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THE SELECTION OF PROJECT IN RAPID ENVIRONMENT'S INDUSTRY USING ZERO BASED BUDGET

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ABSTRACT

Purpose: *The strategic selection of projects deals with the determination of a strategic fit and prioritization. The impact of the project selection process obviously shows on the future profits and growth of an organization. Since the organization is much relied on that growth, this study is initiated to present the case study that the projects can set the plan to prioritize and allocate the resource of an organization.*
Design/methodology/approach: *The budgeting method i.e. "the Zero Based Budget (ZBB)" can be a tool to prioritize projects and allocate those scare resources to the project at the top list.*
Findings: *The article shows the case study of a company from a rapid environment's industry that needs fast development in their projects. The case provide lesson learn that a technology company should practice the six steps process to maximize their project contributions and deliver results using all available resources.*
Originality/value: *The article shows the key to success for practicing good prioritization for project management at high technology companies. The practical guidelines of Zero Based Budget (ZBB) are also useful for selecting projects.*

Keywords: project selection; strategic fit; prioritization; project management; Zero Based Budget (ZBB)
Classifications: Research paper

INTRODUCTION

Cindy has worked at Betel for 18 years. She has served in a variety of roles from individual contributor to senior manager. She has worked in three geographies and is now based in U.S. Betel is a giant company in a high tech industry that needs rapid development in its projects. Cindy realizes that there has always been more work to do than time to do it. This is not a new problem. Every employee has the responsibility to prioritize their projects, and more importantly, levels set and get agreement on those priorities with their managers and stakeholders on a regular basis. The projects at the top of priority list are selected to carry out before projects at the bottom of the priority list.

Therefore, which tool that Betel can use to prioritize its project? How Betel can use that tool? Why is it important? These are questions that Cindy wants to test out in her company. She also wants to make sure that the projects at the top list are selected and resources are not waste with low priorities' projects.

BACKGROUND

Souder, Mandakovic, and Gupta (Gupta and Mandakovic, 1992; Souder and Mandakovic, 1986) introduce the approaches in project selection into two categories: environmental factors in an organization and analytical models. The first category, environmental factors in an organization, is composed of systems approach for the decision making process in an organization, behavioral aspects in motivations, aspirations, and attitudes toward risk of individual managers, and organizational goals and strategies that are combined with R&D project selection. The second category, analytical models, is mostly studied by operation research analysts. They are included checklists technique, economic indexes, and portfolio models. The portfolio models are divided into linear programming, non-linear programming, decision theory, network theory, dynamic programming, goal programming, integer programming, and simulation.

The environmental factors in an organization are discussed as follows:

- Systems approach: The studies of systems approach for the decision making process in an organization are based on the idea that a project comes from any department and at any level within an organization. This idea is viewed organization as a hierarchical unit. The study by Winkofsky, Baker, and Sweeney (Winkofsky et al., 1981) is shown a comprehensive approach to a decision process model of R&D resource allocation in hierarchical organizations. Kocaoglu (Kocaoglu, 1983) studies the individual and organizational aspects through a hierarchical decision process. His study also develops a hierarchical model with measurement of subjective values via constant-sum comparison. The model can apply to make decisions in many management situations such as post-program evaluation using an expert consensus, ongoing program evaluation, goal formation, capital expenditure, resource allocations, project selection, and project performance evaluation. Souder (Souder, 1978) studies how the selection of models in project evaluation affects organization setting in different situation. His study also describes the "Q-Sort (QS) /Nominal Interacting (NI)" process for project evaluation. The QS/NI process uses psychometric methods and controlled group interaction to meet organization and behavioral needs before any project evaluation model can be used effectively.
- Behavioral aspects: There are researchers conducting this study such as Rubenstein & Schroeder (Rubenstein and Schroder, 1977) and Schwartz & Vertinsky (Schwartz and Vertinsky, 1977). The study of behavioral aspects is focused on how the personal, organizational and other variables affect the probabilistic assessment of technical success for R&D projects. The relationship between the characteristics of executives such as position and function, the attributes of the organization, and the trade-offs in forming judgments is another behavioral aspect in R&D project selection.
- Organizational goals and strategies: The studies in this type of environmental factors are concerned the fact that R&D project selection may match and support the strategy of a business or a corporation. R&D program is considered to support the strength in the core technology of the enterprise and the funding for R&D may be produced the expected results in a case study of Allied corporation (Allio and Sheehan, 1984). Curd (Curd, 1982) also studies how R&D priorities can be matched with corporate strategy in a large textile producer. Another study by Hambrick (Hambrick et al., 1983) investigates determinants of R&D decisions in individual business units.

