

# Mapping the Dimensions of Project Success

**Aaron J. Shenhar**, School of Technology Management, Stevens Institute of Technology, Hoboken, New Jersey 07030

**Ofer Levy**, Faculty of Management, Tel Aviv University, Tel Aviv, 69978 Israel

**Dov Dvir**, Faculty of Management, Tel Aviv University, Tel Aviv, 69978 Israel

## ■ Abstract

Project success is probably the most frequently discussed topic in the field of project management, yet it is the least agreed upon. Various measures have been offered to express the success of a project—most common among them are meeting schedule, budget, and performance goals. Different people, however, assess the success of projects in different ways, and at different times. Previous studies have suggested applying multidimensional frameworks to assess project success. Using a similar approach and based on data collected from 127 projects, this paper proposes a multidimensional universal framework to assess of project success. We show that project success could be assessed along at least four distinct dimensions: project efficiency, impact on the customer, direct and business success, and preparing for the future. The exact content of each dimension and its relative importance may change with time and is contingent on the specific stakeholder. Our mapping provides a basis for additional investigation and for further refinement of individual success measures for specific types of projects.

*Keywords:* project success; success measures; assessment

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Project management has become today one of the main organizational activities performed within modern organizations. Assessing project outcome is of extreme importance to everyone involved—managers, customers, and other stakeholders (Cleland, 1986; Kerzner, 1994). Yet, success assessment may differ, depending on the specific point of view. Almost everyone is familiar with projects perceived as successful by those involved in their implementation, while the very same projects have been poorly received by customers (Pinto & Slevin, 1988). There are other projects that consumed excessive resources and were considered internal failures, but were later hailed as successful by their customers and become a source of revenue for the company for many years (de Wit, 1986).

Freeman and Beale (1992, p. 8) provided an interesting example of the different points of view of people: “An architect may consider success in terms of aesthetic appearance, an engineer in terms of technical competence, an accountant in terms of dollars spent under budget, a human resources manager in terms of employee satisfaction, and chief executive officers rate their success in the stock market.” Cleland (1986, p. 6) suggested that “Project success is meaningful only if considered from

two vantage points: the degree to which the project’s technical performance objective was attained on time and within budget; the contribution that the project made to the strategic mission of the enterprise.”

This paper is based on data from a comprehensive study of projects performed by Israeli industry. As in previous studies, we adapt a multidimensional, multiobservational framework to assess project success. We attempt, however, to take the multidimensional approach one step further by identifying four universal dimensions of success: project efficiency, impact on the customer, business and direct success, and preparing for the future. Project and top managers may use this framework as a guideline prior to project initiation. They should identify in advance the expected benefits from the project along different dimensions and focus their teams on this prespecified set of expectations during project execution.

## Theoretical Background

Project effectiveness may be assessed by different interest groups—stockholders, managers, customers, employees, and so on. Criteria for measuring project success must therefore reflect different views (Stuckenbruck,

<p><b>Meeting Design Goals</b></p> <p>Meeting operational specifications  Meeting technical specifications  Meeting time goals  Meeting budget goals</p> <p><b>Impact on the Customer</b></p> <p>Fulfilling customer needs  Solving major operational problems  Actually used by the customer  Level of customer satisfaction</p> <p><b>Benefits to the Organization</b></p> <p>Level of commercial success  Generated a large market share  Opened a new market  Opened a new line of products  Developed a new technology</p>
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**Table 1.** Project Success Dimensions

1986). Similarly, different people, even if they are part of the same organization, will view success in different ways at different times. No wonder, therefore, that the notion of project success is so rarely agreed upon.

The difficulties involved in assessing project success from several points of view has traditionally driven project managers to ascribe to simplistic formulae in rating success: "Projects are often rated successful because they have come in on or near budget and schedule and achieved an acceptable level of performance. These characteristics may be used because they are the easiest to measure and they remain within the realm of the project organization" (Pinto & Slevin, 1988, p. 67). These internal measures of efficiency (staying on budget, on schedule, and meeting technical goals) are partial and sometimes misleading. They disregard incidents where a project was run efficiently but eventually did not meet customer or organizational expectations.

