Pergamon

European Management Journal Vol. 17, No. 2, pp. 120–134, 1999

Printed in Great Britain
PII: S0263-2373(98)00072-3
0263-2373/99 $19.00 + 0.00

MANAGEMENT FOCUS

Overcoming the Improvement Paradox

ELIZABETH KEATING, *MIT Sloan School of Management*
ROGELIO OLIVA, *Harvard Business School*
NELSON REPENNING, *MIT Sloan School of Management*
SCOTT ROCKART, *MIT Sloan School of Management*
JOHN STERMAN[1]**,** *MIT Sloan School of Management*

Despite the demonstrated benefits of improvement programs such as total quality management and reengineering, most improvement programs end in failure. Companies have found it extremely difficult to sustain even initially successful process improvement programs. Even more puzzling, successful improvement programs sometimes worsen business performance, triggering layoffs, low morale, and the collapse of commitment to continuous improvement. We term this phenomenon the 'Improvement Paradox.' For the last four years, we have worked with a variety of firms to understand the paradox and design policies to overcome it. Our findings suggest that the inability to manage an improvement program as a dynamic process is the main determinant of program failure. Improvement programs are tightly coupled to other functions and processes in the firm, and to the firm's customers, suppliers, competitors and capital markets. Failure to account for the feedbacks among these tightly coupled activities leads to unanticipated and often harmful side effects. We describe these dynamics and offer some guidance for managers seeking to design sustainable process improvement programs.

Introduction

Process improvement has become an imperative for businesses seeking competitive advantage, yet it is disturbing how few organizations make lasting and successful use of process improvement tools such as total quality management and reengineering. These tools should help to raise productivity, boost quality and enhance competitiveness. However, quality programs often struggle to gain initial acceptance and to sustain continuous improvement (US General Accounting Office, 1991; Young, 1991a, b). Despite the demonstrated benefits of many improvement techniques, most attempts by companies to use them have ended in failure (Easton and Jarrell, 1998). In fact, companies have found it extremely difficult to sustain even initially successful process improvement programs. Even more puzzling, successful improvement programs have sometimes led to declining business performance, causing layoffs, low morale, and the collapse of commitment to continuous improvement. We term this phenomenon the 'Improvement Paradox.'

If improvement tools were ineffective it would be easy to explain their low use. The evidence, however, does not support that explanation. Firms that win quality awards have higher share-holder returns (Hendricks and Singhal, 1996). Easton and Jarrell (1998) found that among the top 1000 publicly-held companies in the United States, firms with well developed quality programs significantly outperform their counterparts in profitability, share price and return on assets.

These large sample results are consistent with our own findings. In hundreds of hours of interviews with our partner companies, discussing both successful and unsuccessful programs, we rarely heard 'the program was just no good.' Typical comments on stalled or abandoned programs were 'I believe [a particular program] is a good process. Some day I'd really like to work on a project that actually follows it' and 'We've left a lot on the table by letting this program go.' Our findings suggest that the inability to manage an improvement program as a dynamic process — one tightly coupled to other processes in the firm and to the firm's customers, suppliers, competitors and capital markets — is the main determi-

nant of program failure. Failure to account for feedback from these tightly coupled activities leads to unanticipated, and often harmful, side effects that can cause the premature collapse and abandonment of otherwise successful improvement programs. We describe these dynamics and offer some guidance for managers seeking to design sustainable process improvement programs.

For the last four years we have worked with managers at Ford Motor Company, Harley-Davidson, Lucent Technologies, and National Semiconductor Corporation to understand why improvement programs often fail, and how practitioners can design sustainable improvement programs (Jones *et al*., 1996; Sterman *et al*., 1996). This work extends earlier research on the paradoxically poor financial performance experienced by Analog Devices shortly after a highly successful manufacturing improvement program (Sterman *et al*., 1997). Our research involved detailed field studies with our partner organizations. We stressed multiple data sources including extensive interviews and archival data on the various metrics of quality, product histories, internal company materials, and financial results. We used the system dynamics method (Forrester, 1961) to understand the multiple feedback mechanisms that affect the implementation of improvement programs, and to formulate integrative formal models to test our hypotheses.

Our findings span both the internal dynamics of an improvement program and the interactions of a program with forces outside the intended area of improvement focus. We first describe the internal dynamics of an improvement program and the managerial challenges they create. We then examine how an improvement program interacts with other improvement initiatives, other organizational units, and with customers. Other improvement programs, organizational practices, and market response have a profound influence on whether programs can be sustained and contribute to the improved performance of the entire company.

Internal Dynamics of Improvement Programs

Well-functioning quality programs cannot be bought, like a machine tool. No one can go out and purchase a fully functioning 6-sigma quality program. A competence in improvement must be grown organically. To do so management must grapple with three central issues. First, managers need to address the fundamental trade-off between current and future performance levels. Second, managers need to make sure that the source of commitment to ongoing improvement effort shifts from managerial actions to employee initiative. Finally, as a program succeeds, and so-called low-hanging fruit is harvested, managers need to adapt their improvement tools and manage expectations for continued gains.

Fundamental Improvement Trade-Off

Process improvement theorists assert that the employees doing a job are the best-informed experts and should be responsible for identifying improvement opportunities and implementing changes (Deming, 1986; Ishikawa, 1985; Juran, 1969). Accordingly, most improvement initiatives rely on the employees who perform the day-to-day work both to guide the improvement program and make the actual improvements. The rationale behind this strategy is two-fold. First, employees already understand their process, reducing data collection and diagnosis time. Second, employees have a strong interest in implementing changes when they develop the proposals themselves. Deming (1986) argued, in what he called the 'productivity chain', that resources freed up by productivity gains should be reinvested into the search for still greater improvements, creating self-reinforcing feedback stimulating continuous improvement. Operationally, effort allocated to improvement raises productivity, boosting process throughput, thereby lowering production pressure and yielding still more time for improvement (loop R1 in Figure 1). An organization that reinvests early improvement gains in further improvement effort creates a powerful positive feedback that generates ever-greater gains in quality and productivity.

However, reliance on operating employees to guide and implement improvement can limit the reinforcing process of the productivity chain. Imagine a quality program designed to reduce defects and boost usable output. It takes time for improvement effort to bear fruit. Therefore, the first effect of an increase in improvement effort is a *reduction* in the time employees can devote to throughput. The short run effect of improvement effort is a decline in output, exactly the opposite of the goal. As throughput falls, pressure to work harder builds. Employees faced with high pressure to meet throughput goals will be forced to cut back the time devoted to improvement, boosting output but stalling productivity and quality growth (the 'effort squeeze' loop B1 in Figure 1). A manager in one plant we studied captured the dilemma clearly:

> In the minds of the [operations team leaders] they had to hit their pack counts [daily quotas]. This meant if you were having a bad day and your yield had fallen... you had to run like crazy to hit your target. You could say 'you are making 20% garbage, stop the line and fix the problem', and they would say, 'I can't hit my pack count without running like crazy.' They could never get ahead of the game. (Repenning and Sterman, 1997)

To overcome the quandary, process improvement advocates discouraging numerical throughput quotas