The analytical models are mainly classified into checklists, economic indexes, and portfolio models. Each of these models is described below.

- Checklists: Projects is checked with a given criteria to evaluate each project. The score on criteria of each project formulate the total score for each project respected to relative importance weight of each criterion. The example of a checklist model is studied by Becker (Becker, 1980). A checklist model or stating in another way as a quantitative scoring model is formulated as

$$T(j) = S(1, j)*W(1) + S(2, j)*W(2) + ... + S(M, j)*W(M)$$

where;

$T(j)$ is the total score for each project j
$S(i, j)$ is score of criterion I for project j
$W(i)$ is relative importance weight of criterion i

In the above model, assume that there are N projects to be evaluated with M criteria and each jth is scored on every i^{th} criterion.

In addition to Becker's checklist model, there are other studies on this type of models such as Cooper (Cooper, 1978), Glazebrook (Glazebrook, 1976; Glazebrook, 1978), Krawiec (Krawiec, 1974), Merrifield (Merrifield, 1981), Paolini and Glazer (Paolini and Glaser, 1977), and Plebani and Jain (Plebani and Jain, 1981).

- Economic indexes: This approach is expressed in terms of economic factors such as the monetary value of a project, its probability of success, etc. to score and rank projects for index calculation. The instance of this approach is proposed by Ansoff (Ansoff, 1962). The economic index for scoring and ranking projects is as follows:

$$I(j) = \frac{(R \times D \times P \times (T + B) \times E)}{C}$$

Where:

I = Index
R = Probability of research success
D = Probability of development success
P = Probability of market success
T = Technical merit
B = Business merit
E = Present estimated value of earnings
C = Total required investment

Gupta and Mandakovic (Gupta and Mandakovic, 1992) considers the index model in the following prescription.

$$I(j) = P \times V$$

Where:

I = Index
P = Estimated probability of success of project j
V = Financial expression of value of project j, if successful

However, it can be formulated in different way to calculate the index for ranking projects. The formulation is

$$I(j) = P \times V + (1-P) \times F$$

Where:

I = Index
P = Estimated probability of success of project j
V = Financial expression of value of project j, if it is success
F = Financial expression of value of project j, if it fail

The discussion of strength and weakness of two indexes above is also presented in the study by Gupta and Mandakovic (Gupta and Mandakovic, 1992).

- Portfolio models: This approach for selecting projects is based on the mathematical programming, which is to optimize objective function, subject to constraints and limited environments of the organization. Portfolio models can be divided into eight methodologies: linear programming, network theory, dynamic programming, integer programming, simulation, non-linear programming, decision theory, and goal programming. The general form of a portfolio model is:

$$\text{Maximize/Minimize} \quad \sum_j V(j)$$

Subject to:

$$\sum_j E(j) \le B$$

Where E(j) is a project expenditure, B is the budget for j = 1,2,…, N candidate projects for funding, and V(j) is the value of each project.

For other methodologies in portfolio models, they are particular cases of the general form of the equations above. Eight methodologies of the portfolio models are similar as the mathematical programming approaches in table 2-3. Thus, this section will be briefly presented the explanation of the models, which is not intended to duplication effort of study, but rather to present another way of explanation of those models.

1. linear programming (LP): LP can be re-written from the general form of a portfolio model as:

$$\text{Maximize/Minimize} \quad \sum_j V(j) * X(j)$$

Subject to:

$$\sum_j E(j) * X(j) \le B$$

$$X(j) \ge 0$$

Where X(j) is a decision variable for selecting project j. E(j) and V(j) are as defined in the above equations. The objective function is usually an expected value in financial or in cardinal measure terms. The constraint can be laboratory capacities, man-hours at a certain degree of skill, etc. The applications of LP are examined by Gear (Gear, 1974), Allen and Johnson (Allen and Johnson, 1971), and Bell and Read (Bell and Read, 1970).

2. Integer programming (IP): IP studied by Weintgarner (Weintgartner, 1966) can be re-written from the general form of a portfolio model as:

$$\text{Maximize/Minimize} \qquad \sum_j V(j) * X(j)$$

Subject to:

$$\sum_j A(L, j) * X(j) \le B(L)$$

$$X(j) = 0 \ or \ 1$$

Where:

$V(j)$ = Net present value of project j
$A(L, j)$ = Cost of project j in period L
B(L) = L^{th} period budget

$$X(j) = \begin{cases} 0, \text{ if project j is rejected} \\ 1, \text{ if project j is accepted} \end{cases}$$

This model determines the budget allocation to projects during a certain number of periods and select which projects should be supported.

