Using Analytics to Identify Process Opportunities

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Identifying Process Improvement Opportunities:

Process improvement, one of the more popular business improvement initiatives has achieved both success and failure. Success has usually been as part of another initiative such as quality improvement six sigma types of projects. Failures have been more prominent in stand-alone process improvement projects. Studies indicate that up to 75% of process projects end in failure of some sort. The reasons cited are that the schedules are not met, budgets are exceeded, deployment is not successful, the performance is not met or the scope of improvement is not met.

How can we increase the likelihood of success on process projects? Determining the path of process improvement has always been a questionable effort. There are three core techniques currently available for determining the processes most likely to contribute to a business improvement.

1. **Traditional techniques** such as:
    a. A focus on a single or two performance factors such as cycle time or cost or quality
    b. Choosing the largest or most complicated process
    c. Oiling the 'squeaky wheel' where internal complaints are the greatest
    d. Using survey methods such as customer satisfaction (an indirect method)
    e. Plus a number of other subjective methods such as the management wants to change something
2. **The risk versus yield approach** that compares the risk with the expected yield of improvement to organize process improvement opportunities
3. **The strategic impact approach** that relates process performance to KPIs using correlation factors and the capability to drill down through those correlation factors to find the 'guilty party' process contributing to the decline of a performance indicator.

The more rigorous approaches as described in item 2 and 3 above (and there are other approaches emerging) are viable through the use of tools. Risk versus yield is done using a business analysis tool (such Gadrian from Enterprise Analytics, Inc. www.eanalytics.com used for the examples below) and certain process tools that can correlate process performance with KPIs (such as the process management/enterprise performance management tool from QPR www.qpr.com used for method 3 above). The strategy approach is the subject of another white paper.

Considering process performance:

The goal of any process analysis is to rank a set of processes in some manner to decide where to start and pick where you might get the best yield with the lowest risk. Assessing current process performance is the first step in identifying process improvement opportunities. A reliable method of performance ranking is required to accomplish a process performance assessment.

Measuring process performance comes with a number of issues. If the processes are being replaced by a package then there may be low interest in measurement. There also may be a limited amount of data you can gather about the existing processes. On the other hand there may be a workflow package in use that has built in measures. Knowing that there are a number of issues with process performance let's take a simple and basic look at a ranking approach based on performance.

Considering process context:

In business analysis a process is often analyzed for its internal complexity. A large process with many connections is more complex than a process with few connections. Working with such complexity is well known. There is another kind of complexity that is less known and has a large impact on the success of a process project. That complexity is defined by the number and types of touchpoints in the enterprise. In process change consider that the larger the quantity of touchpoints then the greater the risk of failure. Touchpoints means any point that the process contacts and interacts with the different components (or dimensions) of the business. This would include locations, other processes, organizations, decisions, systems, data bases and so on. In enterprise analysis there are over 25 different categories of components that are of concern to the analyst. Fortunately only 6 or 7 of them are used in day to day analysis work. So, process context in the more general case includes internal process complexity because you can look at the interactions of processes along with the interactions of the process with the rest of the enterprise.

Business processes (actions that are taken to support some purpose by a person or automated procedure) are never executed in a vacuum although some people may believe so. They are executed in context with many assets and enablers of the enterprise. Further, they have constraints or relationships that impact their usage. The enablers have characteristics of their own that may be severely impacted by process change or conversely impact the implementation of the new process. The entire set of influences or factors on a process is called "*its context*".

The context of a process places pressures on the process and may cause it to be analyzed for some improvement action. The degree of influence (the pressure) determines which processes might be a target for action. In addition, the results are often used to identify a set of *requirements.* Requirements, as defined in the dictionary, are things essential to the existence or occurrence of something else and relate information about who, what, where, when, how, and why something is needed. This information must provide sufficient detail so eventually something can be engineered or built. Several strategies such as process replacement, workflow

development, and automation via applications and so on are approaches used to fulfill those requirements.

