

# **SIX SIGMA BUSINESS SCORECARD**

**ENSURING PERFORMANCE FOR PROFIT**

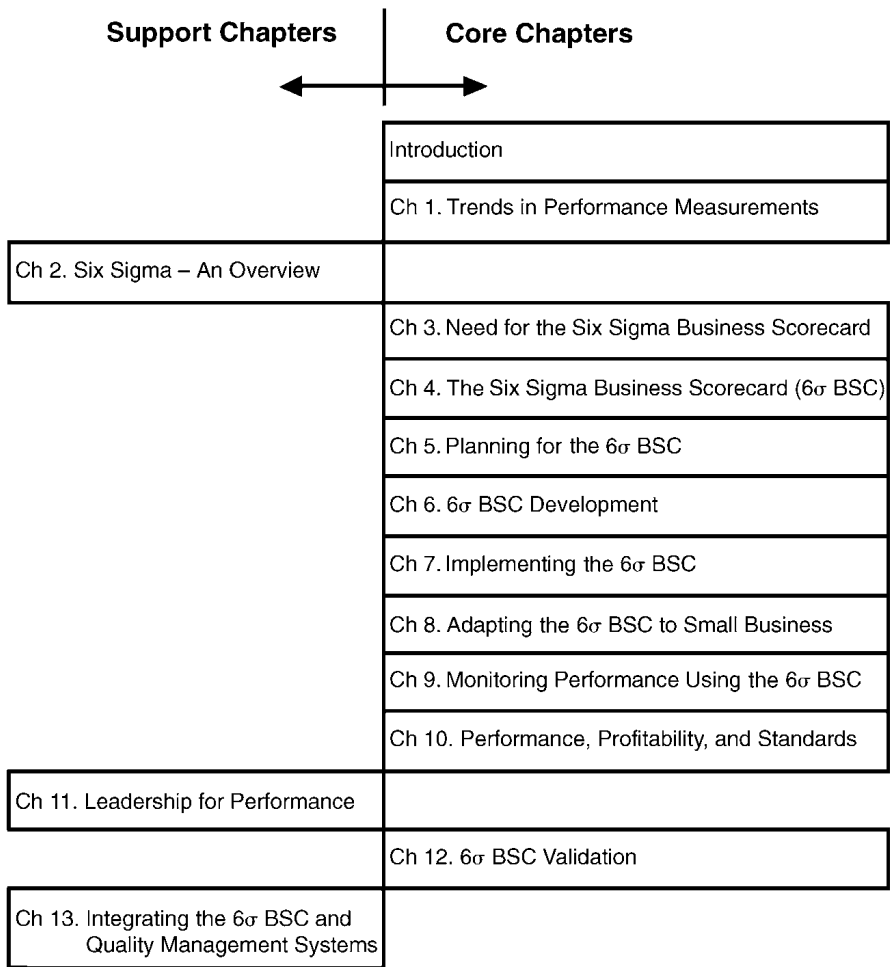
**BY PRAVEEN GUPTA**

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**FIGURE I-1.** Organization of chapters in *Six Sigma Business Scorecard*.

<i>Year</i>	<i>GDP</i> (\$B)	<i>PPI</i>	<i>CPI</i>	<i>PI</i> (000)	<i>VPI</i>	<i>CU</i> (%)	<i>TIPI</i>	<i>E/H (\$)</i>	<i>O/H Index</i>	<i>GI</i> (\$B)	<i>Profits</i> (\$B)
1970	1.04	39.3	38.8	4.1	56.3	81.1	58.7	3.23	67	152.4	28.5
1980	2.8	88	82.4	10.2	30.2	81.5	79.7	6.66	80.4	477.9	92.5
1990	5.8	119.2	130	19.6	40.6	82.3	98.9	10.01	95.4	861.7	110.1
2000	9.9	138	172.2	30.2	47.9	82.1	147.5	13.75	101.4	1767.5	275.6

*GDP: Gross Domestic Product*

*PPI: Producer Price Index*

*CPI: Consumer Price Index*

*PI: Personal Income*

*VPI: Vendor Performance Index*

*CU: Capacity Utilization*

*TIPI: Total Industrial Production Index*

*E/H: Earnings per Hour*

*O/H: Output per Hour*

*GI: Gross Investment*

**FIGURE 1-1.** Measures of U.S. economic performance, 1970–2000.

(*Strawser, 2001.*)

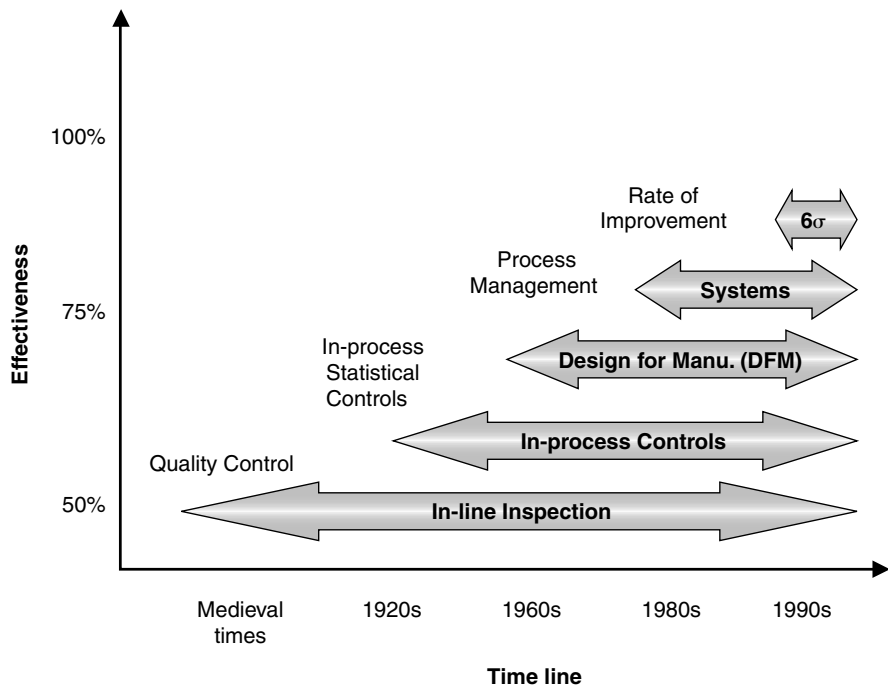
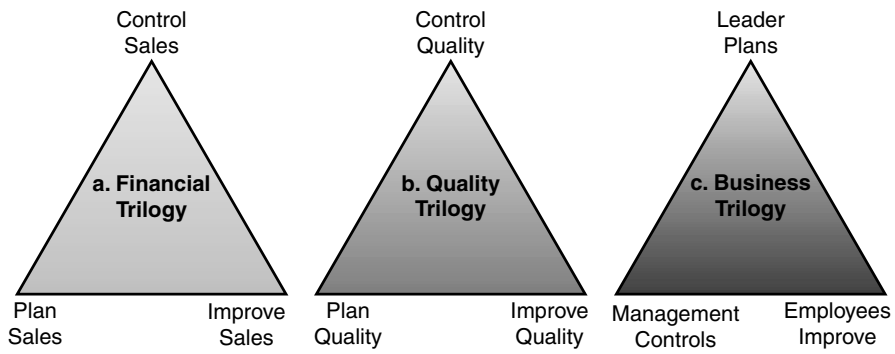


FIGURE 1-2. Performance control methods.



**FIGURE 1-3.** Financial and Quality Trilogies. (*Juran, 1998.*)

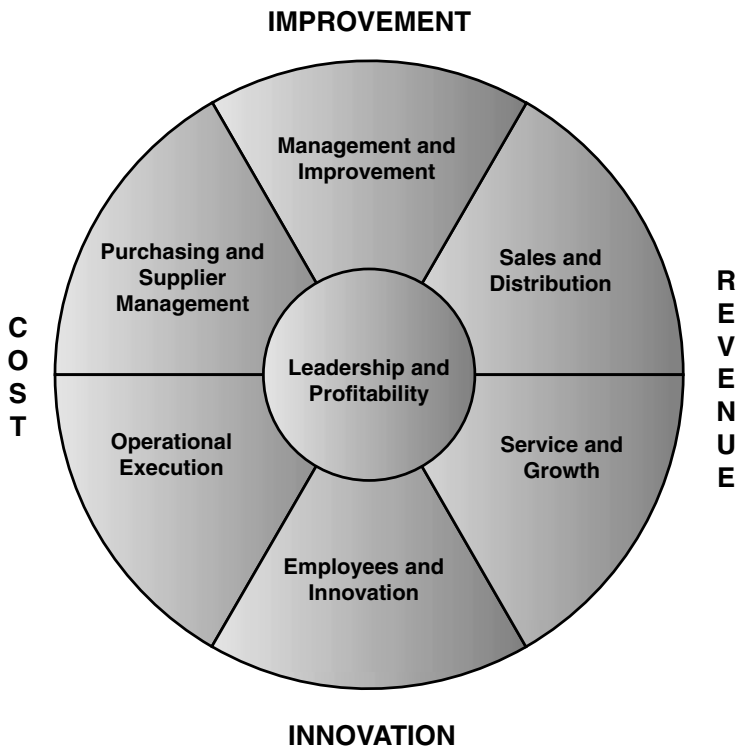


<b>Category</b>	<b>Area</b>	<b>Point Value</b>
Leadership	Organization Leadership	120
	Public Responsibility and Citizenship	
Strategic Planning	Strategy Development	85
	Strategy Deployment	
Customer and Market Focus	Customer and Market Knowledge	85
	Customer Relations and Satisfaction	
Information and Analysis	Measurement and Analysis of Organizational Performance	90
	Information Management	
Human Resource Focus	Work Systems	85
	Employee Education, Training, and Development	
	Employee Well-Being and Satisfaction	
Process Management	Product and Service Processes	85
	Business Processes	
	Support Processes	
Business Results	Customer-Focused Results	450
	Financial and Market Results	
	Human Resource Results	
	Organizational Effectiveness Results	

**FIGURE 1-4.** Baldrige Criteria for performance excellence.  
(MBNQA Guidelines, 2003.)

<b>ISO 9000</b>	<b>MBNQA</b>	<b>Six Sigma</b>
A framework for creating "Quality Thinking."	A framework for creating "Performance Thinking."	A framework for linking improvement to profitability.
Facilitates process management through documentation and compliance.	Facilitates benchmarking to improve performance levels to best-in-class levels.	Facilitates dramatic improvement to achieve performance excellence.
Specifies all business functions except Accounting.	Specifies key aspects of business.	Specifies a methodology for improvement irrespective of functionality.
Promotes Management Responsibility through communication and management review.	Promotes exceptional leadership behaviors as a way of life in society.	Requires leadership to aim at highest performance with highest profitability.
Main aspect is compliance to documented practices and improving effectiveness.	Main aspect is to achieve total customer satisfaction through superior practices and performance.	Main aspect is achieving and maintaining a high improvement rate for business aspects that affect profitability.
About 500,000 companies have implemented it worldwide.	About 4 to 8 companies win the national level; similar number at state level and in other countries.	Has been adopted by several companies to achieve dramatic improvement and profitability.
Savings are difficult to quantify.	Performance of publicly traded companies has shown advantage over the others by 3 to 4 times.	Companies have reported huge amount of savings in production and service areas.
Mass application of the standards.	Limited to a few companies.	Selectively used by companies committing to be a superior company.
It is a third-party certification.	It is recognition for excellence.	It is a methodology to optimize performance and maximize profitability.
Is on decline due to diversification in series of industry-specific standards.	Stabilized due to limited recognition. Has expanded into health care and education.	Growing rapidly as an attractive means to realize superior financial results.

