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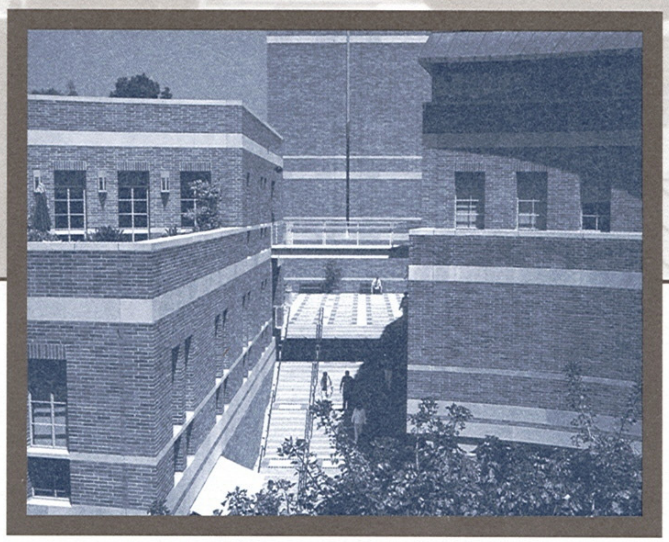

ON IT PROJECT SELECTION

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On IT Project Selection

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Abstract

The high rate of IT project failure has been widely noted. More recently, attention has been drawn to the frequency of problems in achieving tangible benefits from IT projects and to the observation that the most beneficial project candidates are not selected. This paper provides a step-by-step approach for IT project selection. The first step is to identify potential project candidates. Here an approach is defined based on both business processes and systems and technology infrastructure. The next step is to develop the project concept. The project concept is an initial assessment of risk, impact, and feasibility. The third step is to evaluate potential project candidates. Guidelines are provided for both single and multiple projects. The fourth and final step is project selection. A multiple criteria rating system is defined along with a resource allocation approach.

Key Words: project selection, resource allocation, trade-offs in project scope, project concept.

1. Introduction

Over the four and a half decades of IT projects, a number of frequent concerns and issues have been raised. Some of these include the following:

- A substantial of IT projects fail. Surveys indicate a failure rate of 40-50% or more.
- The benefits of completed IT projects are not achieved. Some have indicated that this percentage is 75%.
- Regional offices often indicate that their needs for IT systems are not being met by headquarters projects.
- The Gartner Group conducted a study among European managers that indicated that the biggest barrier to change was IT.
- Many infrastructure projects that are needed are often not done because the business does not perceive either the need or the benefit.

Researchers and practitioners have worked diligently to improve the rate of project success and achieve benefits. However, the problems still remain. One source of the problem is that many organizations treat project selection for IT work in the same way as for non- IT projects (e.g., engineering, product development, marketing campaigns,

construction). Yet, there are a number of significant differences. Because of the dependence of the organization on systems, the impact of not doing an IT project can be much more significant that the gains from not doing an engineering project (Lientz and Larssen [3]). An example of the traditional approach is Kavadias and Loch [2]. The difference is also highlighted by Ravichandran and Lertwongsation [5]. They make the valuable point that it is the targeted use of IT and its resources that really matter to the organization. Similar points are made by Quan et al [4] and Aladwani [1].

One failure lies in the start of the process- how projects are identified, evaluated, and selected. In the past, the method was often reactive. The IT manager, working with general management, would select projects. Many projects were initiated by individual business units and departments to meet their specific needs. Department managers who had IT knowledge, power, and/or money often had their projects selected. The situation changed with cross department systems. Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), and Supply Chain Management (SCM) are three categories of these systems.

Why do these problems occur? One set of causes rests in the initial identification of project ideas. Here a more structured approach will be defined based on business processes and systems and technology infrastructure.

Project ideas are sometimes not examined in depth. The idea of the project concept is developed that provides for a systematic method for developing a project idea so that it can be evaluated vis a vis other project ideas.

Project ideas are often only evaluation based on costs and benefits. Yet, if the benefits are not really measured after project completion, then this puts into the question the cost-benefit approach as the main criterion of evaluation and selection. Presented here is a more comprehensive approach for assessing both single and multiple projects.

Project selection is often based on cost-benefit analysis or specific management direction. Yet, with the project concept and expanded project evaluation, a wider range of criteria can be defined based on past user participation, impact if the project is not done, and risks associated with the type of project.