Starting with Process Performance – The Yield Factor

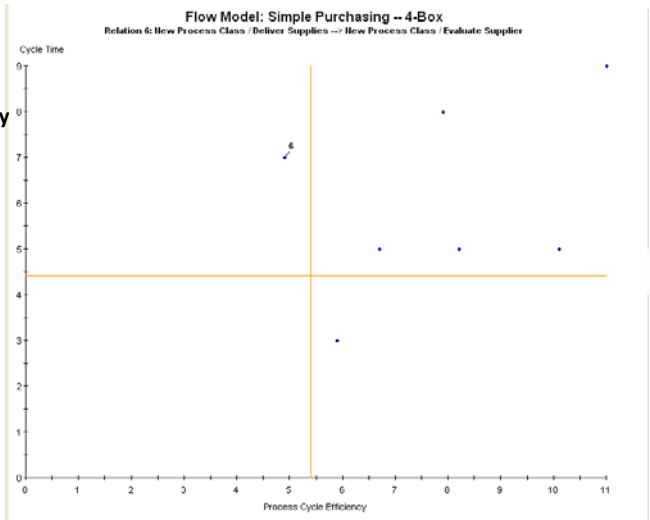
There are 7 basic measures that are used for improvement that emphasizes the operation of the process, namely cycle time, wait time (or queue time), transport time (movement between steps or processes), process cycle efficiency (or pure work time), error rate (a quality measure), throughput (an asset use type measure) and finally cost, the more visible measure for management.

One or two process measures are used to determine rank regarding where to apply process improvement funds and efforts. Simple rankings are used where the most costly or largest cycle time is the target of improvement. In some cases two variables are used together in a regression to give a simple 4 – box that points to good candidates. When you use two quantitative factors the chance for a better and more reliable process ranking increases. Below is an example of using two performance variables (process cycle time and process cycle efficiency) to assess opportunity.

Upper left quadrant – Best opportunity
Upper right quadrant – Second best
Lower left quadrant – third best
Lower right – least opportunity

Vertical Midpoint (4.41) Horizontal Midpoint (5.39)

No.	8 Relations	Cycle Time	Process
1	Start		
2	Identify Supplier	5.	6.7
3	Develop Supplier Relations	3.	5.9
4	Manage Relationship	8.	7.9
5	Purchase Supplies	5.	8.2
6	Deliver Supplies	7.	4.9
7	Evaluate Supplier	9.	11.
8	Manage Materials	5.	10.1

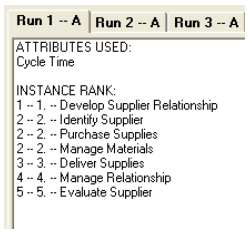


Example Interpretation of 4 -box: Improved process cycle efficiency falls direct to bottom line.

Best yield is reducing cycle time and increasing efficiency which means looking at dots in the upper left quadrant

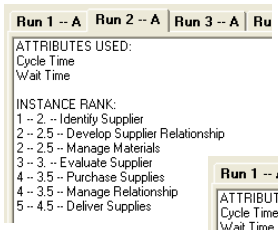
If you gather performance numbers on more than two of the seven types of attributes (can be done with workflow packages and ERP types of packages) then you can integrate them in to a single value and get ranking something like below.

The graphic below shows the ranking of a small group of processes to do a simple purchasing task. If you were to rank these based on cycle time alone then the choice for improvement would be the step or process with the longest cycle time. In this case it is Evaluate Supplier. If you were to use 2 attributes the best candidate is Deliver supplies. For four attributes it is Develop Supplier Relationship and for 6 attributes it is the same but the second candidate changes. Of course this does not take into account the interests of management who may have a totally different perspective.



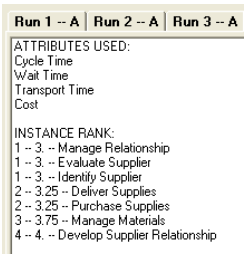
Single Attribute

Cycle Time



Two Attributes

Cycle Time
Wait Time

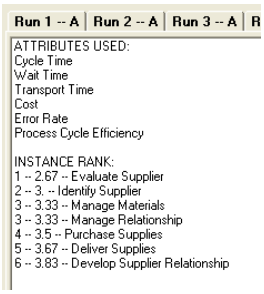


Four Attributes

Cycle Time
Wait Time
Transport Time
Cost

Using 6 performance attributes

- Cycle Time
- Wait Time
- Transport Time
- Cost
- Error rate
- Process Cycle Efficiency



Target is:
Develop Supplier Relationships
Deliver Supplies

So the first conclusion that is drawn from the process ranking and risk remediation effort is to get a ranking of the best yield opportunity to the least. In theory, start with the best yield and work down to the least. No method is perfect. Of course there are some other considerations, here are a few;

