before completing the evaluation. Safran performed well however no Acumen trial was available for use but based on the inability of the Acumen product to perform a three-point impact distribution, it was considered less effective than the top ranked Safran software product.

3.3.4 Analytical Software – Estimating Uncertainty Analysis (Cost)

The following software products met requirements for this group and were evaluated:

- Primavera Risk Analysis
- Oracle Prime
- Safran
- Risky Project
- Oracle Crystal ball
- @Risk

After identifying the software products to be evaluated in this group, the criteria from Attachment 3 were used to develop an AHP model and then were weighted. As this was identical to the cost risk analysis criteria, the same model was used. The results were as shown in Figure 3.3.4-1:

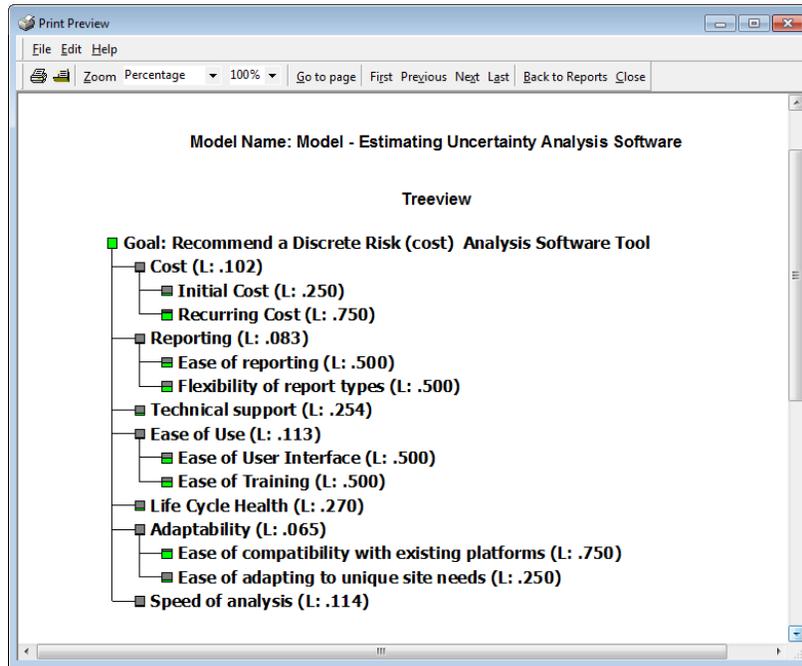


Figure 3.3.4-1: AHP Model for Analytical Software – Estimating Uncertainty Analysis (Cost)

After the model had been completed, the software products were added as alternatives and evaluated for each criterion using a pairwise comparison process. The Team discussed the relationship between the cost risk analysis software and this application of the same group of software products for estimating uncertainty and concluded that the same pairwise evaluation data could be used. The synthesized result in the form of a score for each option was used to develop a ranking. These results are shown in Figure 3.3.4-2.

