Summer 2015

Project Title: A Risk Assessment Model for Assessing ITaP Institutional Opportunities for Efficiency and Cost Savings

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Team Members:

<table>
<thead>
<tr>
<th>Name</th>
<th>College/Affiliation</th>
<th>Email</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown, Robin</td>
<td>Information Services</td>
<td><a href="mailto:rdsbrown@pnc.edu">rdsbrown@pnc.edu</a></td>
<td>219-785-5508</td>
</tr>
<tr>
<td>Corcoran, Laura</td>
<td>Windsor Residence Halls</td>
<td><a href="mailto:lkorcor@purdue.edu">lkorcor@purdue.edu</a></td>
<td>765-494-2612</td>
</tr>
<tr>
<td>Farnsworth, Victoria</td>
<td>IT Application Services</td>
<td><a href="mailto:vfarnsworth@purdue.edu">vfarnsworth@purdue.edu</a></td>
<td>765-494-9796</td>
</tr>
<tr>
<td>Foster, Doug (Co-Chair)</td>
<td>Associate V.P. IT Services and Deputy CIO</td>
<td><a href="mailto:fosterd@purdue.edu">fosterd@purdue.edu</a></td>
<td>765-494-2177</td>
</tr>
<tr>
<td>Springer, Mitch (Co-Chair)</td>
<td>College of Technology</td>
<td><a href="mailto:mlspring@purdue.edu">mlspring@purdue.edu</a></td>
<td>765-496-2983</td>
</tr>
</tbody>
</table>

Report Dates
- Project Scope – June 5, 2015
- Final Report – August 6, 2015

Problem Statement
In aligning with President Daniels, and in the spirit of being good stewards of taxpayer dollars and student tuition, this project will define a methodology for ranking perceived inefficiencies attendant to Purdue University’s utilization of information technology, and, will explore a model for assessing Information Technology at Purdue (ITaP) institutional opportunities for increasing efficiencies and cost savings. This model will support examining information technology areas for creating efficiencies and cost savings through the utilization of this risk methodology. The assessment methodology and attendant model will support, from a macro view, the identification and categorization of the initial complexities of potential change. It is anticipated this project will act as the underlying premise and impetus for future projects exploring the intermediate and detailed approaches to one or more of these identified opportunities for creating efficiencies and reducing costs. It is not the intent of this team to suggest any specific cost savings initiatives, but rather, to demonstrate a methodology for assessing the risk of a number of cost saving opportunities.

Defining Risk Management
Risk management is a permutation of the words risk and management. That is, risk management is really a formal process for managing identified risks; either in a program or in an organization.

Risk can be defined as the probability of an undesirable event or situation occurring and the significance of the consequence of the occurrence.

For example:
A stock price drop causes a paper loss.
An interest rate increase causes higher home payments.
A plane crash causes multiple casualties.

When discussing risk we must also address rewards. There must always be some potential gain from successfully executing an activity with risk. As the potential gain increases, so does the acceptability of higher levels of risks. If the consequence of the risk occurrence decreases, the acceptability of assuming the risk increases.

Figure 1.0 reflects this relationship.

Figure 1.0 - Gain versus Acceptability of Risk

Additionally, there is the consequence versus acceptability of the risk. In this trade-off, the higher the consequence of the risk, the lower the acceptability of the risk, and vice versa. Figure 2.0 reflects this relationship.

Figure 2.0 - Consequence versus Acceptability of Risk

Risk management is a process composed of four distinct, yet dependent, activities:

- Risk planning
- Risk assessment
Risk Planning
The intent of risk management planning is to force organized intelligent thought on the tasks of identifying risks, and subsequently, on eliminating, minimizing, or controlling the expected consequences of risk occurrences.

The planning aspect of risk management requires some basic support from other individuals/functional organizations as well as a focused effort.