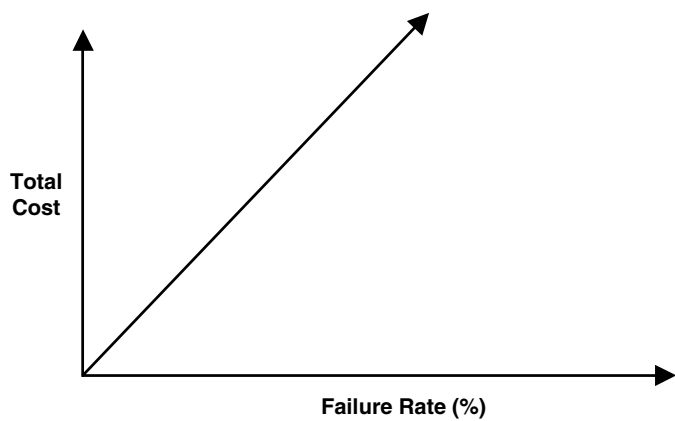
**FIGURE 1-5.** Comparison of ISO 9001:2000, MBNQA, and Six Sigma system requirements.



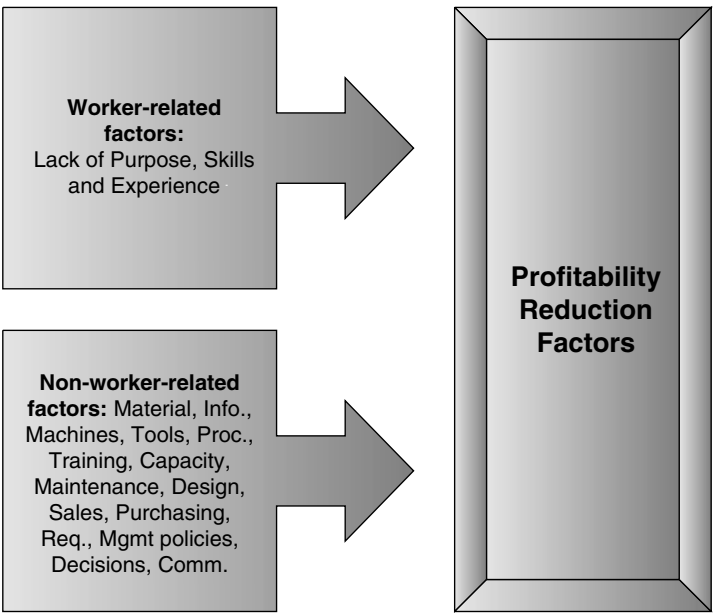
**FIGURE 1-6.** Six Sigma Business Scorecard.

<i><b>Number of Operations or Components</b></i>	<i><b>Overall Yield, % (99% Yield at Each Process, or for Each Component)</b></i>
100	36.7
500	0.5
1000	0
5000	0

**FIGURE 2-1.** Components versus overall yield.



**FIGURE 2-2.** Failure rate versus total cost.



**FIGURE 2-3.** Factors contributing to reduction in profitability.

<i><b>Number of Operations or Components</b></i>	<i><b>Overall Yield, % (99% Yield at Each Process, or for Each Component)</b></i>	<i><b>Overall Yield, % (99.9996% Yield at Each Process, or for Each Component)</b></i>	<i><b>Improvement, %</b></i>
100	36.7	99.9	Greater than 100%
500	0.5	99.8	Greater than 1000%
1000	0	99.6	Practically infinite
5000	0	98	Practically infinite

**FIGURE 2-4.** Performance improvement due to the Six Sigma process capability.

<b><i>Defect Rate, parts per million</i></b>	<b><i>Sigma Level</i></b>	<b><i>Cost Reduction Opportunities, % of Sales</i></b>
66,810 (or 6.7%)	3	25
6210 (0.6%)	4	15
233	5	5
3.4	6	1

**FIGURE 2-5.** Sigma level and related opportunities for improvement.



<i><b>Commitment</b></i>	<i><b>Management</b></i>	<i><b>Purchasing</b></i>	<i><b>Engineering</b></i>	<i><b>Production</b></i>	<i><b>Sales</b></i>
Passionate	Needed		Needed		
Positive		Needed		Needed	
Neutral	Available	Available			
Resistance			Available	Available	
Destructive					

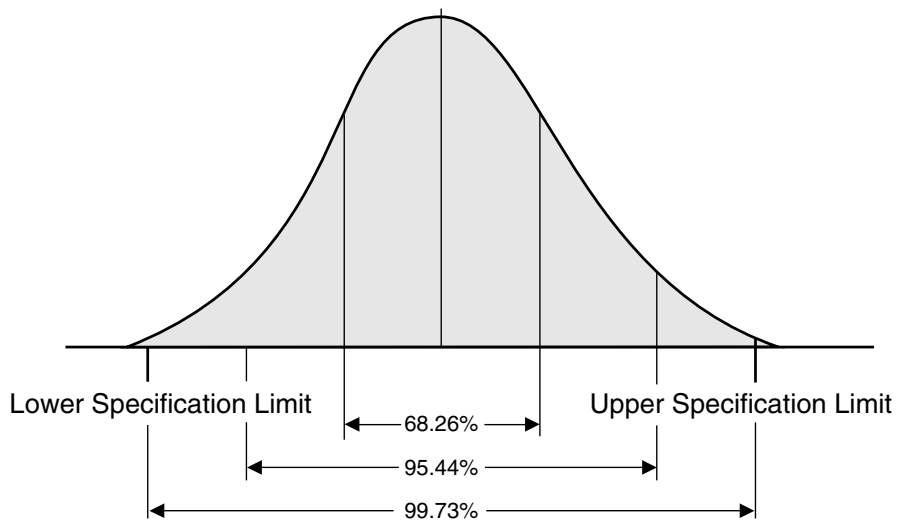
**FIGURE 2-6.** Commitment matrix.

<i><b>Internal Failures</b></i>	<i><b>External Failures</b></i>	<i><b>Appraisal</b></i>	<i><b>Prevention</b></i>
Failure Reviews	Customer Dissatisfaction	Drawing Checking	Planning
Redesign	Equipment Downtime	Final Inspection	Capability Studies
Reinspection	Excess Inventory	In-Process Inspection	Design Reviews
Repair Costs	Excess Travel Expense	Laboratory Testing	Field Testing
Retesting	Excess Material Handling	Personnel Testing	Vendor Surveys and Evaluation
Rework	Penalties	Receiving Inspection	Procedure Writing
Scrap Allowances	Pricing Errors	Product Audits	Training
Engineering Changes		Shipping Inspection	Market Analysis

**FIGURE 2-7.** Cost of poor quality (COPQ) measures.

<i><b>COPQ Category</b></i>	<i><b>Estimated Contribution, %</b></i>
Internal Failures	25 – 40
External Failures	25 – 40
Appraisal	10 – 50
Prevention	0.5 – 5

**FIGURE 2-8.** Cost of poor quality (COPQ) contributions.



**FIGURE 2-9.** Probability of producing products within limits at specified standard deviations.

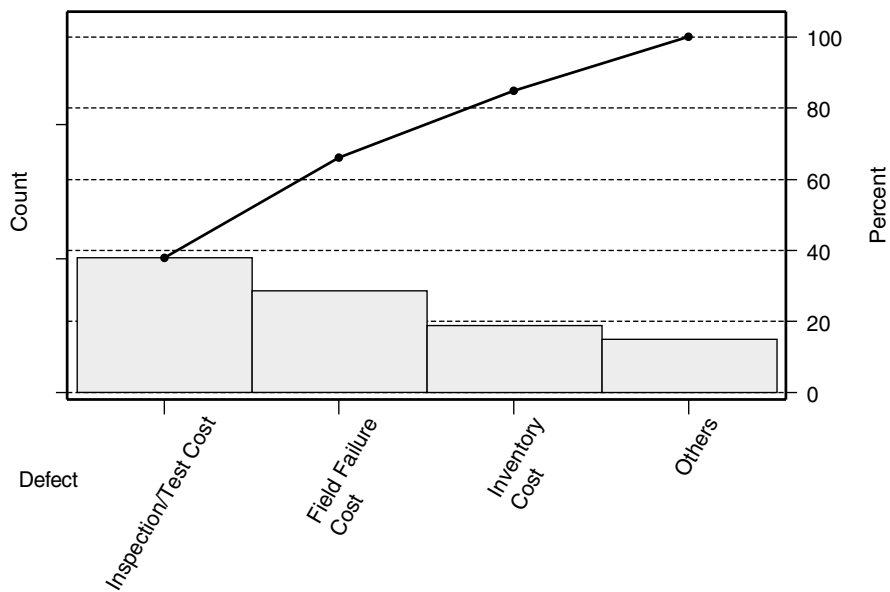


FIGURE 2-10. Pareto chart of opportunities for improvement.

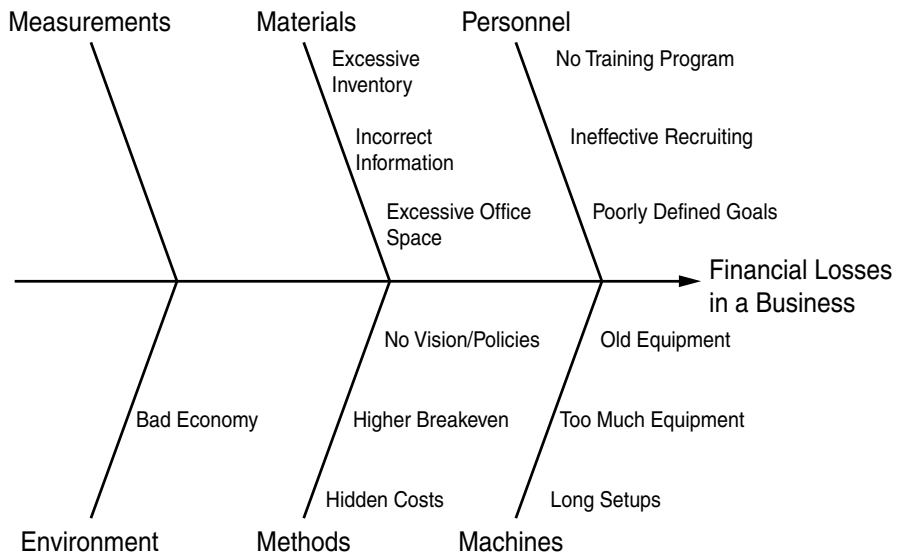


FIGURE 2-11. Cause-and-effect diagram.