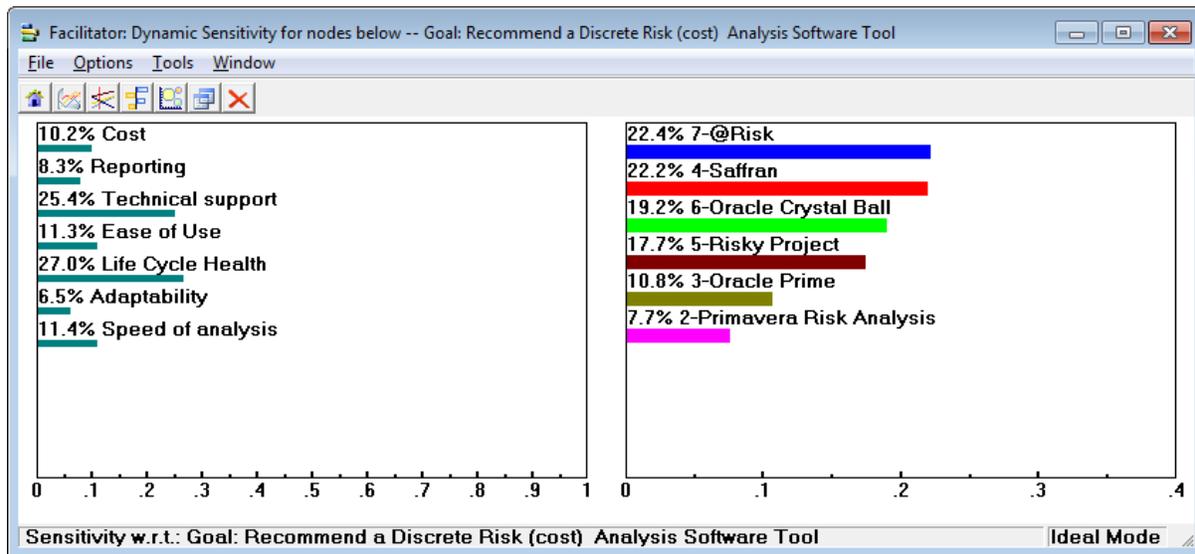


Figure 3.3.4-2: Analytical Software – Estimating Uncertainty Analysis (Cost)(Results)

When evaluating these software products, team discussions and data reviewed worthy of note were:

- Primavera Risk Analysis will continue to be technically supported but will not be developed any further. Eventually it will become obsolete and be replaced by Oracle Prime
- Oracle Prime is cloud-based and may have cyber security issues for use at DOE sites
- The more simple tools @Risk and Crystal Ball were the easiest to use
- Oracle product technical support scored low, but for these simpler software applications, little if any technical support is typically needed

Validation

Although the demonstration and software specifications showed all the software possessed the required functionality, the top three ranking software products (Safran, Oracle Crystal Ball and @Risk) were subjected to a validation test before completing the evaluation. Oracle Crystal Ball and @Risk performed well and although Safran performed the analysis, it was more complex to model cost uncertainty only.

3.3.5 Risk Register Software

Risk Register software products can be subject to two different sets of requirements depending on their environment:

- A stand-alone project will require a risk register that is limited to project risks and will house the data for the project only. Generally, as this data is used by the Integrated Project Team and is

prepared and disseminated by a Risk Management practitioner through the Project Manager, there is not usually a need to have multiple person access capability (e.g. a web or cloud-based application).

- A project which is executed within a large Program at a specific site (it may be one of many projects), could require the project Risk Register to be integrated in the Enterprise Risk Management (ERM) System. In this case multiple users will require access. These users would not only comprise of the Integrated project team, but also Functional Area Managers, Contractor Assurance personnel, senior staff, internal controls personnel, etc. Reporting would be also required to include Program Risk and Functional Area reports, etc.

These two types of Risk Register software were investigated separately by the Team and are discussed in the following sections 3.3.5.1 and 3.3.5.2

3.3.5.1 Stand-Alone Project (Project Risk Register)

The following software products met requirements for this group and were evaluated:

- Microsoft Excel
- Microsoft Access

Both of these software products can function well and can be developed to suit the individual requirements of each stand-alone project. Excel is marginally easier to develop for simple risk registers and reporting, yet may be more difficult to update, create complex risk registers and maintain data records. Access is more difficult to develop, yet can handle more complex risk registers and functions, can have input screen features making it easier to use and maintains records better than Excel. Looking at these pros and cons to each of the software products, they are essentially equal.

3.3.5.2 Projects executed within an ERM Program

The following software products met requirements for this group and were evaluated:

- Sword Active Risk Manager (ARM)
- Enterprise Risk and Opportunity Management System (EROMS)

Both of these software products have the ability to provide an ERM Risk Register with multiple users, flexible reporting, with linkages between Program, Project and Functional Area risks. The pros and cons are more clearly defined in Table 3.3.5.2-1:

Software	Pro	Con
ARM	Proven Track record over many years	Expensive to deploy (\$100,000 rough order of magnitude)
EROMS	Developed for DOE, therefore virtually no cost	Unproven, limited track record

Table 3.3.5.2-1: ERM Risk Register Software, Pros and Cons

As can be seen from the table above, EROMS is a new product and although out of Beta testing, will require some run time to identify and remediate any operational issues. As EROMS is continuing to gain more technical maturity over time as it is used and de-bugged, future deployment and operational issues will be minimized. As with the stand-alone projects it is not viable at this time to rank these options.