2. Step 1: Identify Potential Projects

The user oriented systems support key business processes. The other major category of projects relates to the systems and technology infrastructure. For the business processes, a useful table is that of processes as rows and systems as columns. The table entry is whether or not the system supports the process. There are interesting situations here. If there an empty row, then there is a process that has no systems support. This is an opportunity for a project. If there is an empty column, then the system supports no key

process. Infrastructure related systems support almost all processes. An alternative approach is to rate the degree to which a system provides support the process.

It is often difficult for IT to provide justification for infrastructure projects. The problem often lies in the definition of benefits. Here, instead of benefits, the approach is to identify the impacts if the work is not done. This can point to urgency for action. The approach is to rank the areas of infrastructure in terms of the effect if the problems are not corrected.

3. Step 2: Develop the Project Concept

The project concept consists of the following elements:

- Schedule of work
- Cost analysis
- Benefits assessment
- Likelihood of end user support
- Issues analysis
- Urgency or impact if not done

For a project idea, the standard approach to define the costs and benefits of the idea. The costs are estimated from previous work and experience without standardization. Different individuals have a wide range of experience and expertise.

The method here begins with project templates. A project template consists of high level tasks for each type of work in IT. For example, there would be templates for requirements analysis, software package evaluation, testing, etc. The template can be employed to develop a tentative schedule. Checklists and the schedule can support the development of costs.

The definition of benefits often rests on the cost savings, revenue increase, and other factors. However, this ignores the deterioration that would occur if the project were not done. When deterioration is factored in, the benefits can be substantially greater. Experience reveals that this is the case with infrastructure projects.

IT managers and staff have worked with end users in various departments for many years. There is knowledge about their participation, willingness to change, and capability to handle issues and problems. This can be employed to rate the project ideas in terms of user characteristics.

A list of potential issues for projects can be developed. This is a useful approach since the same issues recur again and again (see Lientz [xx]). This list can be employed as a checklist for each project idea. These are potential issues for the project that are likely to

occur based on impact. Each can be rated in terms of frequency and impact if not addressed.

The last part of the project concept is that of that of urgency. What will be the impact of not doing the project on both the business and IT?

4. Step 3: Conduct Single and Multiple Project Analysis

This section is divided into single and multiple potential projects.

Single Potential Projects

In the project concept, there is a rough schedule developed from templates. There is also a list of issues that potentially may arise in the project. The issues can be associated with individual tasks through a mapping. A task has risk if it has one or more significant issues associated with it.

Distribution of potential risk and issues over time

This chart is the percentage of task hours in a given time period with potential issues. This can derived from the schedule developed in the project concept. If the project idea is highly rated, but the percentage of hours with issues is high or rises later in the project, then you are aware of a higher likelihood of project failure. This can be employed to address the later issues earlier.

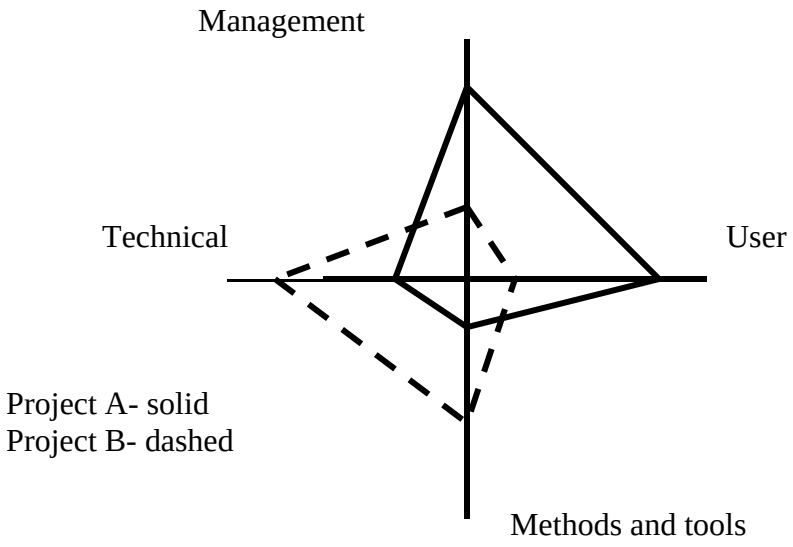
Percentage of work with significant issues

This measure is cruder than the previous one, but it can provide insight into the overall potential risk to the project idea. The percentage can be calculated using the mapping of the issues to the tasks.