- You may want to start with processes in one location or organization or function. In that case you do this ranking within those boundaries

- You may want to use weight factors to give added emphasis to what might be an important attribute. While a good idea these weight factors get manipulated until the desired process comes out on top
- You may not have hard numeric performance values for all the processes. In this case you divide the processes into two (or more) groups according to the quantity and quality of the numbers.
- You may have to conduct a baseline study of the processes to measure their performance. Since this adds cost to the effort there is usually resistance. However, return cannot be calculated without a baseline.
- If the evaluations of the attributes are subjective with values like High, Medium and Low then the technique of Sabremetrics is used. Sabremetrics is a method of quantification of things like expert ratings of athletic performance as combined with quantitative values with some correlation. In these efforts you are looking for an indicator of performance (through correlation) or direct cause and effect which is a bit more difficult to achieve.

What we do not know at this point is the degree of risk associated with changing the various processes. A high yield high risk process may represent a good opportunity for failure. This is the purpose of context analysis.

Adding Process Context – The Risk Factor:

Earlier it was mentioned that one goal of process analysis is to rank a set of processes in some manner to decide where to start and pick where you might get the best yield with the lowest risk. Context analysis is an attempt to measure risk of changing a process. The question is 'which processes are the most risky to change'? Context analysis is a method that provides an answer to that question.

There can be a large number of context categories that are used for context analysis. It is most useful to use 5 or 6 categories that are common to most processes. Typically this would include the following:

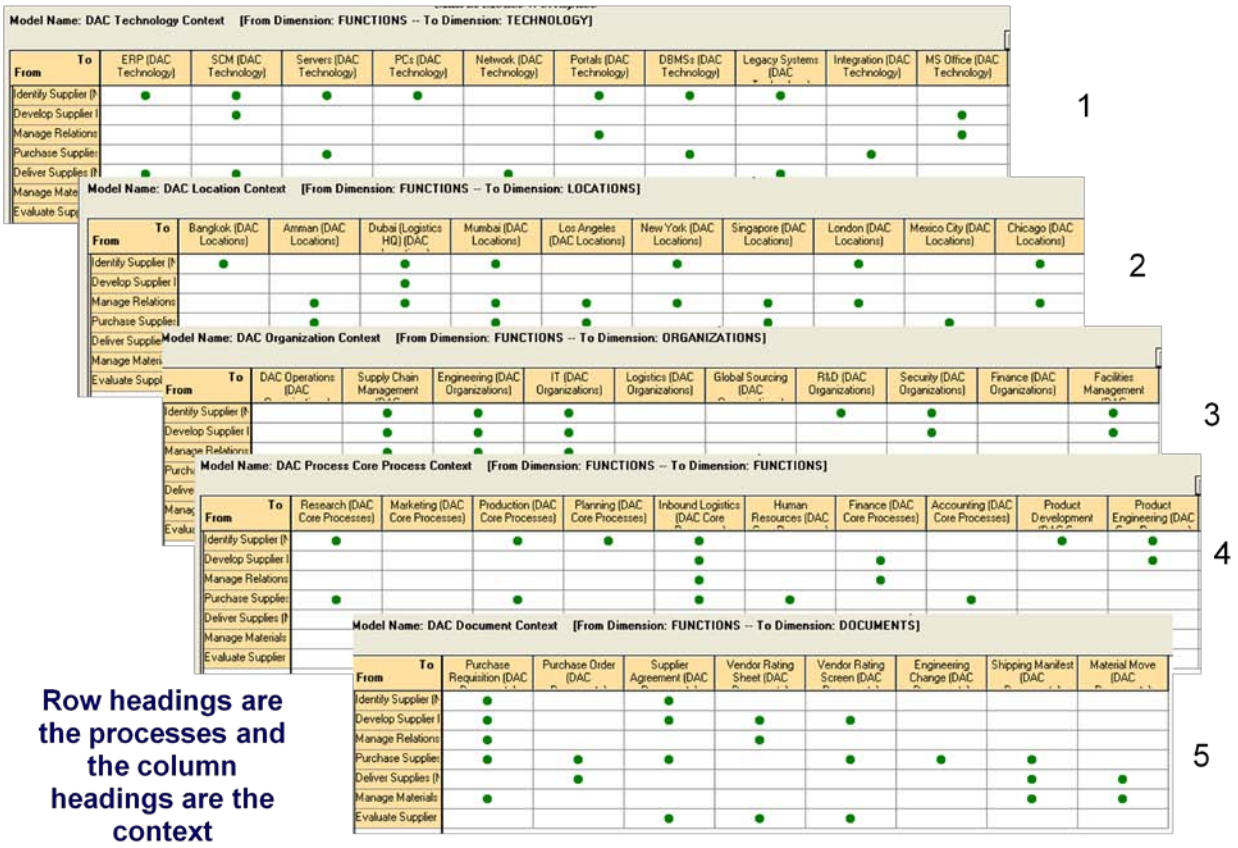
- Documents
- Technology
- Locations
- Organizations
- Other processes