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Potential Failure Mode and (Design
------------------------------------

Key Date\_\_\_\_\_

Item / Function	Potential Failure Mode(s)	Potential Effect(s) of Failure	Severity	Potential Cause(s)/ Mechanism(s) of Failure	Probability	Current Design Controls
Coolant containment. Hose connection. Coolant fill.	Crack/break. Burst. Sidewall flex. Bad seal. Poor hose retention	Leak	8	Over pressure	8	Burst, validation pressure cycle.

Write down each failure mode and potential consequence(s) of that failure.

**Severity** - On a scale of 1–10, rate the Severity of each failure (10 = most severe). See Severity sheet.

**Likelihood** - Write down the potential cause(s), and on a scale of 1–10, rate the Likelihood of each failure (10 = most likely). See Likelihood sheet.

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## Page \_\_\_\_ of \_\_\_\_

Det	RPN	Recommended Action(s)	Responsibility and Target Completion Date	Action Results				
				Actions Taken	New Sev	New Occ	New Det	New RPN
1	64	Test included in prototype and production validation testing.	J.P. Aguire 11/1/95 E. Eglin 8/1/96					

Response Plans and Tracking

**Risk Priority Number** - The combined weighting of Severity, Likelihood, and Detectability.  
 $RPN = Sev \times Occ \times Det$

**Detectability** - Examine the current design, then, on a scale of 1-10, rate the Detectability of each failure (10 = least detectable). See Detectability sheet.

**FIGURE 2-12.** (Continued) Failure mode and effects analysis template.





**TABLE 3-1. Business Assessment Survey Findings**

<b>BUSINESS AREAS</b>	<b>EASY TO ANSWER</b>	<b>COULD ANSWER</b>	<b>DIFFICULT TO ANSWER</b>
Organization Environment	53	38	9
Organizational Relationships	32	46	22
Competitive Environment	27	41	32
Strategic Challenges	26	30	44
Performance Improvement System	19	37	44
<b>Overall</b>	<b>32</b>	<b>38</b>	<b>30</b>

SOURCE: [www.NIST.org](http://www.NIST.org).

**TABLE 3-2. Response to Process Improvement–Related Questions**

<b>PROCESS IMPROVEMENT– RELATED QUESTIONS</b>	<b>EASY TO ANSWER</b>	<b>COULD ANSWER</b>	<b>DIFFICULT TO ANSWER</b>
How do you maintain an organizational focus on performance improvement?	26	23	61
What approaches do you use to systematically evaluate and improve key processes and to foster organizational learning and knowledge sharing?	9	41	50
How do you measure product and process quality? What processes do you have in place to evaluate root cause and improve performance?	21	49	30
At what rate is your operations performance in quality, cost, cycle time, and profitability improving annually?	6	30	64
How do you maintain an organizational focus on customer satisfaction? What processes do you have in place to improve customer satisfaction?	24	43	33
How do you evaluate employee job satisfaction? What processes do you have in place to initiate steps to improve employee morale?	15	26	59
<b>Overall</b>	<b>19</b>	<b>37</b>	<b>44</b>

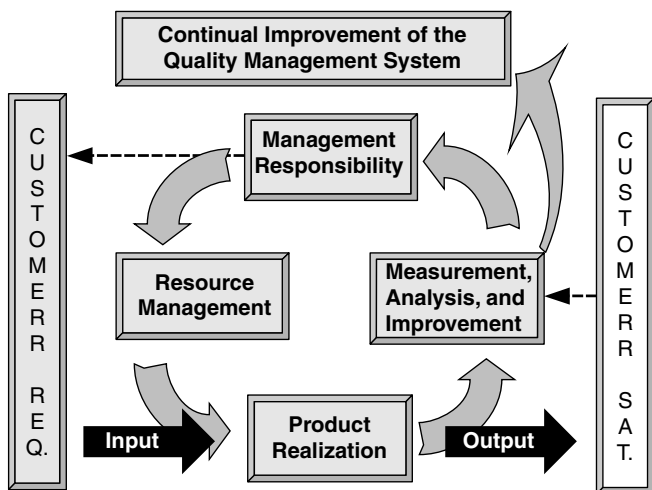


FIGURE 3-1. Process-based quality management system. (ISO 9000:2000.)

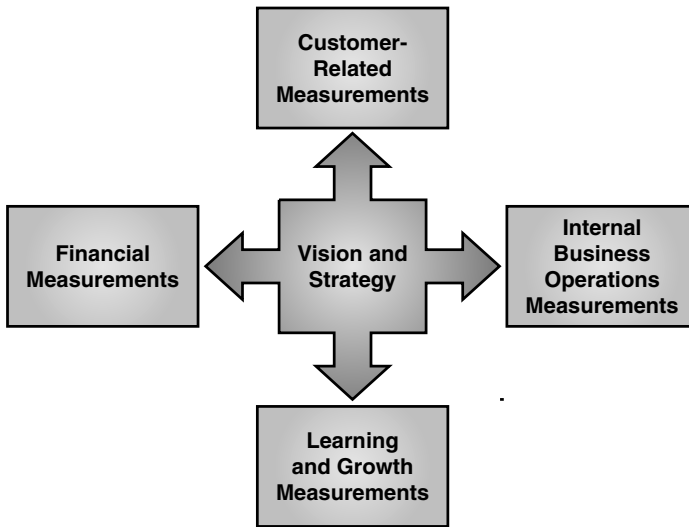


FIGURE 3-2. Balanced Scorecard system. (*Kaplan and Norton, 1996.*)

<i><b>Suppliers</b></i>	<i><b>Inputs</b></i>	<i><b>Process</b></i>	<i><b>Output</b></i>	<i><b>Customers</b></i>
Material suppliers	100% acceptable material	Leadership and management processes (communication, auditing, management reviews)	Product	Business customers
Information suppliers	Accurate information	Data analysis and reporting	Services	Consumers
Tools and equipment suppliers	Usable and well-maintained tools	Production/service delivery processes	Customer care	Stakeholders
Human resources providers	Skilled and available employees	Recognition	Value	
Training service providers	Sufficient capital	Benefits management		
Investors/shareholders	Continued interest in company	Training		
Office supplies suppliers	Office suppliers	Purchasing		
Freight services providers	Noninventory items	Marketing		
More...	Freight service and supplies	Sales		
	More...	Customer Service		
		Documentation management		
		Calibration process		
		More...		

**FIGURE 4-1.** An example of SIPOC analysis for a business entity.

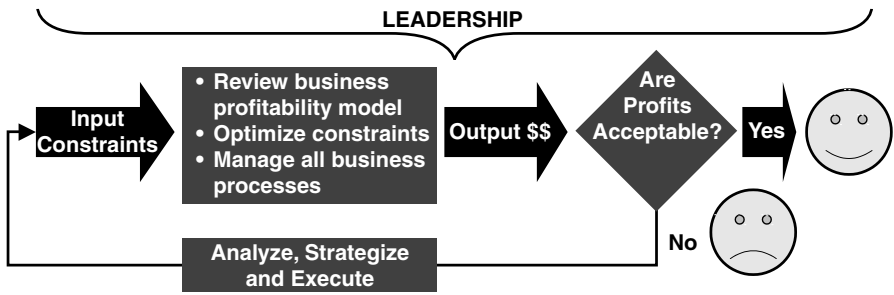


FIGURE 4-2. Profitability management process.

Business Processes	
Accounting and Measurements	Business Policies and Procedures
Learning and Innovation	Business Planning and Execution
Research and Development	Global Marketing and Sales
Administrative and Facility Management	Recruitment and Development
Maintenance and Calibration	Audits and Improvement
Leadership and Profitability	Production and Service
Information Management and Analysis	Partnerships and Alliances
Purchasing and Supply Chain Management	

**FIGURE 4-3.** Business processes.



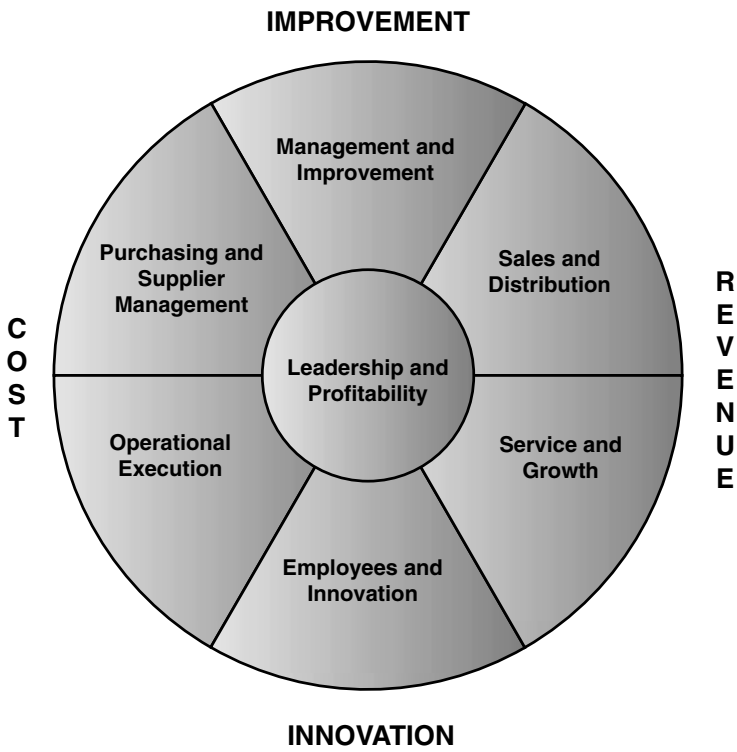


FIGURE 4-4. Six Sigma Business Scorecard.