- Management buy-in: management must provide the necessary resources to perform the required program risk planning. In other words, managing risk is not free. There is effort involved in identifying, quantifying, prioritizing, and monitoring potential risks.
- Functional management buy-in: functional management are the most knowledgeable individuals on discipline-specific risks. In an organization such as information technology, functional management would be other attendant functions/disciplines such as HR, the business office, purchasing, the registrar and in our current dialogue, other named colleges; Engineering, Science, Business, Liberal Arts, Education and the like.
- Key areas should be targeted for the risk management process. While there are hundreds, if not thousands of risks ranging from little to no impact, to catastrophic impact, we have to narrow our immediate areas of interest to those most important to the existing context.

Risk, can defined as the probability of an undesirable event occurring and the significance of the consequence of the occurrence. Figure 3.0 depicts this relationship.
Figure 3.0 - Probability versus Seriousness of the Risk

Notice from figure 3.0, if the probability of the risk is low and the seriousness is equally low, then the risk is basically negligible. In other words, if it occurs, we will handle it through normal decision making. As the probability of occurrence goes up and the seriousness of the occurrence goes up, risks move from moderate to significant.

Formal risk mitigation is the process of determining what preventive actions should occur to reduce the probability of the risk occurring, what type of risk monitoring systems exist to detect when the risk occurs, and what contingent actions can be applied to reduce the seriousness should the risk materialize.

Risk Assessment
Risk assessment is concerned with identifying the risks and then quantifying them, so as to be able to address only those that pose the greatest probability of occurrence and the greatest seriousness should they occur.

Risks can be identified through any number of sources:

- Expert opinion
- Analogy comparisons
- Evaluation of tactical or operational plans

Quantification is characterized as:

- Creating a rating system for identified risks
- Getting all parties to agree on the rating system
Keeping the rating system relatively simple (high, medium, low)

In general, at the highest level, we are attempting to move risks through various known states as follows:

- Knowns - events or situations containing no uncertainty.
- Known unknowns - we know they exist, but don’t know much about them. For example, I know that the scientific discipline of bioengineering exists, but I don’t know much about it.
- Unknown unknowns—typified as events or situations that could not have even been imagined, such as diseases.

Further, risks exist in every discipline or function (e.g., plumbing, electrical, framing, etc.). Below identifies typical program-related risks.

Corporate business risks:

- Business risk—includes the chances of both profit and loss.
- Pure or insurable risk—includes only the chance for loss, not profit.
- Direct property (fire, storm, flood)
- Indirect property (renting alternative equipment)
- Liability (bodily injury, personal injury, property damage, lawsuits)
- Personnel (loss of key individuals)

Program/project risks:

- Technical risks (performance-related)
- Material properties (metal, plastic, fiberglass)
- Physical size of the entity (6 pounds, breadbox size)
- Speed of the entity (0 to 60? Yes!)
- Operating environment (nuclear threat, salt, sand, sun, moisture, etc.)
- System complexity (design/integration issues)
- Program risks (resource-oriented)
- Material availability
Risk Analysis

Risk management analysis is concerned with further definition and description of the identified risks. During this phase of the risk management process we determine:

- The likely causes of the risks
- Variation of the risks
- Magnitude of the risks
- Consequences of the risks
- Possible ways of dealing with the risks

There are many ways to analyze the risk. Techniques for dealing with the risks, to name only a few, include:

- Decision analysis
- Estimating relationships
- Network analysis
- Life cycle cost analysis
- Risk factors

There are many ways to analyze risk, ranging from making a quick assessment based on past experience to more scientific techniques. One technique is called decision analysis.
Decision analysis is also known as expected monetary value technique. It computes the expected value for each alternative and uses decision trees to depict the relationships.

For example, as an organization, should we conduct 100 percent of the tests of our 500 widgets we have to produce?

Givens:

- Field failure rate is 4 percent
- $10,000 per widget for testing (500 widgets x $10,000 = $5 million)
- If tested, there are reassembly costs of $2,000 for each passed widget
- If tested, the cost to repair a failed widget is $23,000
- A fielded failed widget costs $350,000 to repair

Figure 4.0 depicts a decision tree for this problem.