These reasons motivated several researchers to add a new element to the notion of project success: the satisfaction and welfare of the customer (e.g., DeCotiis & Dyer, 1979; Paolini & Glaser, 1977; Pinto & Slevin, 1988). De Cotiis and Dyer demonstrated in their study that five out of 12 determinants of R&D success are related to the external (client) environment. A similar study performed by Baker, Fisher and Murphy (1988) confirmed the previous findings and established the importance of customer satisfaction as a measure of project success. They suggested, however, to push the definition of project success even further by including the level of satisfaction of four different groups of stakeholders: the customer organization, the developing

organization, the project team, and the end-user. And the continued arguments on project success assessment prompted the Project Management Institute to devote much of its 1986 Annual Seminar/Symposium to the question of measuring project success (Project Management Institute, 1986).

Freeman and Beale (1992), who reviewed the project management literature, identified seven main criteria for measuring the success of projects; five of them are more frequently used than others:

- Technical performance
- Efficiency of execution
- Managerial and organizational implications (mainly customer satisfaction)
- Personal growth, and
- Manufacturability and business performance.

The variety of measures used to assess organizational success has led some researchers to group these measures into several distinct clusters with common underlying dimensions. Cooper and Kleinschmidt (1987), for example, used factor analysis techniques to identify three different dimensions to the success of new products: financial performance—capturing the overall financial success of the product; opportunity window—portraying the degree to which the new product opens up new opportunities for new categories of products and new market areas; and market impact—describing the impact of the product in both domestic and foreign markets.

Pinto and Mantel (1990), based on a literature survey and after interviews of experienced project managers, reached a similar conclusion. They identified three distinct aspects of project performance as benchmarks against which the success or failure of a project can be assessed: the implementation process, the perceived value of the project, and client satisfaction with the delivered project. The first of these aspects is primarily concerned with the internal efficiency of the project execution process. The second and third aspects are concerned with the project's external effectiveness and impact.

This multidimensional approach was also used by Dvir and Shenhar (1992) in their research of success and failure of strategic business units in the electronics and computer industry. They found that business unit managers see the success of their units as comprising four separate dimensions: profitability level; level of sales and new orders (backlog); generating new opportunities—for new products and new markets; and preparing the scientific and technological infrastructure for the development and production of future products.

In their thought-provoking article, Pinto and Slevin (1988) suggested that the relative importance of project success dimensions changes with time. The important factors in the early stages of a project are internal—meeting budget, schedule, and technical performance. Yet in more advanced phases of the project, external factors such as customer needs and satisfaction become more

important. Baker, et al. (1988) adopted a similar point of view and suggested that overruns in budget and time cease to be important after the project is terminated. Customer satisfaction and its relation to the project organization continue to be important even beyond project boundaries. Pinto and Covin (1989) tied variations in relative importance of success dimensions to project life cycle, suggesting that not only the relative importance of success dimensions varies with project progress but also the critical success factors—that mostly affect the project outcomes—are different at every phase of the project.

Another question regarding the problem of assessing project success is the relationship between the overall appraisal of project performance and various success dimensions. Project managers and other stakeholders are often asked to rate project success on a scale that spans from total failure to extreme success. Such an assessment would intuitively involve all performance criteria expressed in one score. However, several questions may be asked: Is this evaluation internally or externally oriented? Is it influenced by the end-user type? If such an influence exists, what is the nature of the relationship between the internally oriented dimension and other dimensions? Unfortunately, such topics have been rarely addressed in the project management literature.

As stated previously, this paper deals with the multi-dimensional nature of project success. It tries first to identify the underlying universal set of dimensions. Using four success dimensions found in the first phase of our analysis, we next examine the changes in the relative importance of various dimensions over time. Finally, we discuss the nature of appraisal of the overall performance of a project and its implication for management and for further research.

### Methodology

Using structured questionnaires, distributed among 182 project managers, information was collected about industrial projects executed in Israel during the last 10 years. The managers were approached during executive project management seminars, longer training programs, or via personal contacts. One hundred twenty-seven completed questionnaires were returned—a response rate of about 70%.