3. Goal programming (GP): GP in R&D project selection is modeled to address the problem of multiple and conflicting goals. The GP studied by Baker (Baker, 1974), Keown et, al. (Keown et al., 1979) and Taylor et, al. (Taylor et al., 1982) is a model with multiple goals and use in a decision that has multiple criteria with no common, underlying measures. The application of goal programming to project selection is to satisfy goals in a sequential and/or simultaneous manner. GP is also formulated in non-linear zero one goal programming to cope with the decision that the relationship of resource allocated to a project and the outcomes of project success is not linear. The non-linear model selects projects and allocates researchers to projects with the purpose of satisfying a prioritized goal structure.
4. Non-Linear programming (NLP): NLP in R&D project selection is complex in mathematical expression. As a result, it lacks of users to apply NLP models in practices. The data that is required for the models is also not manageable because of its complexity of the model. The study of NLP in R&D process is conducted by Daubin (Daubin, 1958), Reisman (Reisman, 1965), Reiter (Reiter, 1963), and Sharpe (Sharpe, 1963).
5. Dynamic programming (DP): DP considers the sequential nature of the decision in R&D. The first study for R&D project selection using DP is conducted by Hess (Hess, 1962). The further DP models in R&D project selection are expanded from the Hess's model, for instance, the studies by Aldrich and Morton (Aldrich and Morton, 1975), Atkinson and Bobis (Atkinson and Bobis, 1969), and Rosen and Souder (Rosen and Souder, 1965). However, there are other studies that are not based directly by Hess's model and focused on application. For instance, the studies by Cord (Cord, 1964), Dean and Hauser (Dean and Hauser, 1967), are proposed their approaches of DP for selecting projects and Bobis et al. (Bobis et al., 1971) reports an actual application of a related model.
6. Network theory: The studies of network theory in R&D project selection are conducted by Marschak (Marschak, 1963) and Nelson (Nelson, 1961) through

PERT and by Baker, et al.[Baker, 1976 #102] through algorithms applied to R&D area.

7. Decision theory: This theory is developed to evaluate the overall utility of a given project, or set of projects. It is studied under risk analysis such as the work of Moore and Baker [Moore, 1969 #112] and under utility models such as the work of Souder . It is also evaluated projects by applying decision tree analysis such as the research accomplished by Flinn and Turban, and Hespos and Strassman.
8. Simulation: Simulation is a technique for selecting R&D project in a dynamic organization. However, its limitation is prohibited of its practice when an organization does not have a well established standard and flow of information. The study of simulation in R&D project selection can be found in Augood, and Gaver and Srinivasan.

ZERO BASED BUDGETS

Zero Based Budget (ZBB) is the principal tool for prioritizing projects at Betel. Cindy realized the other day that most people at Betel don't actually know what the term ZBB means any more. Everyone Cindy listen to seems to use the term ZBB as if it meant "I've just decided to stop doing this."

Or more likely, "I've got way too much on my plate, so I've ZBB'd this." Cindy decided to test out her theory. She asked a couple of colleagues what "ZBB" meant. The most common answer was "well you just stop doing something." (The "duh" was unstated.)

But the real head scratching came when Cindy asked the follow-on question "how do you ZBB something?" It has become clear that sometime in our recent history we have lost the recipe on how to ZBB. "ZBB" has morphed into a verb and a buzzword. And if no one knows how to ZBB, Betel have a big problem.

Zero Based Budget (ZBB) is a method of budgeting for projects in which all expenditures must be justified each new period, as opposed to only explaining the amounts requested in excess of the previous period's funding. ZBB uses as a planning tool to list out priorities, cost those projects, and identify which projects will receive funding and which will not. For example, if an organization used ZBB, each department would have to justify its funding every year. That is, funding would have a base at zero. A department would have to show why its funding efficiently helps the organization toward its goals.

ZBB reverses the working process of traditional budgeting. In traditional incremental budgeting, departmental managers need to justify only increases over the previous year budget. This means what has been already spent is automatically sanctioned. In case of ZBB, no reference is made to the previous level of expenditure. Every department function is reviewed comprehensively and all expenditures rather than only increases are approved. ZBB is a technique, by which the budget request has to be justified in complete detail by each division manager starting from the Zero-base. The Zero-base is indifferent to whether the total budget is increasing or decreasing.