Percentage of work with issues of a specific type

Issues can be of various types. Examples are management, technical, user, vendor, project, etc. Using the schedule with issues associated with the type of risk, the number of hours of work associated with each type of risk or issues can be derived. It is useful to construct a chart such as that in Figure 1. In this figure there are four types of risk: management, user, technical, and methods and tools. The first two of these are out of the control of IT while the latter two are within the scope of IT. There are two charts here. Project A (shown in solid lines) indicates that the dominant issues are uncontrolled. Project B (shown in dashed lines) is the reverse. Experience has shown that this can be useful for management in project idea evaluation.

Figure 1: Number of Hours by Type of Issue



Trade-off of Potential Issues by Scope

The scope of a potential project is often difficult to address. What management sees is that if the scope is expanded, the benefits increase substantially while the costs rise only marginally. This is due to the fact that in many cases, expanding the scope for IT projects only adds more labor hours. A useful approach is based on the observation that when the scope of a potential project is increased, the number, type, and severity of issues and risk rise substantially. For example, if the scope of an ERP project is to implement only at headquarters with existing processes, then the benefits are limited, the costs are substantial, and the risks are reduced. If the scope is expanded to the entire organization, the benefits rise and costs rise incrementally. However, the issues rise very substantially.

Multiple Potential Projects

Here the various project ideas can be compared and contrasted in standardized forms. Note that existing projects could also be compared to these project ideas. Also, by doing a comparison based on likely issues, management and IT have the opportunity to address some of these issues before the project work has begun. Experience has shown that this has a very favorable impact on the schedule, cost, and achievement of real benefits from the project work.

Ranking of Projects by Percentage of Work with Significant Issues

This is an overall ranking based on the percentage of work with associated issues. This and the following comparison can be derived from the table in Figure 2. Here the rows

are the potential projects. The columns are the types of issues. The entry in the table is the percentage of total work associated with the specific type of issue.

Figure 2: Potential Projects versus Percentage of Work by Risk Type

Potential Projects	Management	User	Technical	Methods and Tools
Project A	20%	30%	5%	5%
Project B	5%	10%	10%	5%

In this table are two potential projects (A and B). Project A clearly is riskier than Project B. Project A has a higher likelihood of failure based on the issues. This and the following comparison can be employed to trade-off against scope and benefits.

Ranking of Projects by Percentage of Work with Uncontrolled Issues or Risk

A type of issue is uncontrolled if the issues of that type are not under the control and management of IT and the project team. Examples of categories of uncontrolled issues are management, user, organization, process, and vendor. Examples of controlled issue types are technical, systems, and methods and tools.

The ranking of potential projects by uncontrolled issues shows in the example in Figure 2 that 50% of the work in Project A is uncontrolled while only 15% of that of project is uncontrolled. If Project A has a much better Return on Investment (ROI) or cost-benefit ratio, then the associated issues can be analyzed and potentially dealt with. Alternatively, the scope of the project concept can be adjusted to reduce the potential risks and issues.

Distribution of Potential Issues over Time for Projects

A chart can be constructed of the percentage of work in a given period with potential issues. This allows for multiple potential projects to be overlaid and compared on the same chart. This and the following comparison provide more detailed insight into the potential projects since the distribution is time sensitive. If the potential issues are mainly at the start of the project (say A) versus another (say B), then potential project A has reduced risk when compared to B.

Distribution of Potential Uncontrolled Issues over Time for Projects

This chart consists of the percentage of work associated with uncontrolled issues over time. This is often of greater value to management since it is often the uncontrolled issues that cause project failure.

The preceding comparisons consider the likely problems and issues for potential projects. Another set of comparisons can be developed to relate the potential projects to business factors. A suitable method for developing these tables is through collaboration between

IT and business managers. This exercise can provide the business managers with more in-depth insight into the impacts of potential projects.

Potential Projects versus Business Processes

A table can be constructed in which the rows are potential projects and the columns are key business processes. The table entry is a rating of the benefit or impact of the potential project on the business process. The table entry could be based on a rating of benefits to the specific business process. This is a key table for determining the following tables as will be discussed for each. This table is useful in showing the benefits of improving the IT infrastructure on many different business processes.

Potential Projects versus Business Mission or Vision

This table cannot be constructed directly due to the generality of mission and vision. Therefore, it is useful to define another table first: business processes versus business vision or mission. In this table is a rating of the contribution of an individual business process to the element of the vision or mission. The table of potential projects versus business mission or vision is a derived table by combining the two tables of business processes versus business vision or mission and potential projects versus business processes. This table highlights which projects can most contribute to the achievement of business goals, mission, and vision.