The projects in our sample were performed in a variety of industries, including construction, electronics, computers, mechanical, aerospace, and chemical. The end-products were aimed at the military market, as well as for commercial use. Although the projects we studied were not selected randomly, the variety of project size (\$40,000 to \$2.5 billion) and the industries and the diverse nature of their core technologies give no reason to suspect a bias in the results. Nevertheless, since project managers were given the liberty to select the reported project from their own experience, there could naturally be a tendency to choose the successful projects.

**Measures.** Based on indications from previous research (Cooper & Kleinschmidt, 1987; Dvir & Shenhar, 1992; Pinto & Slevin, 1988; Stuckenbruck, 1986), we collected data on 13 measures of success on a scale of 1 to 7, designated from “very low” to “very high.” These measures were initially grouped into three clusters and a single measure to assess the overall success of the project. The first cluster was coined “meeting design goals.” It referred to the initial contract, agreement, or commitment. Such commitment usually specifies the operational and technical characteristics of the end product, the time it will take to deliver it, and the cost of that effort. The second dimension was coined “impact on the customer.” It included assessing the success in meeting customer needs, solving customer problems, and assessing customer satisfaction. The third dimension was coined “benefits to the organization.” It included commercial success, market results, and the development of a new product line and a new technology. The measures comprising each dimension are listed in Table 1. In addition to assessing the 13 measures, the interviewees were asked to rate overall project success on a scale from 1 to 7. We also classified projects into two groups of end-users: the open market, and an identified,

### ■ About the Authors

**Aaron J. Shenhar**, Ph.D., institute professor of management at Stevens Institute of Technology, holds five academic degrees in various fields of engineering and management. Dr. Shenhar accumulated over 20 years of technical and management experience at Rafael, a leading high-tech organization in the defense industry in Israel. His current research and consulting is based on project management, new product development, and management of innovation in technology-based organizations.



**Dov Dvir**, Ph.D., is a senior lecturer and head of the Management of Technology (MOT) department at the Holon Center for Technological Education, Israel. He also teaches at the Faculty of Management, The Leon Recanati Graduate School of Business Administration at the Tel Aviv University.



**Ofer Levy**, a team leader at Intel's development center in Haifa, Israel, holds a BS in electrical engineering from the Technion, Israel Institute of Technology, and an MBA in business administration from Tel Aviv University.

<b>Measure of Success</b>	<b>Factor 1 Customer Satisfaction</b>	<b>Factor 2 Budget and Schedule</b>	<b>Factor 3 Business Success</b>	<b>Factor 4 Future Potential</b>
Meeting operational specifications	<b>.669</b>	.422	-.281	.144
Meeting technical specifications	<b>.572</b>	.355	-.144	-.062
Meeting time goals	.139	<b>.862</b>	.173	-.056
Meeting budget goals	.208	<b>.854</b>	.014	.035
Fulfilling customer needs	<b>.724</b>	.043	-.009	-.047
Solving a major operational problem	<b>.554</b>	-.164	-.214	.402
Actually used by the customer	<b>.509</b>	-.024	.461	-.356
Customer satisfaction	<b>.692</b>	.395	.204	-.012
Level of commercial success	.014	.350	<b>.756</b>	-.035
Generated a large market share	-.052	-.152	<b>.720</b>	.393
Opened a new market	-.005	.078	.595	<b>.609</b>
Opened a new line of products	-.107	-.043	.210	<b>.818</b>
Developed a new technology	-.103	.027	-.079	<b>.832</b>
Eigen Value	3.356	1.408	1.252	2.637
Variance Explained	25.8	10.8	9.6	20.3
Alpha Value	.671	.811	.572	.745

**Table 2.** Factor Analysis Results, N = 80

specific customer; and two categories of lifecycle: whether a project was completed or was still under way during the time of this research.