![Decision Tree Diagram]

**Figure 4.0 - Decision Analysis Decision Tree**

If our objective is to minimize cost, then we would select the alternative with the lowest expected monetary value, which, in this case, would be to test each widget.

Estimating relationships is an analysis method characterized by the following:

- Review characteristics from previous programs that exhibited cost problems
- Create a model relating characteristics and cost implications (problem = % cost overrun)
- Compare current program characteristics to those in the model
- Reserve sufficient funds for this program
Life cycle cost, as a risk management analysis technique, is based on the life cycle cost of a similar project. There are two basic steps in this technique.

- Perform single variable sensitivity analysis, varying:
  - Production rates and quantities
  - Design trade-offs
  - Resource projections
  - Repair and warranty variables
  - Reliability growth
  - Examine the whole project from cradle to grave

Performance tracking, as a risk management analysis technique, is really what we refer to as technical performance measurement. In summary, the basic activities are:

- Identify and baseline technical performance parameters
- Make monthly assessments of progress toward achieving those parameters
- Note variations from the baseline parameters
- Determine corrective actions

In transitioning from risk management analysis to risk management handling, we must remember there are three basic things we need to focus on:

- Preventive actions—those things we can do to reduce the likelihood of the problem occurring
- Risk monitoring systems—those systems put in place to raise a red flag should the problem begin to occur
- Contingent actions—those actions we need to take should the risk actually occur

A model depicting the interrelatedness of these items is depicted in figure 5.0.
Figure 5.0 - Risk Management Analysis to Handling

As depicted in Figure 5.0, preventive actions help us to reduce the probability of the risk occurring. Risk-monitoring systems help to detect the risk should it materialize. Contingent actions help to reduce the seriousness of the occurred risk.

Risk Handling

Once risks have been identified and quantified, there are four ways to handle the risks.

- Avoidance - accept a lower-risk choice. Avoid the higher-risk choice.
- Control - best stated as, “I am aware of the risk, and I will do my best to mitigate the occurrence and effect.”
- Assumption - accept the consequences should the risk occur. One mechanism to minimize the impact of assuming the risk is to share the risk. In a home-building example, the builder might suggest that should the price of lumber go up, the customer would kick-in half of the total cost impact.
- Knowledge and research - this is a continuing process to understand the risks and their impacts, as well as how to curb the events that might trigger the risk's occurrence

Summarizing risk management, then:

- Risk planning - sets out the requirements for performing risk management
- Risk assessment - is the process of identifying and quantifying program risks
Risk analysis - is the process of evaluating program impacts as a result of risk assessment
Risk handling - is the process of executing management actions to mitigate or eliminate the unwanted results of risks
Risk management - is a continual process through all program phases and the umbrella function of the above five steps

A Model for Managing Risk
A model for managing risks should take into account the many criteria that impact the decision on which risks are more likely to be successfully implemented. The criteria, likely, will not all be weighted equally. Criteria may include factors such as:

- Political climate
- Culture of impacted organizations
- Complexity of implementation to mitigate a given risk
- Costs of resources to make the required changes to reduce or eliminate the risk

While these are simply a few of the criteria, they begin to illuminate the myriad of factors weighing in on a given risk decision.

Once an agreed to set of criteria has been defined, then the next logical question asks if the criteria should all carry equal weight in the decision algorithm. The subsequent weighting of the criteria becomes the total of the weighted criteria of the decision matrix.

Figure 6.0 below depicts an example of a weighted criteria matrix with 1..N opportunities.