<b>Categories</b>	<b>Objectives</b>	<b>Measurements</b>
Leadership and Profitability (LNP)	Lead company to wellness and profitability	Communication
		Inspiration
		Planning Accuracy
		Community Perception
		Employee Perception
		Employees' Recognition
		Compensation/Profitability
		Asset Utilization
		Return on Investment
		Debt-to-Equity Ratio
Management and Improvement (MAI)	Drive dramatic improvement	Profitability
		Shareholders' Value Growth
		Goal Setting
Employees and Innovation (EAI)	Involve employees intellectually	Rate of Improvement
		Planning for Improvement
		Employee Innovative Recommendations per Employee
Purchasing and Supplier Management (PSM)	Reduce cost of goods or service	Investment per Employee
		Number of Patents or Publications per Employee
		Material Acceptance
Operational Execution (OPE)	Achieve performance excellence	Total Spend/Sales
		Suppliers' Defect Rate (Sigma)
		Suppliers' Involvement in Development
Sales and Distribution (SND)	Manage customer relationships and generate revenue	Cost of Goods/Service Sold
		Operational Cycle Time
		Process Defect Rate (Sigma)
Service and Growth (SAG)	Gain competitive advantage and grow	Customer Defects/Total Defects
		Number of Inquiries
		New Business (\$)/Total Sales (\$)
		Profit Margins (\$)/Sales (\$)
		Customer Satisfaction
		Customer Retention
		Repeat Business (\$)/Total Sales (\$)
		New Product or Services
		Patents or Trademark

**FIGURE 4-5.** Six Sigma Business Scorecard measurements.

<i>Measurements</i>	<i>Category Abbreviation</i>	<i>Category Significance</i>	<i>Performance Against Plans</i>	<i>Index Contribution</i>
1. # Employees Recognized for Excellence	LNP	15	50	7.5
2. Profitability	LNP	15	75	11.25
3. Rate of Improvement (All departments)	MAI	20	60	12
4. Recommendations per Employee	EAI	10	60	6
5. Total Spend / Sales	PSM	5	80	4
6. Suppliers' Defect Rate (Sigma)	PSM	5	60	3
7. Operational Cycle Time Variance from Planned	OPE	5	60	3
8. Process Defect Rate (Sigma)	OPE	5	80	4
9. New Business (\$)/Total Sales(\$)	SND	10	90	9
10. Customer Satisfaction	SAG	10	80	8
Corporate Wellness (BPIIn)				67.75%
Corporate DPU				0.3893
Corporate DPMO (15 executives)				25,956
Corporate Sigma				3.44

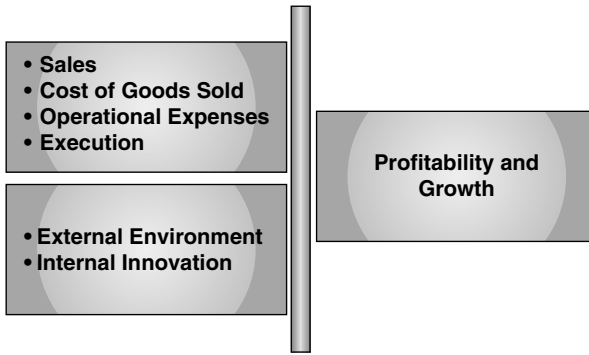
FIGURE 4-6. Example of Business Performance Index.

<i>Corporate DPMO</i>	<i>Sigma</i>	<i>Corporate DPMO</i>	<i>Sigma</i>	<i>Corporate DPMO</i>	<i>Sigma</i>
691,462	1	115,070	2.7	1,866	4.4
655,422	1.1	96,800	2.8	1,350	4.5
617,911	1.2	80,757	2.9	968	4.6
579,260	1.3	66,807	3	686	4.7
539,828	1.4	54,799	3.1	483	4.8
500,000	1.5	44,565	3.2	337	4.9
460,172	1.6	35,930	3.3	233	5
420,740	1.7	28,717	3.4	159	5.1
382,088	1.8	22,750	3.5	108	5.2
344,578	1.9	17,865	3.6	72	5.3
308,537	2	13,904	3.7	48	5.4
274,253	2.1	10,724	3.8	32	5.5
241,964	2.2	8,198	3.9	21	5.6
211,856	2.3	6,210	4	13	5.7
184,060	2.4	4,661	4.1	9	5.8
158,655	2.5	3,467	4.2	5	5.9
135,666	2.6	2,555	4.3	3.4	6

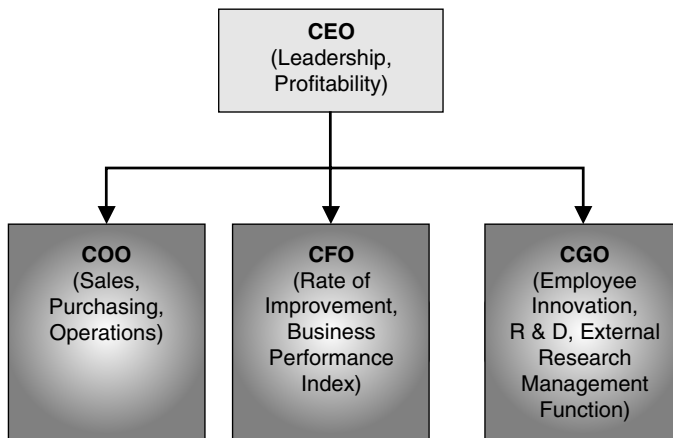
**FIGURE 4-7.** Corporate DPMO and Sigma level.

<b>Balanced Scorecard</b>	<b>Six Sigma Business Scorecard</b>
1. A strategic management system.	A performance measurement system.
2. Relates to a longer-term view of the business.	Can provide a snapshot of a business's performance, as well as identify measurements that would drive performance toward profitability.
3. Designed to develop a balanced set of measurements	Designed to identify a set of measurements that impact profitability.
4. Identifies measurements around vision and values.	Establishes accountability for leadership for wellness and profitability.
5. Critical management processes are to clarify vision/strategy, communicate, plan, set targets, align strategic initiatives, and enhance feedback and learning.	Includes all business processes, management and operational, i.e., leadership, innovation, rate of improvement, sales, service, purchasing, and production operations.
6. Balances customer and internal operations without a clearly defined leadership role.	Balances management and employees' roles; balances cost and revenue of heavy processes.
7. Emphasizes targets for each measurement.	Emphasizes aggressive rate of improvement for each measurement, irrespective of target.
8. Emphasizes learning of executives based on the feedback.	Emphasizes learning and innovation at all levels based on the process feedback. Enlists all employees' participation.
9. Focuses on growth.	Focuses on maximizing profitability.
10. Heavy on strategic intent.	Heavy on execution for profitability.
11. Management system consisting of measurements.	A measurement system based on process management.

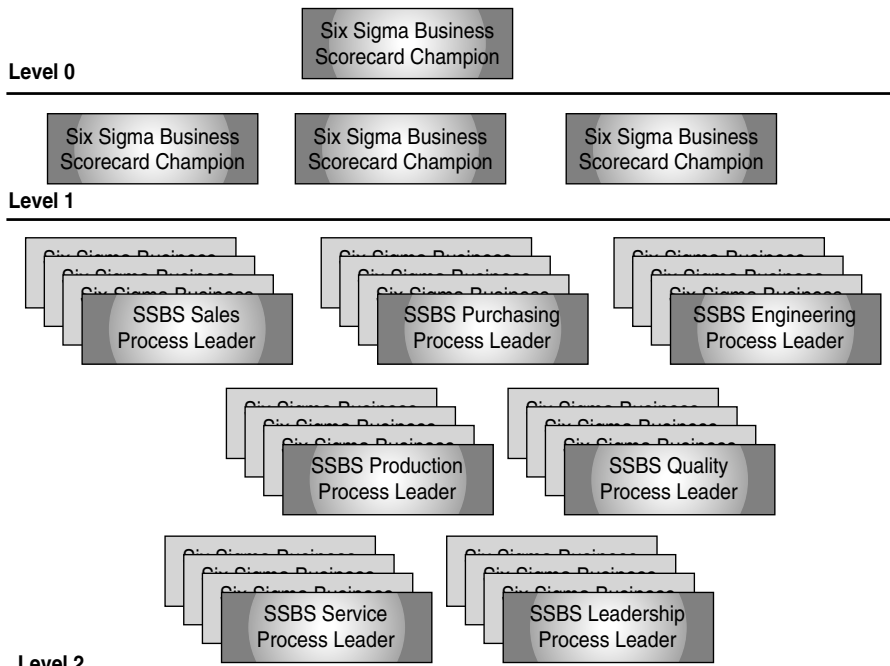
**FIGURE 4-8.** Balanced Scorecard and Six Sigma Business Scorecard comparison.



**FIGURE 5-1.** General profit and growth paradigm.

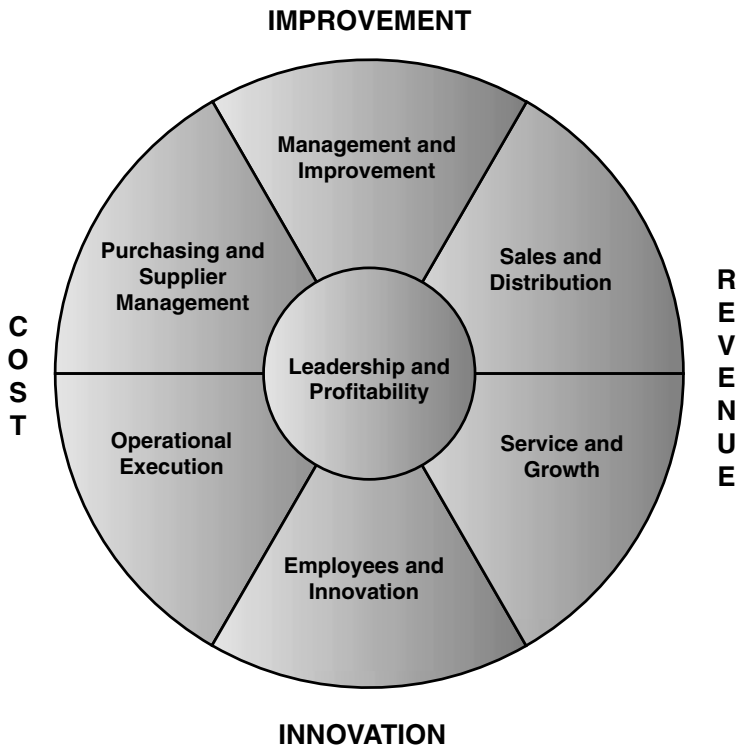


**FIGURE 5-2.** General profit and growth functional layout.



**FIGURE 5-3.** Six Sigma Business Scorecard implementation team structure.





**FIGURE 5-4.** Six Sigma Business Scorecard.

**Corporate Strategic Initiative Planning Form**

Leader: VP\_X

Initiative: Improve Spend-to-Sales Ratio by 10%

Objective: To reduce cost of goods sold and improve margins.

Target: Improve suppliers' capability by 30%, and reduce cost of purchases by 10%.

Strategy: Reengineer the purchasing process to optimize the parts performance and total spend\$.