**Data Analysis.** The hypothesis, that project success has three different dimensions, was tested by analyzing the 13 measures in Table 1, using the factor analysis technique (Jae On, 1978; Rummel, 1970). The relative importance of each success dimension with regard to the end-user type was determined by comparing the correlation (Pearson's Correlation) between the overall success scores and scores of each success dimension (an average of the scores for all measures comprising a specific dimension). Finally, changes of relative importance of success dimensions over time were determined using an ANOVA technique for comparing the scores in the two groups: ongoing projects versus projects that were already completed.

## Results

Table 2 presents the results of the factor analysis performed on the 13 separate measures used in our study to assess the success of projects. Eighty cases were included. They involved 72 questionnaires that had a record of all 13 measures of success plus eight questionnaires that had no more than one measure missing. (The missing variable was replaced by the average value of the other 12 measures.) Factor analysis suggests that the notion of a successful

project has four underlying dimensions, rather than three as initially hypothesized. They were indicated as Factors 1 through 4 in Table 2. The title given to each factor in Table 2 reflects a theme common to the measures having the highest weights on the specific factor (boldface in the table).

We tested the correspondence between the assessment of various success dimensions and assessment of total project success. Table 3 shows Pearson Correlation results obtained for the various success dimensions (the original three dimensions on the left of the table and the updated dimensions on the right) for two different populations: projects in which the end-product is directed to the open market and projects that have a specific customer.

Finally, we tested the relative importance of the four success dimensions for two groups of projects: those already completed, and those that are still under way. Table 4 includes mean scores for each success dimension and their standard deviation for the two different groups of projects. It also includes the Analysis of Variance results.

The differences between the mean scores in the first three dimensions are rather small and not statistically significant. Only the difference in the fourth dimension, the future potential, is significant, with F value of 10.19 ( $p < 0.005$ ).

	Original Dimensions			Updated Dimensions			
	Design Goals	Impact on Customer	Benefit to Organization	Customer Satisfaction	Budget and Schedule	Business Success	Future Potential
Open Market (n = 23)	.715***	.595**	.090	.733**	.610**	.321	-.115
Specific Customer (n = 104)	.455***	.559***	.152	.701***	.464***	.236*	.064
*** p < .001, ** p < .01, * p < .05							
<b>Table 3.</b> Correlation Between Overall Success and the Various Success Dimensions for Two Types of End-Users							

Project Phase	Success Dimensions							
	Customer Satisfaction		Budget and Schedule		Business Success		Future Potential	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Before Completion	5.96	1.00	5.15	1.28	5.24	1.59	3.96	1.86
After Completion	6.25	0.64	5.46	1.34	5.60	1.40	5.07	1.36
ANOVA F	2.23 (n.s.)		1.65 (n.s.)		1.23 (n.s.)		10.19 (p<.005)	
<b>Table 4.</b> Project Phase and Mean Success Values								

## Discussion

The major insight obtained in this study indicates that project managers distinguish among four dimensions of project success, rather than three dimensions as we initially hypothesized. Furthermore, the traditional dimension—meeting time, budget and performance goals—is not really one homogeneous dimension. Meeting project resources constraints (time and budget) is one thing, while meeting specifications is another. It is indeed part of the second factor that reflects the impact on the customer. Obviously, specifications serve as the normal yardstick for measuring project performance, but at the same time they impact customer satisfaction.

The impact on the customer, however, has a wider meaning. It reflects not only how the project was meeting specifications, but also reflects the subsequent satisfaction of the customer with the final product (responding to customer needs and solving his or her problems). Customer satisfaction in the broad sense involves, therefore, a variety of measures. It includes measures that were used *a priori* to specify the characteristics of the planned product (assuming that the customer knew in advance how to define his or her needs). It indicates also that

meeting specifications is not enough. Poor project definition and weak articulation of product requirements may result in dissatisfied customers even when project specifications are fully met. We shall return to this point later in our discussion of managerial implications.