In many cases if requirements for systems are the issue then you might use Applications, IT Infrastructure and Databases along with the above categories. If workflow is a target you might add policies, procedures, rules and decisions.

Often only one or two categories of context are used in determining the complexity of the relationship between processes and the enterprise. There is a simple technique to relate two

categories together. Using multiple context factors improves the assessment of risk and provides a better and more reliable process ranking relative to complexity.

If you gather context relationships on five or six categories then you can integrate them in to a single value and get a process ranking something like below. The example below shows a set of five context matrices that are used for ranking. Matrix 4 is the one that relates the target purchasing process set to the overall core processes of the enterprise. That means the purchasing process either supports or connects to the core process.



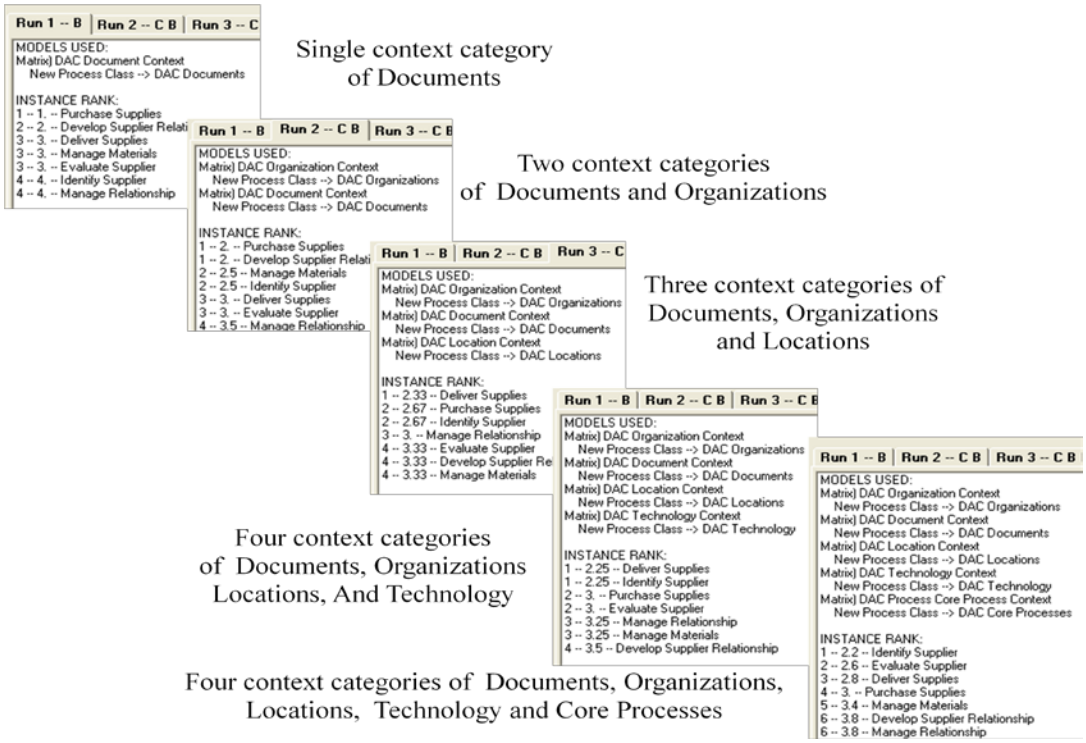
In the graphic below you can see how the ranking of the 7 processes changes as more context is added. Using only documents the ranking gives Manage Relationships as the process with the most touch points.