<table>
<thead>
<tr>
<th>Weighted Criteria/Identified Opportunity</th>
<th>Political climate</th>
<th>Culture</th>
<th>Complexity</th>
<th>Value of Opportunity</th>
<th>Costs of resources</th>
<th>Total Weighted Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunity #1</td>
<td>5</td>
<td>1</td>
<td>9</td>
<td>1</td>
<td>1</td>
<td>17</td>
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<tr>
<td>Opportunity #2</td>
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<td>5</td>
<td>1</td>
<td>1</td>
<td>9</td>
<td>17</td>
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<tr>
<td>Opportunity #3</td>
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<td>9</td>
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<td>5</td>
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<td>33</td>
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<td>9</td>
<td>5</td>
<td>5</td>
<td>9</td>
<td>29</td>
</tr>
</tbody>
</table>

Figure 6.0 – Weighted Criteria Matrix Example

In the above example, the opportunity with the lowest overall total weighted value would represent the opportunity most likely to be implemented successfully; given the weighted...
criteria in the decision matrix. Note, in the above example, all criteria are weighted equally; this, as discussed earlier, will not normally be the case and is very much specific to a given decision.

Each of the above weighted criteria may be defined as follows.

Political climate – represents the breadth and depth of the impact. This implies a weighting relative to the number of the people impacted as well as consideration for the hierarchical level of the individuals impacted.

Culture – this criteria is measured as the degree of alignment to the existing culture. For example; highly aligned to the current culture would represent a low risk (1), whereas, an opportunity most distant from the current culture would represent a high risk (9).

Complexity – is a function of two considerations; namely, technical complexity and implementation complexity. Where, implementation complexity would involve all of the considerations for actual implementation, training, development of policies, processes, methodologies and practices, and, reward systems for applicable individuals.

Value of Opportunity – is a function of cost savings, cost avoidance and organizational perception of intangible value. Cost savings are real dollars that may be returned to the bottom line of the financial statement. Cost avoidance are those costs that are not returnable to the bottom line of the financial statement, but, are perceived as efficiency gains through a reduction of human effort to perform a given task. Organizational perception of value are those perceived values not quantifiable to either category of cost savings or avoidance. In this latter instance, an example might include the creation of an automated notification system that the coffee maker is down, thus saving the energy and time consumed to go to the break room for coffee. This latter perception might be considered an increase in the quality of work life.

Cost of resources – includes those actual costs that are both recurring and non-recurring. If ranges were applied to this criteria they might look like the below, although would need to be tailored to a given set of decisions being considered.

- Low - $1M - $3M
- Medium - $3M - $5M
- High - $5M and above

**Preliminary Assessment (Go/No-Go) to Detailed Assessment**

The above model may be considered a preliminary assessment tool for purposes of narrowing, or down-selecting a given set of opportunities. The next phase of assessment might well be a detailed and more thorough analysis of the opportunities moving through the preliminary assessment tool depicted above.
An example of a next level detailed assessment tool can be found in Appendix A; the scorecard for the Information Technology Application Services organization of the Purdue University organization titled Information Technology at Purdue (ITaP). This tool, would act as a tier two assessment with opportunities as input, as determined by the output of the preliminary assessment tool described above.

**Identified Risks**
Through previous studies and catalogued reports, target rich opportunities for increasing efficiency and reducing overall costs would be identified. A recommendations section would follow the mapping of these many opportunities against the above pre-defined weighted criteria of success.

- Opportunity #1
- Opportunity #2
- Opportunity #3
- Opportunity #N

**Recommendations**
Given the above identified opportunities, the below model would suggest the top three opportunities, most likely to prove successful in implementation would be:

- Opportunity #1
- Opportunity #2
- Opportunity #3

{table added here after mapping}

Table 1.0 – Weighted Criteria Hierarchy of Mapped Opportunities

**Areas for Further Research**
This report defines a weighted criteria model for performing an initial assessment of a given set of opportunities for increasing efficiency and reducing costs. While the above model represents a conceptual and theoretical model, it does provide a viable methodology for preliminary
assessment of said identified opportunities. With this said, there are a number of potential modifications to the above model that represent a specific instantiation of the above described generic model. Specifically:

- What criteria, if different than those identified above, should be added, deleted, or modified?
- Of the identified criteria, what weightings should be applied?
- What rating (scoring) scale should be applied? The proposed scoring scale was devised to allow sufficient differentiation between possible scenarios of low, medium or high impact.
- Should the above preliminary assessment tool be further integrated into the tier two detailed assessment tool?
- Consideration should be given to further fleshing out the above proposed model for consistency and coherency with discipline specific models performing similar functions.
Appendix A – ITAS Tier Two Assessment Tool; Example

### Standard Service Request Prioritization Scorecard

**ONLY COMPLETE SHAD ED ITEMS**

<table>
<thead>
<tr>
<th>SR #</th>
<th>Request Date of SR</th>
<th>Note: Project sponsor is accountable for achieving the business case benefits set forth in this document.</th>
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<tbody>
<tr>
<td>Title</td>
<td>Payroll Assessment</td>
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<tr>
<td>Sponsor</td>
<td>Kendra Cooks, Linda Bar</td>
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<tr>
<td>Functional Area</td>
<td>HR-Payroll</td>
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#### Business Requirements

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<th>Score</th>
<th>Weight</th>
<th>Total</th>
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<tbody>
<tr>
<td>E</td>
<td>T+7 - Technical Directive</td>
<td>1</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>D+ - University Directive</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>E+ - Elective</td>
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#### Strategic Implications

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<tbody>
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<td>M</td>
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<td>3</td>
<td>9</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>S+3 - Campus (issued by Chancellor, Provost, EVP)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S+1 - College or VP Department</td>
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<tr>
<td></td>
<td>S+0 - None or lower than S+1</td>
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#### Benefits (measured for 3 years)

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<td>27</td>
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<td>M+1 - Less than $50,000</td>
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<tr>
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<td>M+0 - None</td>
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#### Risks

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<td>L</td>
<td>L+5 - Impacts majority &amp; training</td>
<td>7</td>
<td>5</td>
<td>35</td>
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<tr>
<td></td>
<td>L+5 - Distinct portion &amp; training</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>L+7 - Distinct portion &amp; no training</td>
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<td></td>
<td>L+3 - Small &amp; no training</td>
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#### The Score Card is used to prioritize requests, allocate resources, and assess the impact of the requested changes.
Standard Service Request Prioritization Scorecard
(ONLY COMPLETE SHADeD ITENs)

Comments/Justification

Use this section to justify or support why you selected the rankings in the various sections of the scorecard.

Business Requirements
Please see the ITA Service Request - Guidelines for Completing the Service Request - for Request Classification definitions.
Perform payrol assessment based on pain points found during hire to retire IT 2014. See proposal and SOW for more details.

Strategic Implications
The Comptroller and Human Resources areas are looking for efficiencies, effectiveness, and process improvements focused on streamlining and simplifying our payroll process. During the Value Stream Mapping of our current processes several pain points were identified regarding pay areas, pay cycles, concurrent employment, timing of deadlines, overpayments and... These pain points impact our business office and central offices process. This assessment will identify best practices within higher education and recommended improvement options. This information will help management prioritize future projects.

Benefits (measured for 3 years)
Payroll will be looking to reduce the number of pay cycles, combine the FY and FY or eliminate the need to have separate pay areas, simplify summer and academic pay processing (example eliminate the need for the ZZAY process and the borrowing of days to make the AY payment in May and August correct). Increase the number of days allowed each month for payroll action processing thus providing the departments to make hiring decisions and reduce the number of off-cycle or emergency pays. Exact metrics will be further defined once each improvement is prioritized and implemented.

* Benefits in productivity to Faculty, Staff & Students
Provide supporting details including: volume of transactions being processed, value of transactions being processed, number of creation and approval points related to transactions being processed, type of individual participating in the creation and approval points related to transactions being processed.

Risks
Current IT and Business resource availability might be at risk if not approved for this time frame due to other operational and project work.