The impact of a project on the performing organization is now split into two dimensions. The first reflects the immediate and commercial success of the project, and the second, the potential created by the project for the future. This division into two separate dimensions provides a meaningful distinction between the benefit to the contractor in the long- and short-run. Profits and increased market share are the immediate results of a well-articulated and well-executed project. The creation of new opportunities based on new technologies, new markets, or new products, establishes the long-term strength of the organization. The results of exploiting these opportunities can be evaluated only in the long-run. This distinction between the short-term and long-term impact on the developing organization is congruent with the earlier findings of Dvir and Shenhar (1992) and their discussion of the multidimensional nature of success of strategic business units.

When project managers were asked to assess the overall success of their project, they intuitively adopted the customer viewpoint (a correlation of more than .7 between total success and the customer satisfaction dimension). The success in meeting time and budget constraints was only seen as second place (a correlation of about .5). Notably, the third and fourth dimensions were not taken into account in the project manager's assessment of overall success. This result supports Pinto and Mantel's (1990) conclusion, which combined the perceived value of the project and the client satisfaction to the success dimensions of a project. It obviously reflects the growing understanding of project managers that the most important stakeholders are the project customers. The common notion of measuring project success by evaluating the implementation process alone is no longer valid.

The stronger connection between overall success and meeting design goals for a project without a specific customer is interesting and counter-intuitive. One might think the importance of meeting specifications and time and budget goals would be greater when a specific customer reviews project performance, but the results show the opposite. The open market probably represents a more demanding customer. Meeting design specifications when there is no specific customer is more important to the project manager. Launching the product in time becomes increasingly important, and is often critical to product success.

The typical project manager is obviously interested in delivering a good product to the customer, on time and within budget. Additional considerations such as building the technological base of the firm, creating new marketing opportunities, or even increasing profits, are only side issues to the main effort of satisfying the customer. Testing project manager perceptions before and after completion strengthened the conclusions regarding the myopia of project managers. As Table 4 shows, only the evaluation of future potential of a project changes with time. During project execution, only three dimensions seem important to project managers: to please the prospected customers, to meet time and budget goals, and to some extent to succeed commercially. After completion, however, this point of view changes dramatically. Project managers start to see the impact of their project on the future of their organization—opening opportunities to new markets, creating new product lines, and establishing the technological base of the firm. Another observation suggests that the importance project managers place on all four dimensions is higher for completed projects than those that are still under way. It seems that time changes the perspective of project managers on project success, helping them realize the significance of their project.

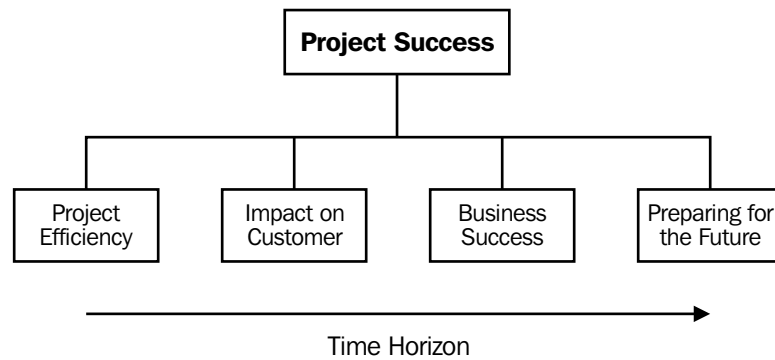
## Implications for Management

The results of this study propose a new way to look at project success. Rather than seeing projects as tasks that lead to meeting time, budget and performance goals, one should view projects in their broader sense. Since projects are initiated with an end result in mind—to make a profit, create a new market, or gain additional capability—this result must be clearly articulated prior to project launch. Obviously, project outcomes must please the customer, but they should also bring value to the organization. Why not make project managers responsible and accountable for the longer-term success and results obtained from their projects? Although managers may not have sole influence on later activities such as marketing, distribution, or field services, they can certainly influence the project outcome during project execution. Project managers must be made aware of the results expected from their projects. And they must constantly focus their attention on these results during the project management process.