4.0 Conclusions

Through the process of this investigation and evaluation several conclusions were made by the Team:

1. Sites are not using the same software products, and in some cases, contractors are using different software products at the same site.
2. Some sites are less than satisfied with the software products currently being used for Risk Management
3. Risk analysis software must be selected with the understanding of what level of risk analysis is to be performed (which software groups) and how the Risk Management Program intends to evolve in the near-term (will the grouping change).
4. Recommendations can be made for each group of software products
5. Risk Management software is constantly evolving at an accelerating pace, primarily driven by the commercial market demand
6. Some platforms currently being used throughout the DOE complex are becoming obsolete (e.g., Oracle Primavera Risk) or are no longer available (e.g., Polaris)
7. Some Risk Management software products will only be available on cloud-based applications (e.g., Oracle Prime)
8. It is anticipated that within the near future new companies may emerge with Risk Management software products

5.0 Recommendations

The Team made the following recommendations:

5.1 Risk Analysis Software

When an analysis of the project schedule is to be performed by loading the extracted schedule into the analysis tool, then for both integrated analysis and schedule uncertainty and discrete risk analysis the scheduling tool dictates the group of software products available to be used. Based on the evaluations performed, the Team recommends Safran to be selected for Oracle P6 scheduling platforms and Risky Project be selected for Microsoft Project scheduling platforms. See Figure 5.1-1.

Where an analysis of the cost risk and estimating uncertainty is to be performed separate from the scheduling analysis, based on their evaluations the Team recommends Oracle Crystal Ball or @Risk.