The term "Zero-Based Budgeting" is sometimes used in personal finance to describe the practice of budgeting every dollar of income that you receive, and then adjusting some part of the budget downward for every other part that needs to be adjusted upward. It would be more technically correct to refer to this practice as "Active Balanced Budgeting," but personal finance tends to be judged by its effectiveness, rather than by the accuracy of the terminology.

In a broad sense, ZBB is composed of two elements: a process and a document. The process is a resource management tool used at all levels to allocate available resources to a prioritized list of projects. Helps managers define a realistic set of deliverables when the amount of work exceeds the resources available. The document is a list of projects and/or activities that are prioritized and allocated some level of resource (e.g. support now, postpone, delegate/reassign, or drop completely).

Why is ZBB important?

After Cindy reviewed ZBB (a tool in which Betel uses to prioritize its projects), she starts thinking about the reasons to convey her employee to belief the importance of ZBB. If Betel does not use ZBB, Betel will be inefficient in an overall use of time and resources. An alignment with project managers and their stakeholders is also missing. Without ZBB, it can cause poor performance and moral of the team. The advantage and disadvantage of ZBB can make Cindy's team to understand more on ZBB's technique. (See table 1 below)

TABLE 1 Advantage and Disadvantage of Zero Based Budget

Advantages of Zero-Base Budgeting	Disadvantages of Zero-Base Budgeting
1. Results in efficient allocation of resources as it is based on needs and benefits and forces cost centers to identify their mission and their relationship to overall goals.	1. Difficult to define decision units and decision packages, as it is very time-consuming and exhaustive.
2. Drives managers to find out cost effective ways to improve operations and Detects inflated budgets.	2. Forced to justify every detail related to expenditure. The R&D department is threatened whereas the production department benefits.
3. Useful for service departments where the output is difficult to identify and increases staff motivation by providing greater initiative and responsibility in decision-making.	3. Necessary to train managers. ZBB should be clearly understood by managers at various levels otherwise they cannot be successfully implemented. Difficult to administer and communicate the budgeting because more managers are involved in the process.
4. Increases communication and coordination within the organization.	4. In a large organization, the volume of forms may be so large that no one person could read it all. Compressing the information down to a usable size might remove critically important details.
5. Identifies and eliminates wastage and obsolete operations and identifies opportunities for outsourcing.	5. Honesty of the managers must be reliable and uniform. Any manager that is prone to exaggeration might skew the results.

Guidelines to review and rank projects with ZBB

Cindy realizes that Betel should have a guideline to use ZBB. She called for the meeting with her team (Laura, Michael, and Stacey) and brainstorming to find the nature of philosophy and practice for ZBB.

Cindy: "Today, I like to brainstorm for a guideline to use ZBB. I believe we are all known what ZBB is, why ZBB is important, and what advantage and disadvantage of ZBB are. Michael, what is your perspective on ZBB? Please, speak up."

Michael: "It is accounting oriented without any specific output input linkages, presented in the form of a departmental budget the funds being allocated to certain aggregated budget heads rather than to certain specific activities/ programs."

Cindy: "That is one thing for ZBB that we can think of. Well, other perspectives for ZBB?"

Stacey: "I think It is an 'aggregated expenditure budget', it does not provide to the top management any basis for restricting expenditure, in case of affordability, it prevents its total funding. Hence the arbitrary across the board cuts affecting high and low priority tasks equally."

Cindy: "That is a good one. Laura, what do you think about ZBB?"

Laura: "It is an extrapolation of the last year's budget by: a.) incrementing it for an assumed rate of inflation, b). providing for wages and salaries increases, c). adding new projects/programs or activities, d). realistic submissions-imprudent if not foolish -also get the inevitable cuts, and get less than necessary, e). across-the-board cuts are made again Clever not what they wanted, and f). cleverer learn their lesion and deliberately inflate their budget submission in future."

Cindy: "Wow, that is a wonderful answer. ZBB also accepts status quo as the fate-accomplish all the activities- old and new -that have been included in the next year's budget. The budget should be equally essential in achieving the objectives, and currently being performed in the most cost-effective manner."

After the brainstorm meeting, Cindy concludes the 6 steps process for setting ZBB.

Six Steps process for ZBB

The process for ZBB includes six steps. There are 1). understand organizational and department objectives, 2). develop key deliverables that support objectives, 3). prioritize key deliverables, 4). allocate resources and draw ZBB line, 5). agree & align with managers and stakeholders, and 6). execute to plan and make appropriate adjustments. The communication has to be conduct throughout the process.