Potential Projects versus Business Issues

A similar approach can be employed for this table. The table of business processes versus business issues is defined. The table entry is the extent to which the individual process contributes to the business issue. The table of potential projects versus business issues can then be determined using this table and the first one in this section. This table is useful in a negative way. That is, the table shows which projects can contribute the most toward solving significant business issues.

Potential Projects versus Business Departments

Of lesser value but still of interest is the table of potential projects versus business departments. Here the first table to be determined is that of business departments versus business processes. The entry is the table is the degree of involvement of the individual department or business unit in the specific business process.

5. Step 4: Select Projects

The traditional approach of project selection rests on standard financial criteria such as cost-benefits, Internal Rate of Return (IRR), Return on Investment (ROI), or Net Present Value (NPV). However, the analysis in the preceding steps supports a wider ranging analysis.

Alternative ratings can be defined based on the following:

- Financial analysis
- Risk
- Contribution to resolving business issues
- Contribution to mission or vision
- User involvement and commitment
- Resource availability
- Impact on the business if not done

Comments on these criteria are useful. Risk can be considered in several ways. First, the percentage of work associated with uncontrolled issues can be employed. However, this is not time dependent. Therefore, an additional measure is often useful. One candidate is that of the mean of the distribution of percentage of uncontrolled issues over time.

Both the contribution to resolving business issues and that of mission or vision can be extracted from the work in the previous analysis step. User involvement is subjective based upon the past user involvement in IT related work.

Often, the issue of resource availability is taken up after project selection. Here resource availability is incorporated into the selection process. A useful table here to develop is that of resources versus potential projects. The rows are individual IT resources. The table entry is the demand of the potential project on the specific resource. Another related table that is valuable is that of resources versus existing projects and work. The columns here can include maintenance, support, and enhancements as well as existing projects. Taken together the two tables provide management with information of the effect of selecting specific potential projects on current work. This can be politically useful in acting to control maintenance and enhancement work as well as some of the current projects.

The rating of impact if the project is not done focuses on the deterioration of the business process over time. The best and most recent example of the use of this rating was the Y2K efforts that most organizations embarked on in the late 1990's. With the business potentially threatened, many systems were replaced or modernized and the technology infrastructure was updated. In many cases, this was done with limited attention to cost-benefit analysis. The key was urgency driven by a set date. Another instance has been in industries in which a new technology had to be implemented by all major firms in an industry after one firm took the lead. Examples have been RFID (Radio Frequency Identification), point-of-sale systems, and ATM (Automated Teller Machines).

It is the role of IT to support and help coordinate the development of the alternative ratings. As with the preceding steps a collaborative approach is most suited to doing this work. The position of IT should be neutral since with the exception of infrastructure, IT derives little direct benefit. The benefits accrue to the business units and organization.

The selection trade-off process serves to identify a slate of projects for the next period. Here it is valuable to develop a resource allocation table. The IT and user resources are shown in rows. The columns include the following:

- Selected new projects
- Existing projects
- Maintenance- repairs and fixes to current systems and technology
- Support and operations
- Enhancements- added features to current systems and technology
- Strategic planning action items- generated by the IT plan
- Emergency fixes- allocation set aside based on past experience

Note that the backlog of projects is not included since these items would be incorporated into the potential projects. Thus, a rejected potential project would appear in successive evaluations and selections until dropped or modified.

After developing the lists of items in each category, the first step in analysis and prioritization is to consider each category separately. Even though a new project has been approved, it has neither been funded nor given resources. The overall process is often carried out in three stages. First, new projects are approved. Second, funding is given to do the work. Third, resources are allocated to undertake the projects.

There are several potential ratings for existing projects. One is the percentage complete. A second is schedule performance. However, while these relate to the work, they do not relate to the business. Additional ratings are 1) impact on the business if the project is stopped and placed on hold; 2) percentage of remaining work with uncontrolled issues. The first provides a measure of urgency of the project while the second considers the overall likelihood of success in completion.

The literature has not really addressed the allocation of resources into maintenance, enhancement, and operations/support. These things are often taken for granted and avoid the formal resource allocation process. Rather than embark on the effort of cost-benefit analysis, an approach is to prioritize each of these in terms of impact if not done. Experience has shown that this can eliminate many enhancements and some of the maintenance work.

Once the ratings within each category have been carried out, then the overall ratings based upon alternative criteria (cost-benefits, risk, impact if not done, etc.) can be undertaken.