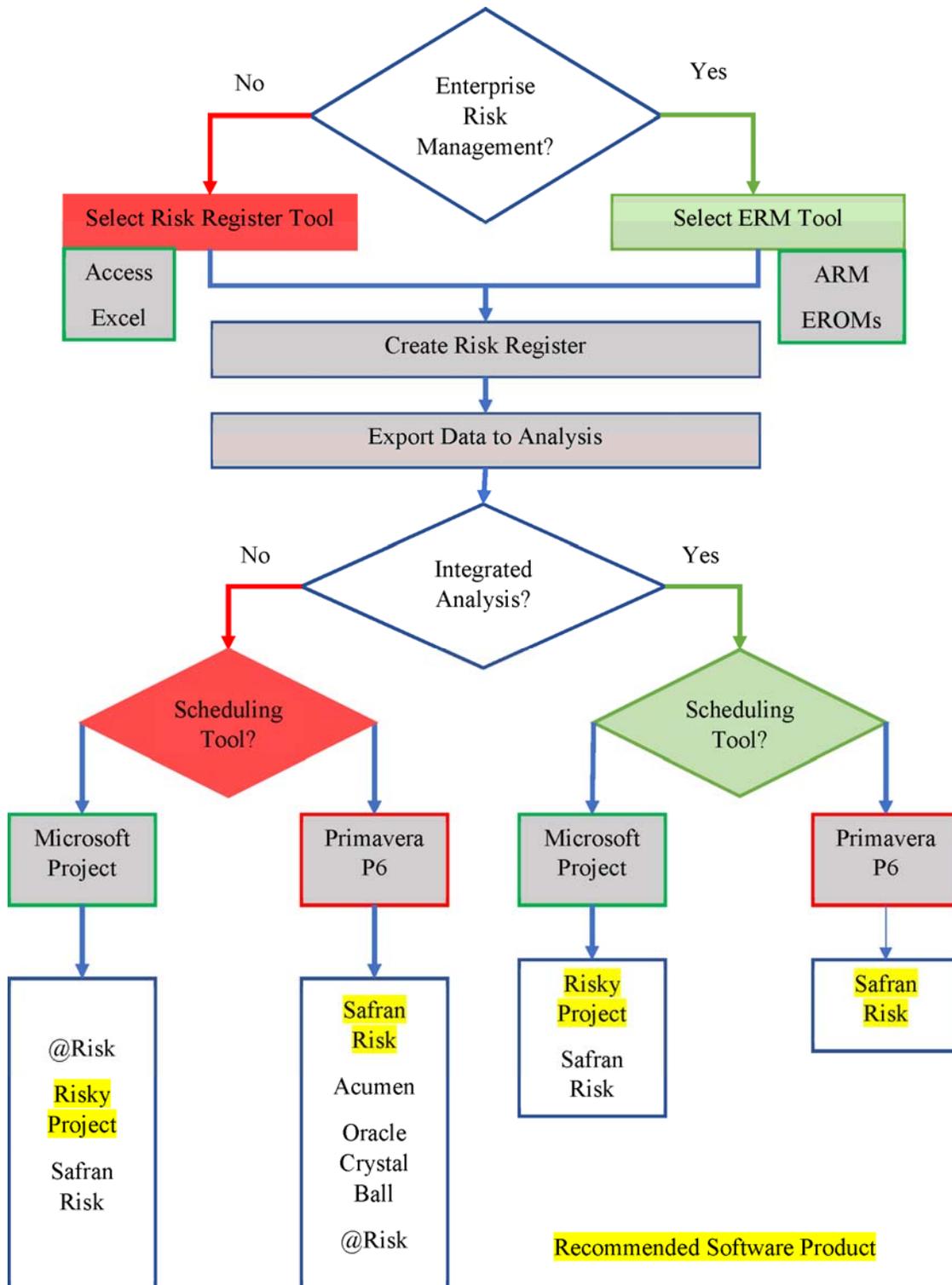


Figure 5.1-1: Selection of Schedule Analysis Software

5.2 Risk Register Software

For stand-alone projects either Microsoft Excel or Microsoft Access is recommended. The selection of these would be based upon the proficiency of the project Information technology or other SME with either of the products as it will be necessary to task them to construct the risk register architecture using the selected software.

For projects within an ERM Program, in the near future, after any deployment and operational issues have been resolved, EROMS may be the preferred product. However, until the EROMS is matured, the Team will not be able make any recommendations.

5.3 Future Activities

Subsequent to the completion of the evaluation and validation activities, a newer release of Risky Project was issued. This version was stated to have overcome issues associated with importing P6 files and to also have additional customizable fields which could assist with tracking and housing risk register information. This new version was not evaluated. Updates to software evaluated herein may be the subject of an updated report. The Team therefore recommends that this report be periodically reviewed and updated. This update should specifically address:

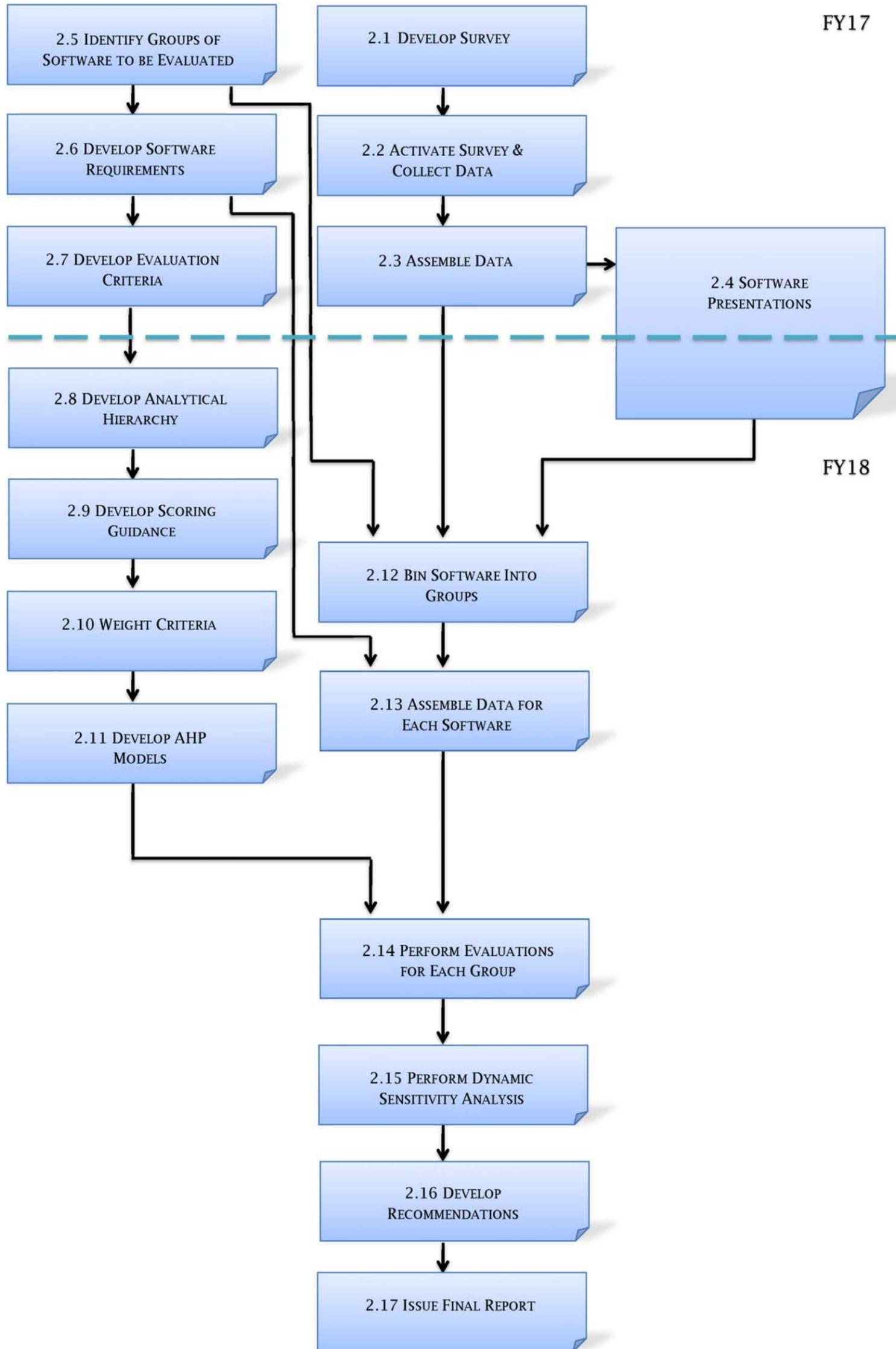
- Changes to the approach to using cloud-based software tools at DOE sites
- Results from the maturation, deployment and operation of EROMS
- Release of new Risk Management software products
- Retirement of existing Risk Management software products