AI #

### Action

## Responsibility

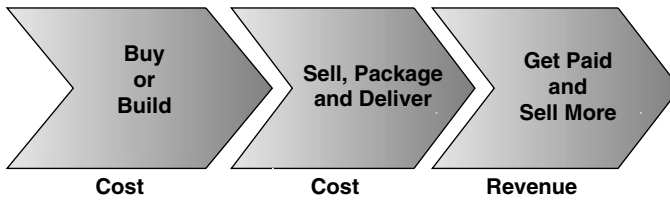
**Committed Completion  
Date**

**Critical Resource  
Required**

***Expected Benefits:***

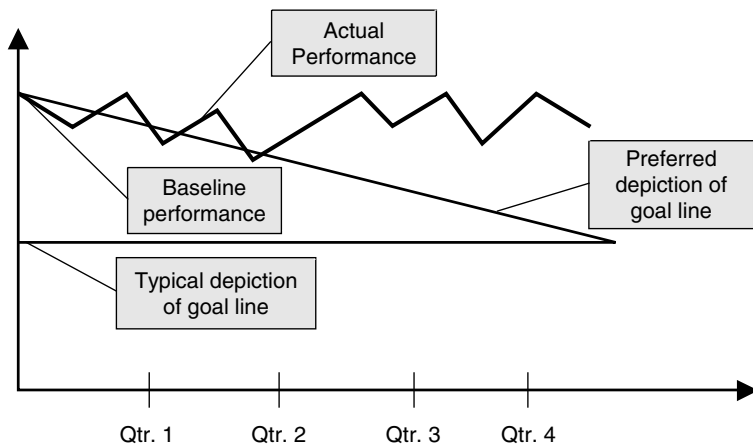
**Impact on Profitability:**

**FIGURE 5-5.** Corporate strategic initiative planning form.



$$\text{Profit} = \text{Revenue} - \text{Total Cost}$$

**FIGURE 6-1.** Basic business building block.



**FIGURE 6-2.** Understanding significance of defect reduction (goal versus actual).

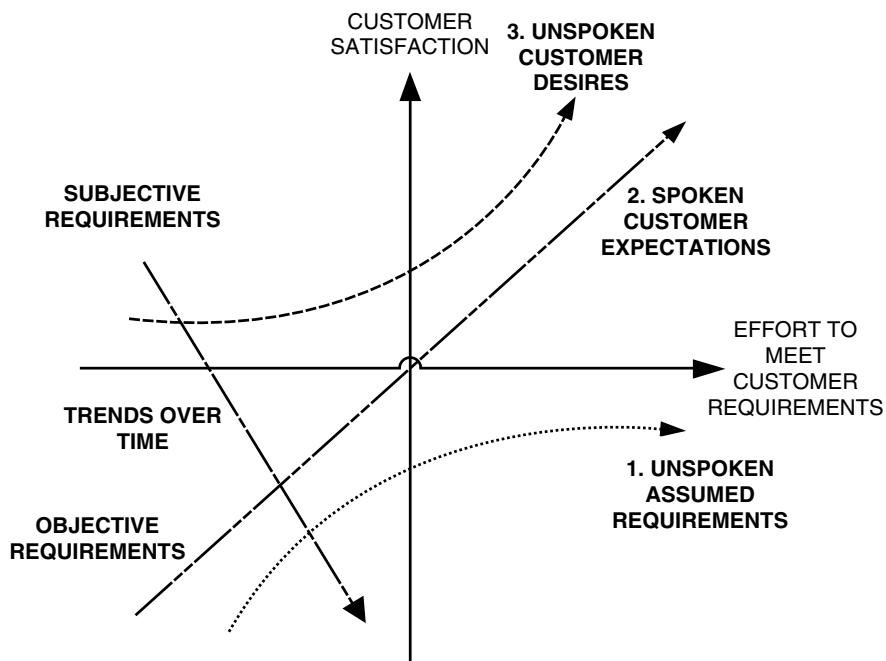


FIGURE 6-3. Objective and subjective aspects of performance.

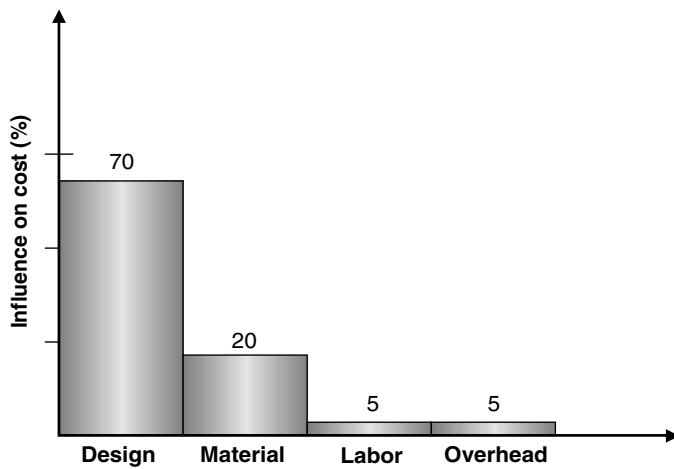
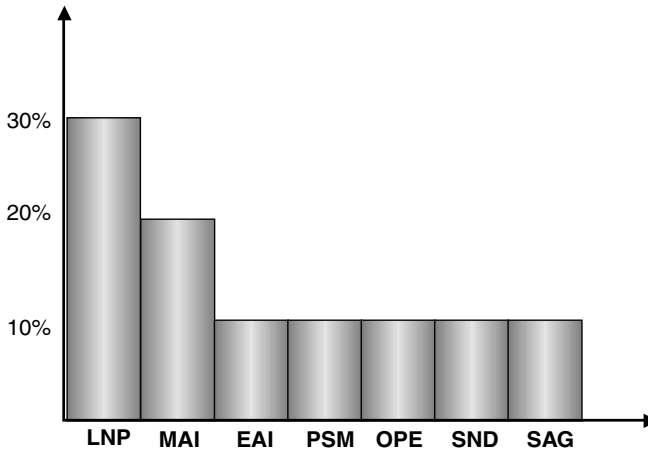


FIGURE 6-4. Cost influence factors.



**Legend:**

LNP => Leadership and Profitability

MAI => Management and Improvement

EAI => Employees and Innovation

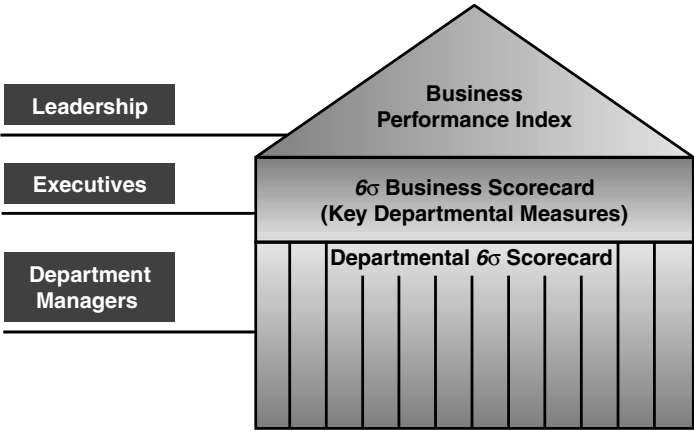
PSM => Purchasing and Supplier Management

OPE => Operational Execution

SND => Sales and Distribution

SAG => Service and Growth

**FIGURE 6-5.** Business Scorecard categories and influence on profitability.



**FIGURE 6-6.** Hierarchical structure of measures.

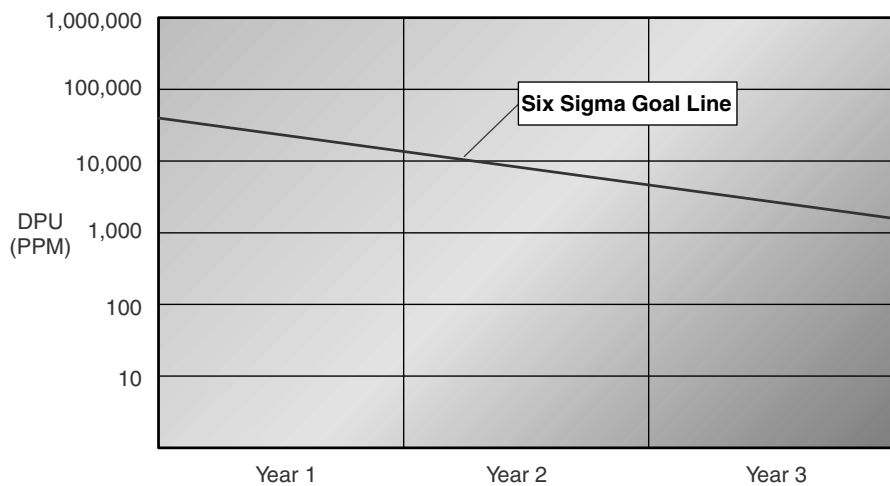


PROFITABILITY OBJECTIVES	REVIEW CYCLE
3 to 5 years	Annual
Annual	Quarterly
Quarterly	Monthly
Monthly	Weekly
Weekly	Daily

Table 1

<i><b>Function</b></i>	<i><b>Processes</b></i>	<i><b>Measurements</b></i>
Purchasing	Purchasing Requisition	Number of Errors per Requisition
Sales	Quotation Sales	Total revenue Number of new customers Value of repeat business Number of proposals accepted to total proposals submitted
Engineering	Design	Variance in on-time completion of design Completeness of design outputs Variance of design from target performance Changes after design release Reproducibility of design
Accounting	Accounting	Receivables age Timeliness of financial measures or reports Invoicing errors
Quality	Inspection Audits	Cost of poor quality Number of recurring problems Improvement opportunities
Management	Leadership	Rate of improvement Planning Communication Employees' satisfaction

**FIGURE 6-7.** Matrix of measurements.



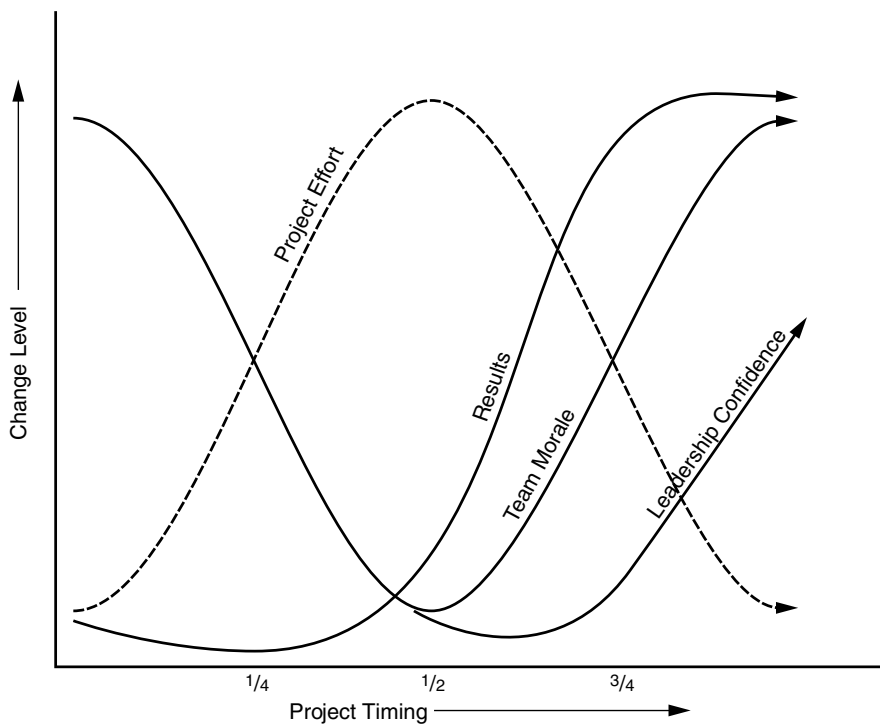
**FIGURE 6-8.** Six Sigma performance tracking chart.