Step 1: understand organizational and department objectives. It attempts to find the intersection of opportunity and capability. It is also to understand (1) where the business and

org are going, (2) what needs to be done, and (3) your capabilities to meet the needs and add value.

Step 2: develop key deliverables that support objectives. It collects input from management, team-members, and stakeholders. Without fresh input, the group relies on inertia & carry-overs from previous periods. Result is misalignment, low ROI activities, and wasted effort. The deliverables should write concisely and state business impacts. For example, the deliverables are "SMART" (Specific, Measurable, Achievable, Realistic, and Timely). It is also need to define success metric and key result."

Step 3: prioritize key deliverables. This step is to identify the highest priority items to maximize impact, given scope of job and available resource. Key elements of the prioritization process are 1). understand tradeoffs between "urgent" and "important," 2). use help-methods e.g. ABC prioritization, SSM (Start, Stop, Maintain), Pareto Principle (80:20 rule), 3). understand value to Betel for each deliverable, e.g. What will happen if the item gets pushed or dropped? Can the deliverable be scaled back to consume less resource? and 4). consult with management & stakeholders throughout.

Step 4: allocate resources and draw ZBB line. This step is to propose items below ZBB's line. (See table 2) It should escalate and get help if there are unacceptable business consequences of ZBB'ing.

Table 2 Propose items and draw ZBB line

Key Deliverable	Priority	Resource Required	Interdepen-dencies	Consequence of ZBB'ing	Commit Date	Status
XXX	A				Weekly	On track
YYY	A				Ongoing	On track
ZZZ	A				WW21	On track
ABC	B				WW25	On track
123	B		ZBB Line		EOQ	At risk
456	B				ZBB	Dropped
789	C				ZBB	Pushed

Step 5: agree & align with managers and stakeholders. The ZBB process does not work without this step. It needs to communicate often with your stakeholders (manager, business partners, internal customers, peer functions, your team, etc…). The communication process should include: a). what is "above the line" AND what you propose to ZBB, b). opportunities for stakeholders to influence your ZBB, c).negotiation on priorities and due dates, and d). escalation of any items "at risk" due to lack of resources. It should ensure that you get co-ownership with your management (you succeed or fail together).

Step 6: execute to plan and make appropriate adjustments. This step focuses on execution e.g. 1). plan out your quarter, week, and day, 2). leave some buffer time for unexpected requests, 3).practice good time management – discipline yourself to work on the most important items first (vs. the easiest, etc…). It is flexible and makes appropriate adjustments. For example, it recognizes that we work in a dynamic business environment. New items will appear and organizational priorities will change. Your ZBB process needs to be dynamic. It regularly renegotiates your ZBB list and due dates with management & stakeholders. It is also needed to regularly reprioritize: assess new requests versus current list.

CONCLUSION

In school, and in some other places Cindy have worked, assignments were given out in a more "measured" way. The expectation was that everything you were given would get done. Or else. At Betel, not so. Your manager or your customers will keep piling things onto your plate until you never leave work.

Remember: ZBB is about maximizing your contribution and delivering results using all available resources. Practicing good prioritization & ZBB is key for the success of Betel and your success at Betel. You should practice the 6 step process: 1). understand the big picture, 2). write SMART deliverables that have clear value-add, 3).use a proactive & methodical approach to prioritizing, 4). allocate resources with focus on impact and quality, 5). agree and align with managers and stakeholders, and 6). execute and adjust along the way. You should also communicate early and often.

There are lots of other things that are critical to success at Betel: talent, brains, hard work (and luck). But in Cindy's experience, figuring out ZBB is number one. Take control of your own ZBB – if you don't, nobody else will!

QUESTIONS

1. What is ZBB? Why is ZBB important?
2. Construct a 1 sentence goal for you or your team representing what you would like to take away from this case. e.g. "**My (our) ZBB goal is to…**"
3. What are 3 actions that you are going to take in the next 2 weeks based on steps 1-3 of ZBB process?
4. What are some of the key elements of the prioritization process using ZBB?
5. What are the consequences of NOT setting good priorities up front?
6. What are advantages and disadvantages of ZBB?
7. How ZBB is used? Explain its process.
8. What are 3 actions that you are going to take in the next 2 weeks based on steps 4-6 of ZBB process?
9. What will you discuss with your manager in the next 2 weeks on your key learning from this case?
10. What do you plan to do differently as a result?

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