6.0 References

- 6.1 EFCOG Project Management Working Subgroup, Risk Management Task Team, Risk Management Survey Results, September 26, 2017.
- 6.2 Booz Allen Hamilton's Polaris Model v 1.10 Product guide
- 6.3 Safran Risk, Exploring Safran Risk, Copyright 1999-2017, version 7.1.5, May 2017
- 6.4 Oracle Primavera Risk Analysis, Oracle Data Sheet, Oracle's Primavera Risk Analysis.
- 6.5 Oracle Prime, Overview Copyright © 2015 Oracle and/or its affiliates. All rights reserved. Confidential – Oracle Internal/Restricted/Highly Restricted
- 6.6 Risky Project Professional 7 user Guide, Copyright 2017 Intaver Institute.

- 6.7 Deltek Acumen Risk, Overview, Rev 092016.
- 6.8 Oracle Crystal Ball, web-based overview:
<http://www.oracle.com/us/products/applications/crystalball/Crystal-Ball-product/overview/index.html>
- 6.9 @Risk, web-based overview: <http://www.palisade.com/GuidedTour/EN/RISK/>
- 6.10 Sword Active Risk, ARM 6, Chart and Report Catalogue.
- 6.11 EROMS Enterprise Risk and Opportunity Management System, Washington River Protection Solutions, description document.

Attachment 1 – Software Evaluation Roadmap



Attachment 2 – Risk Management Survey

EFCOG Risk Management Survey



This survey is being conducted by the EFCOG Project Management Working Subgroup, Risk Management Task Team.

The Energy Facility Contractors Group (EFCOG) is a self-directed group of contractors of U.S. Department of Energy (DOE) facilities. The purpose of the EFCOG is to promote excellence in all aspects of operation and management of DOE facilities in a safe, environmentally sound, secure, efficient, and cost-effective manner through the ongoing exchange of information and corresponding improvement initiatives.

The goal of this survey is to gather data which will help guide EFCOG in developing recommendations to DOE and to also identify problem areas where new initiatives can be launched to investigate, evaluate and recommend solutions.

The Risk Management Task team will assemble the data and provide each participant in the survey, summary level results to all of the questions. These summary level results will be helpful to each participant in understanding the current trends within the DOE Complex.

This survey targets the following topical areas:

- Types of Risk Management Software currently in use
- Processes used for developing and handling Management Reserve (MR)
- Processes used for developing and handling Schedule Reserve (Schedule Margin)
- Handling Operational Vs Capital Funding on Capital projects

Please enter your details below:

Site	<input type="text"/>
Company	<input type="text"/>
Name (optional)	<input type="text"/>
Contact info (optional)	<input type="text"/>

CONTEXT

Please check the Risk Management Process(es) applicable to your activities:

- Enterprise Risk Management
- Business Risk Management
- Program Risk Management
- Capital Asset project Risk Management
- Non-Capital Asset project Risk Management
- Operational Activity Risk
- Other (please describe)

Which best describes your contract?