<i>Measurements</i>	<i>Category Abbreviation</i>	<i>Category Significance</i>	<i>Performance Against Plans</i>	<i>Index Contribution</i>
1. Employees' Recognition	LNP	15	60	9
2. Profitability	LNP	15	50	7.5
3. Rate of Improvement	MAI	20	80	16
4. Recommendations per Employee	EAI	10	80	8
5. Total Spend/Sales	PSM	5	60	3
6. Suppliers' Defect Rate	PSM	5	60	3
7. Operational Cycle Time	OPE	5	80	4
8. Operational Sigma	OPE	5	80	4
9. New Business/Total Sales	SND	10	90	9
10. Customer Satisfaction	SAG	10	80	8
Corporate Wellness (BPIn)				71.50%
Corporate DPU				0.3355
Corporate DPMO (number of executives = 9)				37,275
Corporate Sigma				3.27

**FIGURE 6-9.** Sample index report card for a medium-size company.

<i><b>BPI<sub>n</sub> Measurements</b></i>	<i><b>Quantifiable</b></i>	<i><b>Ease of Data Collection</b></i>	<i><b>Relationship to Profitability</b></i>
1. Employee Recognition	Yes	Need to establish a process	Important for customer satisfaction
2. Profitability	Yes	Yes	NA
3. Rate of Improvement	Yes	Yes	Yes
4. Recommendations per Employee	Yes	Need to establish a process	Critical for business growth
5. Total Spend/Sales	Yes	Yes	Direct relationship to profitability
6. Suppliers' Defect Rate	Yes	Yes	Direct relationship to profitability
7. Operational Cycle Time	Yes	Yes, may take effort	Will impact profitability directly
8. Operational Sigma	Yes	Yes, may be challenging for office functions	Direct relationship to profitability
9. New Business/Total Sales	Yes	Yes	Critical for growth
10. Customer Satisfaction	Yes	Yes	Yes

**FIGURE 6-10.** Analysis of BPI<sub>n</sub> measurements.



**FIGURE 7-1.** The project life cycle.

SIX SIGMA BUSINESS SCORECARD CATEGORIES	APPLICABILITY TO A START-UP BUSINESS OF 1 TO 25 EMPLOYEES	APPLICABILITY TO AN ESTABLISHED SMALL BUSINESS OF 26 TO 75 EMPLOYEES	APPLICABILITY TO A MEDIUM-SIZE BUSINESS OF 76 OR MORE EMPLOYEES
Leadership and profitability	Yes, measurable	Yes, measurable	Yes, measurable
Management and improvement	Yes, guidelines	Yes, guidelines	Yes, measurable
Employees and innovation	Yes, guidelines	Yes, guidelines	Yes, measurable
Purchasing and suppliers' management	Yes, measurable	Yes, measurable	Yes, measurable
Operational excellence	Yes, measurable	Yes, measurable	Yes, measurable
Sales and distribution	Yes, measurable	Yes, measurable	Yes, measurable
Service and growth	Yes, guidelines	Yes, measurable	Yes, measurable

Table 2

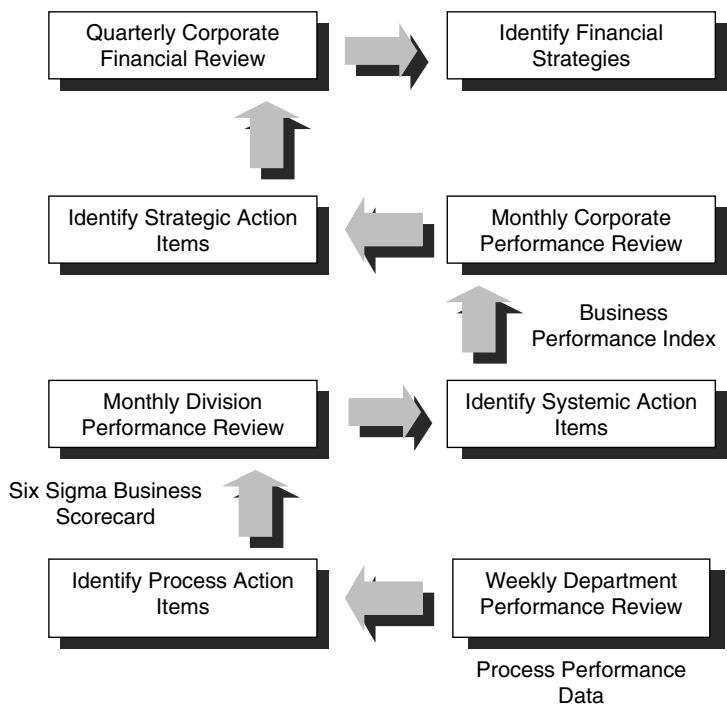
<i>Measurements</i>	<i>Applicability to Small Businesses</i>	<i>Importance</i>	<i>Initial Performance Guidelines</i>	<i>% Score</i>	<i>Weighted Score (AxC/100)</i>
		<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
1. Employee Recognition (% of employees)	Guidelines	NA	0.2% - 25 0.5% - 50 2% - 75 >5% - 100		
2. Profitability	Measurable	30	2% - 50 4% - 60 8% - 80 >12% - 100		
3. Rate of Improvement in Process Performance	Guidelines	NA	<20% - 50 30% - 60 40% - 80 >50% - 100		
4. Recommendations per Employee	Guidelines	NA	0.5/Emp - 50 1/Emp - 60 2/Emp - 70 >5/Emp - 100		
5. Total Spend/Sales	Measurable	10	>60% - 30 45% - 50 35% - 75 <25% - 100		
6. Suppliers' Defect Rate	Measurable	10	3 $\sigma$ - 25 4 $\sigma$ - 50 5 $\sigma$ - 75 6 $\sigma$ - 100		
7. Operational Cycle Time Variance	Measurable	10	>50% - 25 40% - 50 25% - 75 <10% - 100		
8. Operational Sigma	Measurable	10	<3 $\sigma$ - 25 4 $\sigma$ - 50 5 $\sigma$ - 75 >6 $\sigma$ - 100		
9. New Business/ Total Sales	Measurable	10	20% - 25 30% - 50 40% - 75 50% - 100		
10. Customer Satisfaction	Measurable	20	80% - 60 85% - 70 90% - 80 100% - 90		
Total (BPIn)					
DPU (-ln(BPIn/100))					
# of Executives (president and staff)					
DPMO					
Sigma (from table)					

**FIGURE 8-1.** Six Sigma Business Scorecard for small businesses.

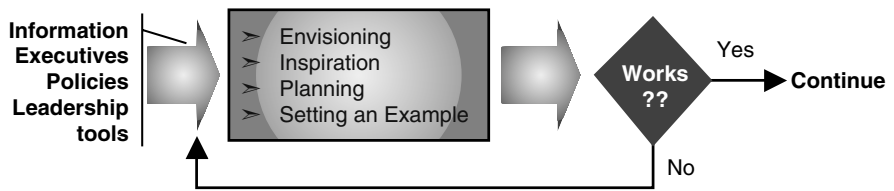


<i><b>BPI<sub>n</sub></b></i>	<i><b>DPU</b></i>	<i><b>BPI<sub>n</sub></b></i>	<i><b>DPU</b></i>
10	2.302585	55	0.597837
15	1.89712	60	0.510826
20	1.609438	65	0.430783
25	1.386294	70	0.356675
30	1.203973	75	0.287682
35	1.049822	80	0.223144
40	0.916291	85	0.162519
45	0.798508	90	0.105361
50	0.693147	95	0.051293

**FIGURE 8-2.** BPI<sub>n</sub>-to-DPU conversion table.



**FIGURE 9-1.** Corporate performance review cycle.



**FIGURE 9-2.** Leadership evaluation process.

<b>Leadership Performance Review</b>	<b>Employees</b>	<b>Feedback</b>
<b>Envisioning</b>		
Always thinking; analyzing competitors, new business strategies, new work methods, and the future		
Not afraid of experimenting, striking out in new directions		
Buoyant and building a sense of excitement and adventure in employees		
Takes risks and pursues novel approaches and encourages creativity in others		
Demonstrates mastery over crucial skills and is eager to share the knowledge		
Ever-present willingness to learn new things, to explore new areas, to test concepts, and is not afraid of failure		
An excellent reader and builds on others' ideas		
<b>Inspiring</b>		
Candid, honest, and objective		
Quick to recognize and thank others		
Understands his or her success is a team effort and a result of good fortune		
Listens well in order to learn from others		
Cooperative and enjoys working with others		
Perceptive of thoughts and fears of others		
Shows exuberance – a childlike curiosity inspiring others		
<b>Planning</b>		
Keeps his desk, agenda, and mind open and clear		
Prioritizes tasks and devotes necessary effort		
Establishes his own best-in-class benchmarks		
A good strategist who systematically deploys available resources for best results		
Action-oriented and plans to make things happen		
Plans to continually do better and expects others to follow		
Plans to get involved as needed to achieve results		
<b>Practicing (Exemplary)</b>		
Demonstrates exemplary dedication		
Looks at all aspects of an issue before making a decision		
Practices and encourages fairness		
Tenacious and keeps moving forward toward goal that appears elusive to others		
Lets others bask in limelight		
Builds and maintains comfortable, goal-oriented atmosphere at work		
Strives for excellence in all things. Does the best job possible and inspires others to do the same.		