The graphic below uses the small group of purchasing processes used earlier. If the rank were based on only one type of context such as location, technology or documents then the choice for improvement would be skewed towards that context perhaps at the expense of other context factors that may be more significant or have greater impact.

In this case using just documents connected to the processes the greatest frequency of reference for a process is by the Manage Relationships process. However this is pretty weak by itself because there is not much difference between the least and most referenced process. If the matrix were larger this factor would most likely improve. If you were to use 2 context factors by adding the organizations that the processes touch, then the best candidate is still Manage Relationships. However, when all five context categories are used the most referenced process is Develop Supplier Relationship and Manage Relationships are both tied for the process with the most connections. Also, notice that there is good discrimination between the lowest and the most referenced.

The significance of the references is that the more touch points there are the greater the complexity with respect to the business and therefore risk related to process change. Larger matrices used in actual analysis are typically 30 to 50 row headings by 30 to 50 column headings. This analysis becomes more significant when dealing with the emerging use of workflow engines as the enablers become more significant. There are files, screens, data groups, rules, documents, policies, procedures, analytic flows and a number of other enablers that become involved with the process.

Included in this set of context matrices is a matrix that covers process to process complexity. Often this matrix is important as it shows all the interconnections between sets of processes or which processes support other processes as an enabler.



So the second conclusion that is drawn from the process ranking and risk remediation effort is to get a ranking of the least risky to the most risky. In theory, start with the least risky and work down to the most. There are some considerations that are needed to make this work well:

- The more accurate the associations the better the context analysis. Here are the extremes:
  - Associations that come from management interviews are OK but not the best. However, they are a good start.
  - Associations that come from fact such as what systems connect to which processes or workflows are much better but their scope is more narrow than the management view and more material is gathered to get the larger view. The material must be summarized and integrated for the more general views.
- The only way to use weight factors is on the final ranking results.
- It may be an advantage to divide the context by major component of the business to focus the eventual improvement effort.
- The most useful approach is to do the higher level associations and then to validate with some detail work. With the validation you can determine the approximate bias and factor that into the analysis.

First the performance of processes was analyzed for a ranking based on typical attributes such as cycle time, cycle efficiency, wait time and so on. The result is one set of ranking that can be used just focusing on the yield from process change. Then the focus was on the context of processes. This gives a ranking based on the complexity of the interconnection of the processes with the enterprise. This reflects the potential risk involved with the changes. Below these two are combined to get a ranking based on both yield and risk.

Combining these into the yield versus risk proposition:

So far both yield and complexity (risk) have been analyzed. The real value of this type of analysis is to use the two perspectives together to get a ranking of processes in terms of the greatest yield with the least risk. Of course, management interests will always override these considerations but at least the degree of risk and yield are known for the deviation. In this part we bring the two perspectives together.

Process analysis is not like physics where things are precisely known. Often the numbers relating to process execution vary according to the stability of the process. A machine based process might be very stable while a customer service process might vary considerably. The difference is usually in the variety of inputs and results from the process. Single input and single output are very predictable especially for machine output and assessing quantity and quality of the output. When it comes to variations in input and output, more measure variance exists between outputs. The process then has a variable set of performance parameters that need to be averaged. With performance factors this was assumed so there is no need to worry about it here but we need to be aware of the situation if we are to change the process.

Further, management often is changing the structure of the enterprise to respond to some market situation or competitive threat and so the context may also change. The point is, there is no perfection or exactness here only approximation. Even in best practices the results will vary from enterprise to enterprise. The enablers may also change over time or there may be a project in affect that is upgrading or changing a number of enablers that are not obvious. So the context may vary a bit also.

All of the 'variation' is normal in any enterprise that is adapting to its environment. The averaging out of values takes most of this into account. So perfection in measuring is not needed here but consistency is. If there is any bias it should be consistent. The reason is that we are concerned with ranking not absolute values. With this in mind we prepare a yield/risk 4 – box to rank process opportunities.

Preparing a risk to yield 4 – box and assessing the result:

The initial interest is to go directly to the relationship of the largest composite yield values and compare them or regress them with the largest composite context results. This is a good place to start. Of course you need two values for each point (in this case each point is a process component) to get a plot. The following two steps are required to get this to work:

1. The yield values are used with a focus on the 5 performance parameters used to identify candidate process for improvement based only on performance. The 'Y' or vertical axis is used for this value. The ranking might change a bit with more parameters in consideration but the changes are usually insignificant unless the parameter is heavily weighted.