- FAR-Based
- M&O
- Other (please describe)

Do you utilize an EVMS process?

- Yes
- No

If Yes, is your EVMS System currently certified?

- Yes
- No

RISK MANAGEMENT SOFTWARE

Which software application is used for your Risk Register?

- Microsoft Access
- Active Risk Manager (ARM)
- Acumen
- Deltek
- @Risk
- Excel
- Other (please list)

Overall, how would you rate your Risk Register software?

- Does not always meet my needs
- Meets my needs
- Always meets and consistently exceeds my needs

List "Pros" of your Risk Register software?

List "Cons" of your Risk Register software?

Do you perform a single integrated risk and uncertainty analysis including both cost and schedule?

- Yes
- No

If Yes, which software is used for your cost and schedule integrated analysis?

- Acumen
- Deltek
- @Risk
- Primavera Risk
- Other (please list)

List "Pros" of your integrated cost and schedule analysis software

List "Cons" of your integrated cost and schedule analysis software

**If not performing a single integrated analysis including cost and schedule,
Which software application is used for your discrete risk analysis (cost)?**

- Active Risk Manager (ARM)
- Acumen
- Deltek
- @Risk
- Oracle Crystal Ball
- Primavera
- Other (please list)

List "Pros" of your discrete risk analysis (cost) software

List "Cons" of your discrete risk analysis (cost) software

If not performing an integrated analysis for cost and schedule, do you perform a combined analysis of discrete schedule risk and schedule uncertainty?

- Yes
- No

If yes, which software is used for you combined schedule risk and schedule uncertainty analysis?

- Acumen
- Deltek
- @Risk
- Primavera Risk
- Other (please list)

List the "Pros" of your schedule risk and uncertainty analysis software

List the "Cons" of your schedule risk and uncertainty analysis software

If you do not perform a combined schedule risk and schedule uncertainty analysis, which software application is used for your schedule uncertainty analysis?

- Active Risk Manager (ARM)
- Acumen
- Deltek
- @Risk
- Primavera Risk
- Other (please list)

List the "Pros" of your schedule uncertainty analysis software

List the "Cons" of your schedule uncertainty analysis software

If you do not perform a combined schedule risk and schedule uncertainty analysis, which software application is used for your discrete risk analysis (schedule)?

- Active Risk Manager (ARM)
- Acumen
- Deltek
- @Risk
- Primavera Risk
- Othe (please list)

List the "Pros" of your discrete risk analysis (schedule) software

List the "Cons" of your discrete risk analysis (schedule) software

Which software application is used for your estimate uncertainty analysis?

- Acumen
- Deltek
- @Risk
- Oracle Crystal Ball
- Excel
- Other (please list)

List the "Pros" of your estimate uncertainty analysis software

List the "Cons" of your estimate uncertainty analysis software

MANAGEMENT RESERVE

Contractor Management Reserve (MR) value

For your Capital Asset Projects, Management Reserve value is:

- Not Applicable (No Capital Asset Projects)
- Calculated at agreed percentile (CL) and used without adjustment
- Calculated by other method (please describe)

For your Non-Capital Asset Projects, Programs or Operations Activities, Management Reserve value is:

- Not Applicable (No Non-Capital Asset Projects, Programs or Operations)
- Calculated at agreed percentile (CL) and used without adjustment
- Calculated at agreed percentile (CL), with some reduction for management
- Calculated, but reduced during alignment of budget with funding
- Determined by management
- Calculated by other method (please describe)

Contractor MR Spend Plan

For your Capital Asset Projects, a Management Reserve Spend Plan is:

- Not Applicable (No Capital Asset Projects)
- Not developed
- Developed and presented as a straight line
- Developed using risks and uncertainties with regard to when they can
- Developed by other methods (please describe)

For your Non-Capital Asset Projects, Programs or Operations Activities, a Management Reserve Spend Plan is:

- Not Applicable (No Non-Capital Asset Projects, Programs or Operations)
- Not developed
- Developed and presented as a straight line
- Developed using risks and uncertainties with regard to when they can
- Developed by other methods (please describe)

SCHEDULE RESERVE (MARGIN)

Contractor Schedule Reserve (Margin):

For your Capital Asset Projects schedule reserve (margin) is:

- Not Applicable (No Capital Asset Projects)
- Calculated at agreed percentile (CL) and used without adjustment
- Developed using other method (please describe)