**FIGURE 9-3.** Leadership performance review elements.

<b>Employee Performance Review</b>
<b><i>Excellence Expectations</i></b>
Leadership Practices
Value Added (including Six Sigma projects)
Innovation
<b><i>Demonstrated Excellence (Measurable Value Added)</i></b>
Innovation (including breakthrough solutions)
Direct Value-Added
Leadership Practices
<b><i>Areas for Improvement</i></b>
Behaviors
Skills
<b><i>Growth Plans</i></b>
Training
New Assignments
Incentives for Extraordinary Performance
<b><i>Value Plans (Including Six Sigma Projects)</i></b>
<b><i>Plans for Innovation</i></b>
Thought Leadership
New Areas of Interest

**FIGURE 9-4.** Employee performance evaluation elements.

<b>Management Performance Review</b>
<b>Improvement Expectations</b>
Rate of Improvement
Breakthrough Solutions
Direct Value Creation (including Six Sigma projects)
Leadership Practices
<b>Demonstrated Improvement (Measurable Value Added)</b>
Rate of Improvement
Breakthrough Solutions
Direct Value Created
Leadership Practices
<b>Areas for Improvement</b>
Improvement Goals Not Met
Resource Management
<b>Growth Plans</b>
Leadership Training
New Areas of Interests
Incentives for Group's Superior Performance
<b>Value Action Plans (Including Six Sigma Projects)</b>
<b>Plans for Innovation</b>
Thought Leadership

**FIGURE 9-5.** Management performance evaluation elements.

<i>Company</i>	<i>Sector</i>	<i>Company</i>	<i>Sector</i>
Alcoa	Basic materials	Intel	Technology
American Express	Financial	IBM	Technology
AT&T	Telecom	International Paper	Basic materials
Boeing	Industrial	Johnson & Johnson	Health care
Caterpillar	Industrial	J.P. Morgan Chase	Financial
Citigroup	Financial	McDonalds	Consumer, cyclical
Coca Cola	Consumer, noncyclical	Merck & Co.	Health care
Dupont	Basic materials	Microsoft Corp.	Technology
Eastman Kodak	Consumer, cyclical	3M	Industrial
Exxon	Energy	Phillip Morris	Consumer, noncyclical
General Electric	Industrial	Proctor & Gamble	Consumer, noncyclical
General Motors	Consumer, cyclical	SBC Communication	Telecom
Hewlett-Packard	Technology	United Technology	Industrial
Home Depot	Consumer, cyclical	Walt Disney	Consumer, cyclical
Honeywell International	Industrial	Wal-Mart	Consumer, cyclical

**FIGURE 10-1.** Dow Jones Index companies.

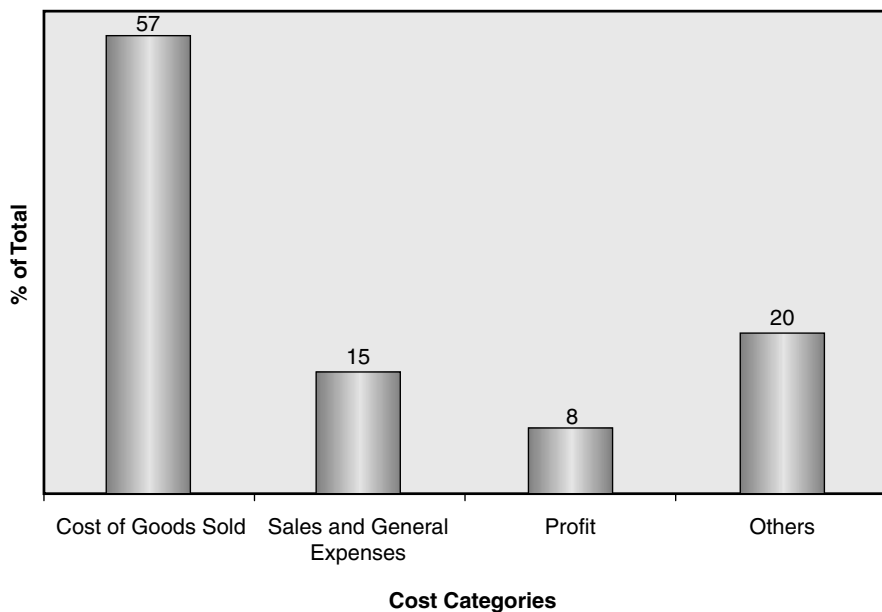
<i>Measurement</i>	<i>Dow 30 Average</i>	<i>Low</i>	<i>High</i>	<i>% of Sales</i>
Sales	\$58,114	\$13,234	\$217,799	100
Cost of Goods Sold	33,044	3,455	171,562	57
R&D	2,045	203	5,290	4
Inventory	4,928	105	22,614	8
SGA Expenses	8,977	1,276	32,173	15
Profits	4,350	-1,204	15,320	8
Long-Term Debt	16,015	0	121,631	28
Plant and Equipment	19,226	1,903	89,602	33
Shareholders' Equity	25,167	2,894	81,247	43
Retained Earnings	22,505	-3,484	95,718	39
Total Assets	\$133,635	\$13,362	\$1,051,450	230

**FIGURE 10-2.** Summary of key measures (in millions).

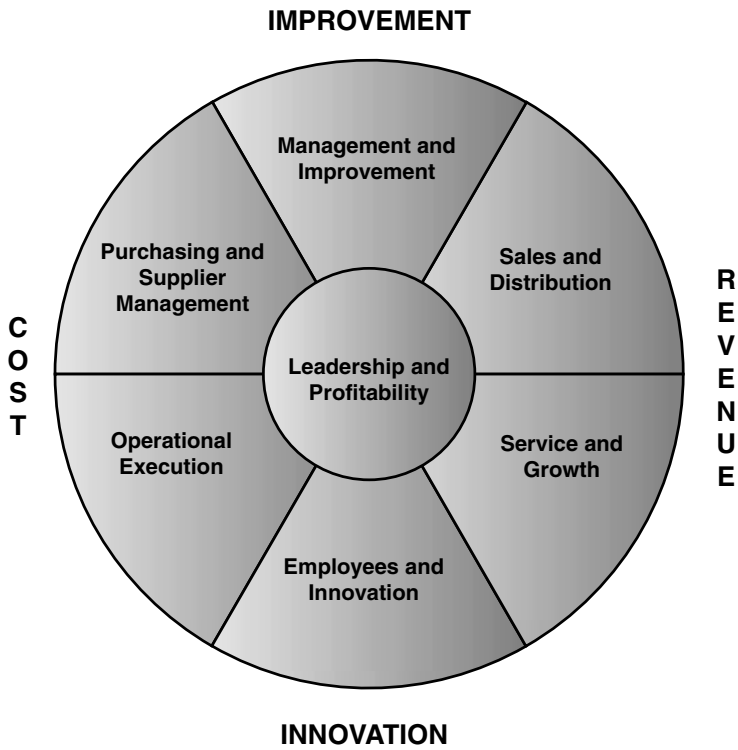


<i><b>Measurements</b></i>	<i><b>Correlation with Profits</b></i>	<i><b>Correlation with Growth, 3 Years' Sales</b></i>
Plant and Equipment	0.6936	0.2365
Long-Term Debt	0.5891	0.1795
Total Assets	0.4623	0.1681
Shareholders Equity	0.7861	0.1514
R&D	0.2943	0.1494
Profits	1.0000	0.1125
Retained Earnings	0.8346	0.0690
Sales, Cost, SGA	0.8748	(0.1239)
Sales	0.6048	(0.1586)
SGA Expenses	0.4829	(0.2008)
Inventory	0.4219	(0.1315)
Cost of Goods Sold	0.2434	(0.2328)

**FIGURE 10-3.** Financial breakdowns for Dow 30 companies.



**FIGURE 10-4.** Profits and sales growth versus business performance measures.



**FIGURE 10-5.** Six Sigma Business Scorecard.

CATEGORIES	PROFIT/GROWTH
Leadership	Growth
Sales and Distribution	Profit
Purchasing	Profit
Operational Execution	Profit
Rate of Improvement	Profit/Growth
Employee Innovation	Growth
Service and Growth	Growth

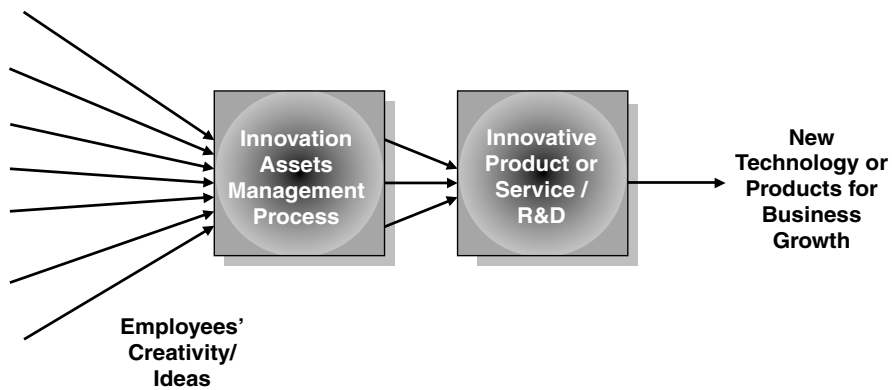
Table 3

MEASUREMENTS	PROFIT/GROWTH
Employee Recognition	Growth
Profitability	Profit
Rate of Improvement	Profit/Growth
Recommendations per Employee	Growth
Total Spending/Sales	Profit
Suppliers' Defect Rate	Profit
Operational Cycle Time	Profit
Operational Sigma	Profit
New Business	Growth
Customer Satisfaction	Growth

Table 4

<i>Measurements</i>	<i>Category Abbreviation</i>	<i>Category Significance</i>	<i>Performance Guidelines</i>
1. Employee Recognition (% of employees)	LNP	15	0.2% - 25 0.5% - 50 2% - 75 >5% - 100
2. Profitability	LNP	15	2% - 50 4% - 60 8% - 80 >12% - 100
3. Rate of Improvement in Process Performance	MAI	20	<20% - 50 30% - 60 40% - 80 >50% - 100
4. Recommendations per Employee	EAI	10	0.5/Emp - 50 1/Emp - 60 2/Emp - 70 >5/Emp - 100
5. Total Spend/Sales	PSM	5	>60% - 30 45% - 50 35% - 75 <25% - 100
6. Suppliers' Defect Rate	PSM	5	3 $\sigma$ - 25 4 $\sigma$ - 50 5 $\sigma$ - 75 6 $\sigma$ - 100
7. Operational Cycle Time Variance	OPE	5	>50% - 25 40% - 50 25% - 75 <10% - 100
8. Operational Sigma	OPE	5	<3 $\sigma$ - 25 4 $\sigma$ - 50 5 $\sigma$ - 75 >6 $\sigma$ - 100
9. New Business/Total Sales	SND	10	20% - 25 30% - 50 40% - 75 50% - 100
10. Customer Satisfaction	SAG	10	80% - 60 85% - 70 90% - 80 100% - 90

**FIGURE 10-6.** BPIn performance guidelines.



**FIGURE 10-7.** Creativity to innovation conversion process.

<b>Organism</b>	<b>Then</b>	<b>Now</b>
Society	Structured family Interdependence Task-oriented Mechanical skills (used material) Sound-driven (hearing senses)	Spontaneous family Independence Systems-oriented Computer skills (use information) Light-driven (visual senses)
Corporation	Quarterly returns driven Acceptable products or services Buy cheapest parts and materials Hire employees for productivity Hierarchical management for tasks Excellence in production Growth or profitability	Customer-focused Highest quality products and services Buy capable parts and materials Attract people for innovation and value Leadership-inspired executive team Excellence in everything Profitability and growth
Team	Task-oriented Mainly in production to solve problems Targeted product problems Chosen members for teams	Goal-oriented Used in development to prevent problems Seeking systemic solutions Qualified members on teams
Leadership	Management-oriented Directing for performance Profitability-focused External measurements	Leadership-driven Inspiring for success Performance-focused Internal measurements

FIGURE 11-1. Recent organizational dynamics.