One should notice the possible disparity between meeting performance objectives and satisfying the customer. The traditional assumption is that performance is well-defined and, if met correctly, the customer *must* be satisfied. In reality, however, this is not always the case. Many projects have failed because they did not fulfill customer expectation, even though they were well executed. It is no longer just the responsibility of marketing or top-level management; in the current competitive and cross-functional environment, project managers must be attuned to customer requirements and to his or her *real* needs. Consequently, project managers must act decisively to rectify any gap between project perceived performance and actual customer needs.

Similarly, project managers must be mindful to the business aspects of their company. They can no longer avoid looking at the big picture and just concentrate on getting the job done. They must understand the business environment and view their project as part of the company's struggle for competitive advantage, revenues, and profit. Even in nonprofit organizations (e.g., government agencies or internal departmental reengineering), project results should be seen as contributing to the well-being of the entire organization, and thus managed accordingly.

Project managers must also have long-term benefits in mind. In many cases, a long time may pass before success can be really evaluated and until long-term expectations are met (e.g., market leadership). Creating future opportunities or capabilities often makes the difference between short-term and sustainable long-term success. For example, adding provisions for additional customers to the current product may save enormous resources in the future, while adding only marginally to the current project expenses.



**Figure 1.** The Four Dimensions of Project Success

To generalize the findings of this study, we suggest that management conceive project success using four distinct dimensions. These dimensions are hierarchical and will be addressed differently for different projects and different time frames. Management must specify project objectives as early as possible and focus manager and team member attention to the expected results from the project. Management must look both at the short-term and the long-term benefits of the project and judge its performance on the outcomes of all dimensions. One must identify success measures before the project is even begun and prior to committing organization resources to it. Managers and project teams will have to be evaluated on the performance of all dimensions rather than only the short-term ones. Descriptions of the four dimensions follow and are illustrated in Figure 1.

**Success Dimension 1—Project Efficiency.** The first dimension is the short-term measure expressing the efficiency with which the project process has been managed. It simply tells us whether the project was completed on time and within the specified budget. This is the immediate dimension with which the project can be assessed, first during execution, and immediately after completion. Although success in this dimension may indicate a well-managed, efficient project, it may not indicate success in the long-term nor benefit to the organization. However, with increased competition and shorter product life cycles, time-to-market (time from initial concept to market introduction) becomes a critical competitive component. Enhanced project efficiency should therefore be seen as adding to product competitiveness.

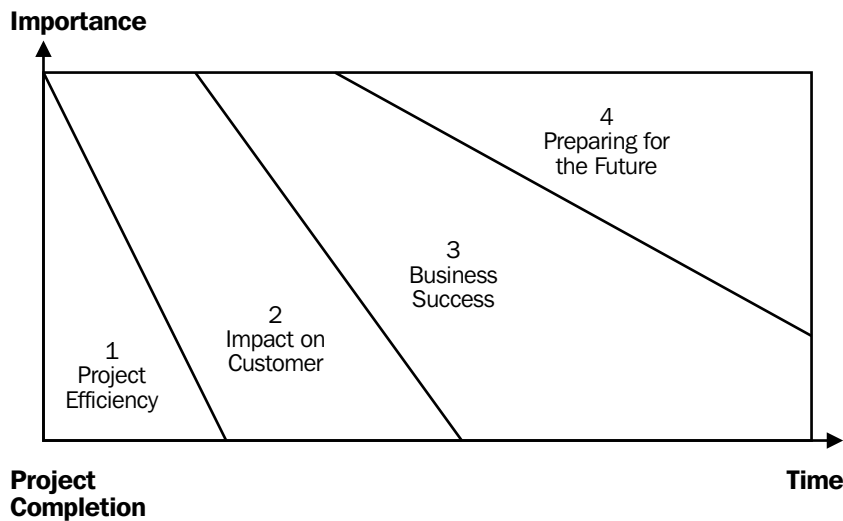
Some organizations may use additional measures of efficiency. For example, the number of engineering changes before final design release, cost of materials and tooling, efficiency and yield of production ramp (Wheelwright & Clark, 1992). Other measures may involve efficiency of purchase orders, reliability (or inverse number of prototype failure), safety measures, etc. However, one must realize that all of these measures relate only to

successful implementation of project execution, and do not necessarily mean total success.