For your Non-Capital Asset Projects, Programs or Operations Activities schedule reserve (margin) is:

- Not Applicable (No Non-Capital Asset Projects, Programs or Operations)
- Calculated at agreed percentile (CL) and used without adjustment
- Calculated at agreed percentile (CL), with some reduction for management
- Selected by management
- Calculated by other method (please describe)

Contractor Schedule Reserve (Margin) Cost

For your Capital Asset Projects schedule reserve (margin) cost is:

- Not Applicable (No Capital Asset Projects)
- Calculated by using an estimated hotel load
- Calculated by other method (please describe)

For your Non-Capital Asset Projects, Programs or Operations schedule reserve (margin) cost is:

- Not Applicable (No Non-Capital Asset Projects, Programs or Operations)
- Calculated by using an estimated hotel load
- Calculated by using an estimated hotel load, with some reduction for m
- Calculated by using an estimated hotel load, but reduced during alignm
- Calculated by other method of deriving schedule reserve (margin) cost

Contractor Schedule Reserve (Margin) Use

For your Capital Asset Projects schedule reserve (margin) value is:

- Not Applicable (No Capital Asset Projects)
- Shown in the project schedule as a milestone
- Shown in the project schedule as an activity bar
- Shown using other method (please describe)

For your Non-Capital Asset Projects, Programs or Operations Activities schedule reserve (margin) value is:

- Not Applicable (No Non-Capital Asset Projects, Programs or Operations
- Shown in the project schedule as a milestone
- Shown in the project schedule as an activity bar
- Shown using other method (please describe)

OPERATIONAL VS CAPITAL FUNDING FOR CAPITAL ASSET PROJECTS

Division of risk impacts (for Capital Asset Projects only)

Are operational cost impacts and capital funded cost impacts separately identified for each risk?

- Yes
- No

Are risks related to operationally funded project activities separated from those related to capital funded activities?

- Yes
- No

Is another method used to separate operational and capital risk impacts?

- Yes
- No

If "Yes" please describe

Are separate operational and capital MR spend plans developed?

- Yes
- No

Is one integrated MR spend plan is developed?

- Yes
- No

Are there any unique risks you have encountered in balancing funding levels between operating costs and capital costs that you can share? (please identify)

GENERAL QUESTION

This EFCOG Risk Management Sub-task Team has been chartered to promote the sharing of Risk Management Knowledge and identification and resolution of emergent issues. Please add any additional information you may feel would be helpful to us (e.g. Risk management issues you may be encountering, Risk Management success stories etc,

Thank you for completing our survey.

Attachment 3 – Software Requirements and Evaluation Criteria

Risk Register Software:

Requirements:

- Software Should be adaptable for all sites
- Meet cyber security requirements
- Configuration control
 - Change Log
 - Audit/Compliance Reports/Archivability
- Have reporting capabilities
- Customer Acceptance and Expectations (need to know)
 - SME (HQ)
- Integration with
 - Analysis Software (transfer data to analysis platform)
 - EVMS Process (e.g. ties RHS to schedule activities, ties risks to activities, MR spend plan)
 - ERM Systems
- Software Fields
 - General fields (ID, Title, Event, etc...)
 - Risk Bases (specific enhanced ability to detail bases of cost/schedule impacts)

Criteria:

- Cost
 - Initial
 - Recurring
- Ease of reporting
- Flexibility of report types
- Technical support demands/quality
- Ease of user interface
- Ease of adapting software to each site
- Life Cycle Health

- Upgrade capability/frequency (patches etc.)
- Sustainability (COTS: company longevity; Homegrown: Configurational control and maintenance)
- Multiple user capability and ability to restrict access to certain registers (e.g. Business)
- Ease of training (e.g., by COTS vendor, others)
- Future Interoperability between sites (RMBOK)

Analytical Software - Integrated Analysis

Requirements:

- Ability to import schedule data (multiple formats)
- Ability to input or import cost/resource data
- Ability to import/input estimating uncertainties
- Ability to import/input scheduling uncertainties
- Ability to perform schedule check
- Ability to add LOE/hammock
- Ability to perform deterministic analysis (determining CL of schedule before risk is loaded)
- Ability to input or import risk data (including mapping to activity)
- Ability to identify user defined fields
- Ability to code such that OPC Vs TEC are separate
- Ability to identify DOE/Contractor risks or perform separate runs
- Calculate:
 - Risk percentiles
 - Sensitivity analysis (by activity and risk)
 - Criticality (by activity and risk)
 - Cruciality (by activity and risk)
 - Individual risk impacts (by activity and risk e.g. as with Acumen)
 - Probabilistic cash flow
 - Outputs for MR/Contingency
- Ability to load results back into P6 (e.g. Gantt chart)