2. The context or risk values are used with a focus on the set of four context matrices. The 'X' or horizontal axis is use for these values. These are used to identify the probable maximum complexity of the processes under consideration. The context used here is only partially complete as it does not include the enablers. The enablers would provide another degree of complexity or difficulty to making a change.

Usually 4, 5 or 6 performance parameters are used to get the yield ranking and 4 or 5 context categories to get the risk rank.

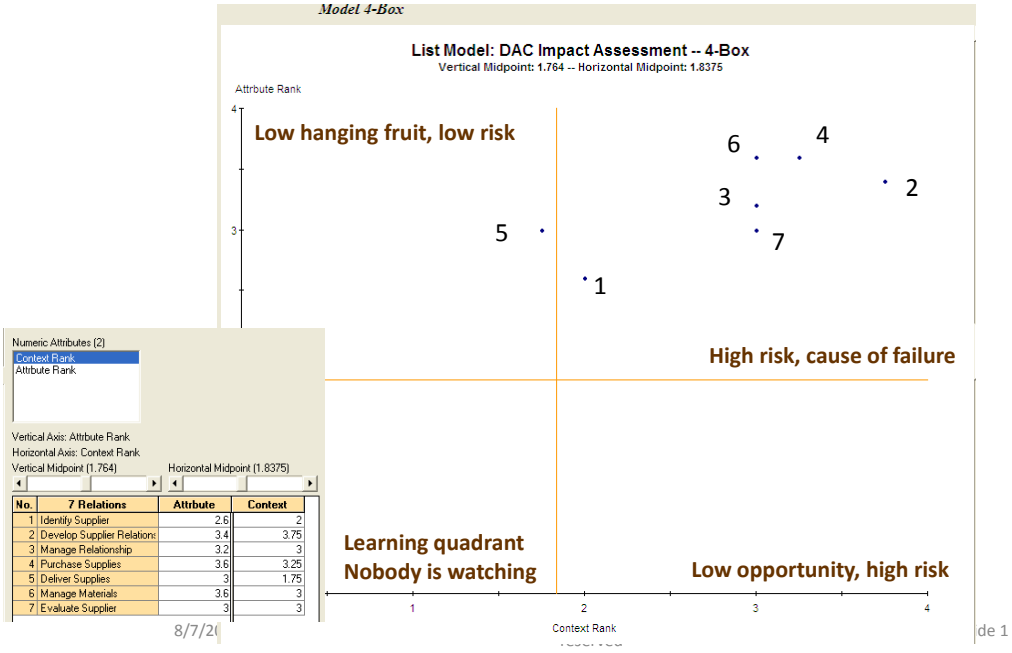
If process enablers are added then 4 or 5 enablers will give you a ranking based on enabler context. This results in a 3 dimensional assessment box with 8 boxes (2 by 2 by 2) for determining the risk – yield. This is a bit more difficult to work with and certainly not easy to explain quickly to management. A good approach is to use two 4 –boxes, one for the yield – business context and another for yield – enabler context, get a ranking for each and compare the two rankings.

Interpreting results of the 4-box:

The 4-box can be interpreted by quadrant using the following approach:

Quadrant Position:		Description		Business Implication
Upper Left		High yield, low complexity		low hanging fruit, low risk
Right		High yield and high complexity		High risk, cause of failure
Lower Left		Low yield and low complexity		learning opportunity
Right		Low yield and high complexity		leave alone

This is what the 4 - box would look like



To select which processes, steps or groups to work on the processes must be ranked. The final ranking can be done base on risk or yield. The guidelines are as follows:

- Minimize risk - Start with the lowest risk, highest yield process and rank according to risk
- Maximize yield - Start with the highest yield and lowest risk process and rank according to yield

Rank by Risk (lowest first):

1. **Step 5 – Deliver Supplies (1.75) This is the lowest risk sub process.**
2. **Step 1 – Identify Supplier (2.0)**
3. **These next three are about equal from complexity perspective, discrimination is by performance:**
    a. **Step 6 – Manage materials (3.0) best performance yield (3.6)**
    b. **Step 3 – Manage Relationship (3.0) next best (3.2)**
    c. **Step 7 – Evaluate Supplier (3.0) least of the three (3.0)**
4. **Step 4 – Purchase Supplies (3.25)**
5. **Step 2 – Develop Supplier Relations (3.75)**

Ranking according to risk is placing the sub processes in order of increased risk values. To minimize risk the steps or sub processes would be transformed in the following order:

Notice in the ranking above that the high yield processes are somewhere in the middle of the risk rank. Often these will be chosen as a balance between risk and yield.