**Success Dimension 2—Impact on the Customer.** The second dimension relates to the customer and/or the user of the end result. This dimension addresses the importance organizations should place on customer requirements and real needs. As our results indicate, meeting performance measures, functional requirements, and technical specifications are all part of this second dimension, and not, as previously assumed, part of meeting the project plan. From the contractor's point of view, this dimension also includes the level of customer satisfaction, the extent to which the customer is using the product, and whether the customer is willing to come back for a follow-up project or for buying the next generation of the same product.

**Success Dimension 3—Business and Direct Success.** The third dimension addresses the direct impact the project may have on the organization. In the business context, did it provide sales, income, and profits as expected? Did it help increase business results and gain market share? However, this dimension may also apply to projects not aimed at building new products. For example, internal reengineering projects (Hammer & Champy, 1993) or the development of a new manufacturing process also need assessment. This is the measure with which such an assessment could be made. It will include measures of performance time, cycle time, yield, and quality of the process, and total improvement of organizational performance. All of these will assess the direct impact the project had on the organization.

In a wider sense, this dimension may also apply to nonprofit organizations involved in project management. For example, a public service organization such as the IRS may wish to improve its services, shorten its processes and serve more customers. The effectiveness of an improvement project in such an organization will be measured with the third dimension assessing the direct impact the project had on the organization.



**Figure 2.** Relative Importance of Success Dimensions is Time-Dependent

**Success Dimension 4—Preparing for the Future.** The fourth dimension addresses preparing organizational and technological infrastructure for the future. It is the longest-term dimension and involves the following questions: How does the organization prepare for future opportunities? Does it explore new opportunities for further markets, ideas, innovations and products? Does it build new skills that may be needed in the future, or develop new technologies and core competencies? Is it prepared to make a change and create the future in its industry or to adapt quickly and meet additional challenges, unexpected moves of competitors, and market and technology surprises?

**Assessing Success is Time-Dependent.** Project success, therefore, should be considered an integrative concept in which both short- and long-term implications are considered. The first dimension can be assessed only in the very short-term—during project execution and right after project completion. The second dimension can be assessed after a short time, when the project has been delivered to the customer and the customer is using its product. Customer satisfaction can typically be assessed within a few weeks to a few months of the date of purchase. The third dimension, direct success, can only be assessed after a significant level of sales have been achieved—usually after one or two years. The fourth dimension can only be assessed after a longer term of probably three to five years.

The relative importance of each of these dimensions is time-dependent. Different dimensions are more important at different times with respect to the moment of project completion. As we have seen, in the short-term and particularly during project execution, the project efficiency dimension is most important. In fact, it is the only dimension that can be measured at this time. Meeting

resource constraints, measuring deviation from plans, and looking at various efficiency measures may be the best way to monitor the project progress and control its course. Once the project is completed, however, the importance of this dimension gradually declines. As time goes by, it matters less whether the project has met its resource constraints; in most cases, after about one year it is completely irrelevant. In contrast, after project completion the second dimension, impact on the customer and customer satisfaction, becomes more relevant. The third dimension, business and direct success, can only be judged later. It takes usually a year or two before a new product starts to bring in profit or establish market share. Preparing for the future can only be recognized and assessed much later. The long-term benefits of projects will affect the organization only after three or even five years. The relative importance of the four dimensions as a function of time is illustrated in Figure 2.

### Conclusion

Project conceptual understanding has advanced significantly during the last decade. Instead of seeing projects as jobs to get done, projects should be perceived as major vehicles for organizational and societal prosperity. Project managers can no longer afford to be detached from the organization's strategic and long-term goals. Project definition, planning and success assessment should all become an integrated part of strategic planning and strategic management in organizations. The measures of assessment should be set prior to project initiation, as part of the strategic goals of the organization. These goals should be incorporated during project initiation into the decision-making process of top management.



The multidimensional framework of project success may help articulate project expectations in an era of increased involvement and integration. A specific project should thus focus on its explicit dimensions and these dimensions should be determined according to the particular project type.

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