Criteria:

- Cost
 - Initial
 - Recurring
- Ease of reporting
- Flexibility of report types
- Technical support demands/quality
- Ease of user interface (e.g. input, operation, token/license configuration)



- Ease of adapting software to each site
- Life Cycle Health
 - Upgrade capability/frequency (patches etc.)
 - Sustainability (COTS: company longevity; Homegrown: Configurational control and maintenance)
- Ease of compatibility with available platform (e.g. Thin client, intranet, servers, desktop, laptop, internet)
- Ease of training (e.g., by COTS vendor, built-in help, on-line tutorials, others)
- Speed of analysis

Analytical Software - Discrete Risk Analysis (Cost)

Requirements:

- Ability to input or import risk data (cost only)
- Ability to code such that OPC Vs TEC are separate
- Ability to identify DOE/Contractor risks or perform separate runs
- Calculate:
 - Risk percentiles
 - Sensitivity analysis (by activity and risk)
 - Individual risk impacts
 - Outputs for MR/Contingency

Criteria:

- Cost
 - Initial
 - Recurring
- Ease of reporting
- Flexibility of report types
- Technical support demands/quality
- Ease of user interface (e.g. input, operation, token/license configuration)
- Ease of adapting software to each site
- Life Cycle Health
 - Upgrade capability/frequency (patches etc.)
 - Sustainability (COTS: company longevity; Homegrown: Configurational control and maintenance)
- Ease of compatibility with available platform (e.g. Thin client, intranet, servers, desktop, laptop, internet)
- Ease of training (e.g., by COTS vendor, built-in help, on-line tutorials, others)

Analytical Software - Schedule Uncertainty and Discrete Risk Analysis

Requirements:

- Ability to import schedule data (multiple formats)
- Ability to import/input scheduling uncertainties
- Ability to perform schedule check
- Ability to perform deterministic analysis (determining CL of schedule before risk is loaded)
- Ability to input or import risk data (including mapping to activity)
- Ability to identify user defined fields
- Ability to identify DOE/Contractor risks or perform separate runs
- Calculate:
 - Risk percentiles
 - Sensitivity analysis (by activity and risk)
 - Criticality (by activity and risk)
 - Cruciality (by activity and risk)
 - Individual risk impacts (by activity and risk e.g. as with Acumen)
 - Outputs for MR/Contingency
- Ability to load results back into P6 (e.g. Gantt chart)

Criteria:

- Cost
 - Initial
 - Recurring
- Ease of reporting
- Flexibility of report types
- Technical support demands/quality
- Ease of user interface (e.g. input, operation, token/license configuration)
- Ease of adapting software to each site
- Life Cycle Health
 - Upgrade capability/frequency (patches etc.)
 - Sustainability (COTS: company longevity; Homegrown: Configurational control and maintenance)



- Ease of compatibility with available platform (e.g. Thin client, intranet, servers, desktop, laptop, internet)
- Ease of training (e.g., by COTS vendor, built-in help, on-line tutorials, others)
- Speed of analysis

Analytical Software - Estimating Uncertainty Analysis (Cost)

Requirements:

- Ability to input or import cost data (by WBS and terms)
- Ability to code such that OPC Vs TEC are separate
- Calculate:
 - Cost percentiles
 - Sensitivity analysis (by term/WBS)
 - Outputs for MR/Contingency (by term/WBS)

Criteria:

- Cost
 - Initial
 - Recurring
- Ease of reporting
- Flexibility of report types
- Technical support demands/quality
- Ease of user interface (e.g. input, operation, token/license configuration)
- Ease of adapting software to each site
- Life Cycle Health
 - Upgrade capability/frequency (patches etc.)
 - Sustainability (COTS: company longevity; Homegrown: Configurational control and maintenance)
- Ease of compatibility with available platform (e.g. Thin client, intranet, servers, desktop, laptop, internet)
- Ease of training (e.g., by COTS vendor, built-in help, on-line tutorials, others)