6. The Timing of Project Selection

The most frequent pattern of project selection is on an annual basis. However, with business demands and change, this is proving to be inadequate. Frequently, management and/or events step in to change the project slate and negate the project selection process.

Thus, it is useful to consider project selection and resource allocation on a quarterly basis. This allows for a greater sensitivity to changes in the business. However, the evaluation and selection method defined in the preceding sections supports a wider scope of evaluation. This in turn can reduce the number of disruptive changes to the IT work.

Example

A major employer in the northwest of Ireland is a farming cooperative with over 1,500 employees spread out over five counties. There are over fifteen lines of business, including 29 retail outlets, 3 dairies, 3 laboratories, one feed mill, transport, auction marts for the sale of cattle, meat processing, logging and timber, and mushroom production. The IT group consists of ten staff. In the past, projects were suggested to a management steering committee. The project selection criterion used was cost-benefit analysis. Yet, in the past, benefits were not evaluated after project selection. Many of the benefits were subjective. Most of the projects were undertaken for specific business units. An ERP system was implemented, but it provided limited benefits in finance and accounting. Because of this, emergency IT projects surfaced. A number of projects were not completed due to lack of resources.

The four step approach was implemented during 2002. The first step was to identify potential project ideas. Using the method in this paper, fifteen project ideas were identified. Of these 12 pertained to the business and three addressed technology modernization. For each of these the project concept was developed. In this process, a list of potential issues was gathered. User participation in past projects was also rated by IT and management. For each project idea the potential identified along with costs, benefits, schedule, and impact of not doing the project. This information provided input to the third step of evaluation.

Alternative project selection criteria included: 1) costs and benefits; 2) risk and issues associated with the projects; 3) resource availability; 4) user participation; 5) impact of not doing the project. The project ideas were then ranked in each criterion. This was done through collaborative meetings that included managers, IT, and employees. This approach provided consensus. It is interesting to note that the dominant criterion was the impact of not doing the project. The method has been used each year since. In fact, the method moved from an annual basis to semi-annual basis.

After the first cut that eliminated fifteen project ideas, the key remaining project ideas for which concepts were developed were:

- Upgrading of the point of sale system for retail stores (essential, with substantial benefits)
- Implementation of e-transactions with suppliers (labor savings, improved inventories)
- Milk testing system (of marginal value due to a current system in place)

- PLC system for the feed mill that controls the production of the food pellets
- Enhancements to the accounting system
- Replacement of the debtor's ledger system
- Modernization of the display system for the marts where cattle are sold (reduced labor, faster turnover)

In the other categories of support, maintenance, etc., a number of items were eliminated since their benefits could not be verified. This was the first instance in which maintenance, support, and enhancement work was reviewed with this degree of scrutiny. Resources were freed up to pursue new projects as a result. Using a collaborative approach, the managers and key employees understood and supported the ratings and priorities. This was a critical factor in avoiding priority changes later.

Resources were clearly not available to handle all of these projects. Rankings based on cost-benefits placed the point of sale project first and the PLC project near the bottom. Rankings based on risk and issues placed the debtor's ledger system at the bottom. This led to its elimination. In the ranking based on urgency and impact if not done, the PLC system rated the highest by a large margin. This was in spite of the fact that both the user department and IT saw no need for the project since the old system was still working, although at a reduced rate. The problem with the PLC system was that there was no internal or external systems support. As a result the PLC project and point of sale project received the highest overall priority. Enhancements to the accounting system and the debtor's ledger system were placed on hold. The display system was also approved.

There were a number of benefits of this implementation. The rate of project completion improved as did the cost and schedule performance. Resource use was not interrupted due to changing priorities. The benefits were better identified and understood since the impacts of not doing the work were determined. Smaller, marginal projects were deferred. Business unit managers better understood how priorities were set. Had the process not been employed, the PLC system would not have been replaced.

Conclusions

A stepwise approach for performing project selection for IT projects has been developed. The approach expands the standard method of cost-benefit analysis to include risk, user participation, and other factors. The value of this approach is increase the degree of realism in project selection. In addition, these additional factors can serve to narrow the scope to create more realistic IT projects at the start—thus, helping to avoid potential problems and failure later after the project has been started. To carry out the method it is necessary to institute a more systematic analysis of project tasks and issues.

A more structured resource allocation approach has been defined as part of the project selection process. This has a number of benefits. First, it can serve to ensure that work is actually performed on the selected projects. Second, the process can serve to control the

extent of work in maintenance, enhancement, and support. After all, while these sustain the processes, they do not significantly improve them.

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