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Pipeline Index Helps You Identify Product Development Overload

Companies consistently overload their product development pipeline. That's the harsh reality facing engineering management. It's borne out by the complaints *EDMAR* hears repeatedly from engineering managers. It's also evidenced in our many surveys.

Unrealistic expectations from limited resources. Supporting our findings are those of Bradford L. Goldense, of the Goldense Group, Inc. (Cambridge, Mass.; 617-876-6776), a leading authority on the product development process. He recently told *EDMAR*, "In a typical organization, steering committees routinely are approving product development projects that total 170% to 250% of an engineering organization's capacity."

Meanwhile, authority Jon McKay, director, Pittiglio Rabin Todd & McGrath (Rosemont, Ill.; *jmckay@prtm.com*) believes "companies overload their product development pipelines despite the problems caused by under staffing projects because they have no indicator to quantify the problem and highlight the issues."

Relief in sight through application of the pipeline index. "To help managers assess their project pipelines, we developed the pipeline index which compares the present load in a company's product development pipeline to the flow of products that the company has demonstrated it can handle."

The pipeline index defined as a working tool. McKay, in *PRTM's Insight*, explains the pipeline index (PI) is based on factory principles relating to cycle time, inventory, and throughput. It has the "benefit" of using component metrics at the macro level, where they are relatively easy to obtain, he mentions.

Theoretically, when PI=1.0, it means a company has committed to a portfolio of projects it has proven it can handle means (see sidebar opposite page for sample calculation).

Given the approximations of the PI equation, PRTM's experience has shown that PI values fall into four ranges:

- PI < 0.9–underload, wasting capacity;
- 0.9 < PI < 1.3–optimal load, maximizing productivity;
- 1.3 < PI < 1.6–probable overload, somewhat degrading productivity; and
- PI > 1.6–definite overload, significantly hurting productivity.

The pipeline index in seven industry segments, from PRTM's *1997 Product Development Benchmarking Study*, compares the top 20% of the study (best-in-class companies) to the remainder.

It also finds that even best-in-class companies have overloaded pipelines, while a great majority of companies are afflicted with overloaded pipelines.

Basis Of the Pipeline Index

The calculation for the Pipeline Index (PI) is:

$$\text{Pipeline Index} = \frac{\text{Pipeline Load}}{\text{Demonstrated Pipeline Flow}}$$

Where:

- Pipeline Load = Number of projects in development between concept approval and launch
- Demonstrated Pipeline Flow = (Average Annual Products Released) x (Average Major Project Time-to-Market
- Pipeline Load and Annual Products Released are measured in Major Project Equivalents
- Time-to-Market is the time in years between concept approval and launch

To account for project variations among companies in our product development database, we ask them to classify their projects into three categories: platform, major, and minor. Platform projects are tremendous efforts that establish entirely new product families with features and functionality that "leapfrog" previous products. Major projects represent major upgrades to a platform and establish new product lines. Minor projects are extensions to existing products.

Based on analysis of total person-years of effort for past projects, or even using "rules of thumb," estimates can then be made of the ratios between platform, major, and minor projects so that the pipeline load and average annual products released can be converted into major project equivalents (MPEs). (Major projects typically represent the largest category of R&D resource allocation.)

The number of products released each year and currently in development (between concept approval and launch) by category are definite and easy to obtain. For PI calculation, time-to-market is the period from concept approval to launch and does not include time spent in the concept phase, which occurs before commitment to a project. It is critical that the average major project time-to-market be used, not fastest time-to-time market be used, not the fastest time-to-time market, because PI is a measure of the entire portfolio in development, not just one "star" project.

Understanding the denominator in the PI equation is essential. The denominator (demonstrated pipeline flow) can be deceptive because it is a measure of how many projects a company has demonstrated it can keep moving productively in development, not how many are launched, he clarifies.

For example, a company that averages three launches a year and two years' time-to-market has the same DPF as a company that averages six launches per year and one year time-to-market.

"Both companies have a DPF of six, however, the second company launches twice the number of products as the first company," McKay explains. "And those products are based on newer technology and more recent customer input, since they have been in development for only one year instead of two years."

According to McKay, it is critical that the makeup of the DPF be as well understood as the pipeline index, because "achieving more launches with faster time-to-market is a better configuration than executing fewer launches with longer time-to-market in today's rapidly advancing technological world."

Using the PI to drive effective pipeline management practice. In conjunction with other metrics measuring project execution and innovation, McKay maintains, the pipeline index can be used in many applications to initiate good pipeline management. As examples he cites:

- **Portfolio management.** The PI can be a powerful planning tool for setting R&D budgets within and across business units, setting concrete pipeline flow improvement targets. Also, for planning associated product development process improvements, and performing 'what if' portfolio scenario analyses.
- **Phase reviews.** The pipeline index can be referenced for decision making during phase reviews. It can assist in assuring that a project can be staffed for success and, if not, to assess whether it should be delayed or rescoped with concurrent shifting of other projects. Also, for more specificity, PI can be calculated for the individual phases in product development.
- **Functional management.** The index can be used within a particular function to communicate upcoming bottleneck situations to upstream groups and senior management. ❑

Pipeline Index Calculation Sample (Input Data)

	Annual Products Released				Projects by Phase				
Project	Launch Year				Phase				Pipeline
Type	1995	1996	1997	Average	1	2	3	4	Load
Platform	0	1	0	0.33	1	0	0	1	0.33
Major	3	2	2	2.33	1	3	2	1	2.33
Minor	6	5	7	6	1	2	3	2	6

Average Major Project Time-to-Market = 2.2 years

Platform: Major: Minor Person-Year Effort Ratios = 2.8: 1.0 : 0.2

(Source: Jon McKay, *PRTM'S Insights*)

How to Calculate

1. Average Products Released
   = .33 x 2.8 + 2.33 x 1.0 + 6 x 0.2
   = 4.5 MPEs
2. Pipeline Load
   = 2 x 2.8 + 7 x 1.0 + 8 x 0.2
   = 14.2 MPEs
3. Demonstrated Flow
   = 4.5 x 2.2
   = 9.9 MPEs
4. Pipeline Index (PI)
   = 14.2 ÷ 9.9

PI = 1.4