Maximizing yield requires placing the sub processes in order of decreasing yield, highest yield rank to lowest. To maximize yield the steps or sub processes would be transformed in this order (Yield value is in parenthesis):

Rank by Yield (highest first):

1. **Step 6 – Manage materials (3.6) (higher rank because it is lower risk than Step 4)**
2. **Step 4 – Purchase Supplies (3.6)**
3. **Step 2 – Develop Supplier Relations (3.4)**
4. **Step 3 – Manage Relationship (3.2)**
5. **Step 5 – Deliver Supplies (3.0) (higher rank because it is lower risk than Step 7)**
6. **Step 7 – Evaluate Supplier (3.0)**
7. **Step 1 – Identify Supplier (2.6)**

Here the high risk sub processes are right up there with the yield. The yield is what makes the transformation of those processes attractive to management.

An alternative - Doing a step-wise analysis:

Sometimes a step-wise analysis is done to see the change in ranking as the yield and context change. This approach is used to find out which performance parameter and/or which context has the most influence on the results. The result is evaluated by observing the movement of the dots of the 4-box across any of the quadrants. The idea is simple, which parameters or context seems to cause the greatest movement.

The step-wise approach starts with one performance parameter ranking such as cycle time and one (or more) context rankings such as organizations impacted. The performance parameters are added one at a time and the change in ranking (noted by movements of the dots on the 4-box) are evaluate to find the parameter that seems to have the most influence. While a bit more tedious this technique may focus efforts more sharply into certain processes or process groups.

Summary of the risk – yield approach method:

1. Identify the target process, suite of processes or suite of groups of processes of interest
2. Gather 4 to 6 performance parameters on the processes (actual values or estimated)
3. Create a composite ranking that represents the yield opportunity part of the method
4. Gather the relationships of the same process suite and categories of the business (locations, technology, organizations, strategies and so on) using simple matrices. 4 or 5 of these are sufficient.
5. Create a composite ranking of the context results that represents the risk part of the method
6. Create a 4 –box (regression technique) using yield as the vertical axis and context as the horizontal axis.
7. Draw interpretations of the results

Comments and Cautions:
A few comments and cautions are in order for using this approach.

- You can do this type of analysis on a set of process steps, a group of processes or on a set of groups of processes. The level of detail depends on the data you have and if it is actual measured numbers or estimated numbers. Both work quite well.

- The example used in this 3 part series is very small consisting of 7 steps or sub processes. More likely a real suite of processes or steps will be 30 to 50 long and the context categories will have 30 to 40 instances.

- Matrices should have a density of about 33% to 66%, that is, the number of cells with a relationship should vary from 1/3 to 2/3 to be useful.

- The source of these matrices is often swim lanes used in the development of process flow diagrams in many process modeling tools. Swim lanes identify both connected

components of the enterprise (often organizations, locations, or external players) and enablers (often systems, databases machines and so on) that define the context of the processes.

- Without tools, a good and easy to work with quantity is about 15 to 20 processes (or steps) and about 15 to 20 instances of categories for the context and enabler analysis.

- There are several ways you can calculate a composite ranking for performance parameters or context. Weights can be added though we do not favor using such an approach due to manipulation mentioned earlier in Part 1.

- Finally, management interest will always overrule any formal method of ranking.

This article introduced the idea of a formal way to rank processes based on possible or expected yield of improvement and potential risk. At the end of the day you want to know what order to do the work that will provide the best yield and the least risk. At least if you need to tackle something with a higher risk than expected you know the issues as you have risk matrices to identify all the connections or touch points from the processes to the components of the enterprise. The types of rankings described in these articles provide the analyst with a good baseline and starting point for initializing a process project.

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- Techniques for Developing Process Requirements
- An Analytic Approach to Merger and Acquisition Operational Evaluation
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