<i>Questions for Personal Growth</i>	<i>Questions for Professional Growth</i>
Who do I want to be like?	What would I like to accomplish in the short term or long term?
Who am I now?	Where I am now?
How do I get there from here?	How do I get there from here?
How do I make change stick?	How do I maintain?
Who can help me?	What do I need and from whom?

**FIGURE 11-2.** Process for achieving personal and professional growth.

<b>Q #</b>	<b>Question</b>	<b>Yes</b>	<b>No</b>
1	I understand natural behaviors.		
2	I carry positive energy.		
3	I know what success means to me.		
4	I welcome others instead of being welcomed.		
5	I am willing to start over.		
6	I am ready to face the consequences of my actions.		
7	I enjoy every moment of life.		
8	I thank frequently.		
9	I know the purpose for my life.		
10	I learn from the past.		
11	I love everyone.		
12	I am curious.		
13	I know my natural strengths.		
14	I do everything with a passion.		
15	I seek the purpose of every challenge.		
16	I love the critical moments.		
17	I carry the right lesson forward.		
18	I share my resources at work.		
19	I create opportunities for my people.		
20	I honor my appointments.		
21	I am kind and dependable.		
22	I have no expectations for entitlements.		
23	I know my true worth.		
24	I know my time is limited.		
25	I chose the right over the easy in tough times.		
26	I seek win-win solutions.		
27	I serve my employees.		
28	I balance profit and growth.		
29	I prioritize.		
30	I know my needs.		
31	I communicate personally.		
32	I do not have a stiff neck.		
33	I do not get upset easily.		

**FIGURE 11-3.** Executive personal assets inventory checklist. (*Julian, 2001.*)

<i><b>BPI<sub>n</sub> Measurements</b></i>	
1.	Employee Recognition
2.	Profitability
3.	Rate of Improvement in Process Performance
4.	Recommendations per Employee
5.	Total Spend/Sales
6.	Suppliers' Defect Rate
7.	Operational Cycle Time Variance
8.	Operational Sigma
9.	New Business/Total Sales
10.	Customer Satisfaction

**FIGURE 12-1.** Ten BPI<sub>n</sub> measurements.

<b>M1</b>	<b>M2</b>	<b>M3</b>	<b>M4</b>	<b>M5</b>	<b>M6</b>	<b>M7</b>	<b>M8</b>	<b>M9</b>	<b>M10</b>	<b>BPI<sub>n</sub></b>
10.94	15	15.94	8.06	5	4.9	2.5	3.77	8.08	9.8	84.3
9.6	15	15.42	8.16	5	4.83	5	3.84	7.22	9.66	83.44
11.13	13.5	15.54	7.88	3.75	4.93	4.5	3.78	7.6	9.86	83.04
11.09	15	14.66	7.14	4.5	4.83	4.5	3.24	6.52	9.67	81.48
11.36	13.5	14	7.6	2.5	4.92	4.5	3.95	8.81	9.83	81.23
11.82	13.5	14.6	7.91	2.5	4.89	4.5	3.37	7.7	9.79	81.23
9.95	12	15.48	8.7	2.5	4.93	4.5	4.22	8.6	9.87	80.9
10.92	15	14.36	7.19	4.5	4.85	3.75	3.41	6.42	9.69	80.34
10.28	13.5	15.94	8.29	5	4.86	1.5	3.54	7.38	9.72	80.25
10.91	15	13.96	6.73	4.5	4.88	3.75	3.59	6.36	9.77	79.8
11.69	12	14.96	7.76	2.5	4.92	3.75	3.95	7.64	9.84	79.32
9.32	12	15.84	7.79	2.5	4.88	5	3.04	6.23	9.77	77.28
10.08	13.5	14.44	7.06	1.5	4.88	5	4.35	7.06	9.75	77.15
10.52	15	13.36	6.95	1.5	4.84	5	3.47	6.63	9.68	77.06
9.87	12	15.08	7.77	1.5	4.86	5	3.6	6.85	9.72	76.42
10.5	15	12.78	6.95	1.5	4.84	5	4.38	6.3	9.67	76.12
10.95	9	15.18	7.31	1.5	4.87	5	3.84	7.03	9.74	74.44
10.19	9	15.74	6.97	1.5	4.82	5	4.38	7.7	9.64	74.02
11.42	13.5	13.48	6.7	1.5	4.67	5	3.5	5.04	9.34	73.16
10.22	12	13.2	7	2.5	4.83	2.5	3.57	6.61	9.66	72.06
9.36	12	13.48	6.72	1.5	4.81	5	3.77	6.12	9.62	72.02
9.81	12	12.2	6.59	1.5	4.88	5	3.37	6.33	9.76	71.99
9.95	9	14.48	6.41	1.5	4.91	5	3.24	6.34	9.81	71.53
11.64	4.5	11.06	5.5	1.5	4.87	5	3.89	5.78	9.74	63.42
8.49	15	6.48	3.67	2.5	4.74	5	3.78	4.21	9.47	62.48
9.05	4.5	11.82	6.39	1.5	4.81	5	3.66	5.97	9.61	62.01
9	0	12.84	6.27	1.5	4.84	5	3.55	6.39	9.67	59.1
9.39	4.5	9.96	5.66	1.5	4.79	5	2.52	5.28	9.57	58.89
9.81	0	10.5	5	3.75	4.82	3.75	3.59	5.08	9.65	55.86
9.39	0	10.26	5.17	1.5	4.76	5	4.03	4.96	9.51	53.59

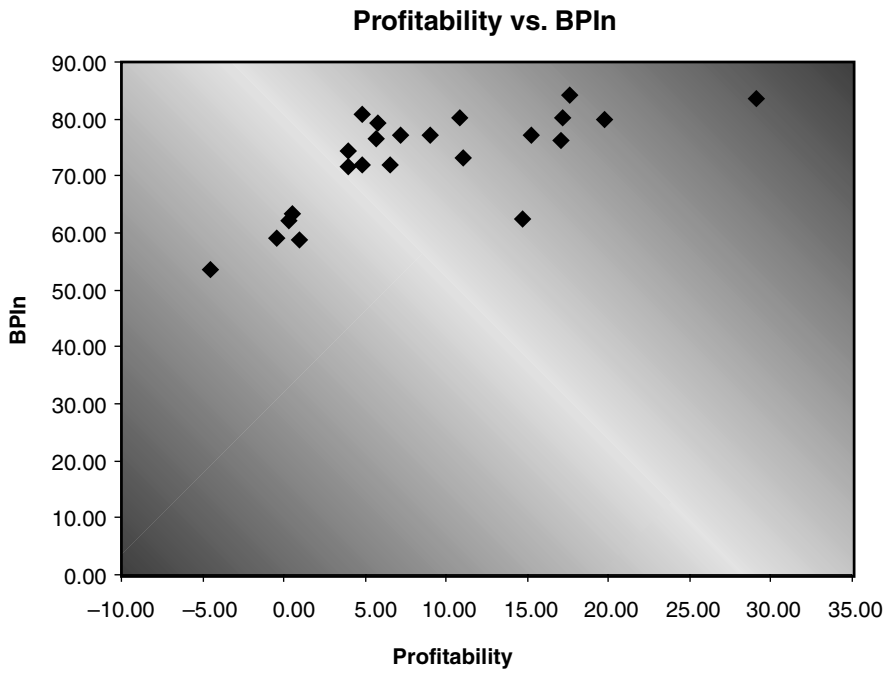
**FIGURE 12-2.** Estimated BPI<sub>n</sub> measurements for Dow 30 companies (sorted by BPI<sub>n</sub>).

<i>Profitability</i>	<i>BPIIn</i>	<i>DPU</i>	<i>Executives</i>	<i>DPMO</i>	<i>Sigma</i>
10.82	81.23	0.2078	36	5,773.5	4.02
7.18	77.28	0.2578	39	6,610.1	3.98
4.86	80.9	0.2119	30	7,064.8	3.95
17.64	84.3	0.1708	24	7,267.7	3.94
29.04	83.44	0.181	25	7,239.3	3.94
17.17	80.34	0.2189	22	9,950.5	3.82
8.89	81.23	0.2079	19	10,778	3.79
9.52	83.04	0.1859	17	10,935	3.78
8.99	77.15	0.2594	21	12,352	3.74
3.03	74.02	0.3008	22	13,674	3.7
4.86	71.99	0.3287	23	14,289	3.68
0.57	63.42	0.4554	32	14,230	3.68
6.55	72.06	0.3277	23	14,249	3.68
17.1	76.12	0.2729	16	17,056	3.61
10.87	80.25	0.22	13	16,924	3.61
11	73.16	0.3125	18	17,361	3.6
3.97	74.44	0.2952	16	18,449	3.58
5.68	76.42	0.2689	14	19,207	3.57
5.81	79.32	0.2317	12	19,310	3.56
3.94	71.53	0.3351	17	19,711	3.56
19.75	79.8	0.2257	11	20,515	3.54
15.78	81.48	0.2048	10	20,484	3.54
15.26	77.06	0.2605	12	21,712	3.52
6.95	72.02	0.3282	14	23,871	3.48
-0.63	55.86	0.5822	24	24,260	3.47
0.34	62.01	0.4778	16	29,862	3.37
0.9	58.89	0.5296	16	33,098	3.33
14.68	62.48	0.4704	12	39,198	3.25
-4.57	53.59	0.6238	16	38,986	3.25
-0.42	59.1	0.5259	9	58,435	3.06

**FIGURE 12-3.** Estimated BPIIn and Sigma performance of Dow 30 companies (sorted by Sigma level).

<i>Measurements</i>	<i>Average</i>	<i>Range</i>	<i>Median</i>
M1	10.29	3.33	10.2
M2	10.85	15	12
M3	13.57	9.46	14.18
M4	6.91	5.03	6.99
M5	2.53	3.5	2
M6	4.85	0.26	4.85
M7	4.47	3.5	5
M8	3.7	1.86	3.72
M9	6.61	4.6	6.47
M10	9.7	0.53	9.71
DPU	0.3	0.45	0.27
DPMO	19,095	52,662	17,209
Sigma level	3.62	0.96	3.61

**FIGURE 12-4.** Summary of BPIn measurements for Dow 30 companies.



**FIGURE 12-5.** BPIIn and profitability scatter plot.

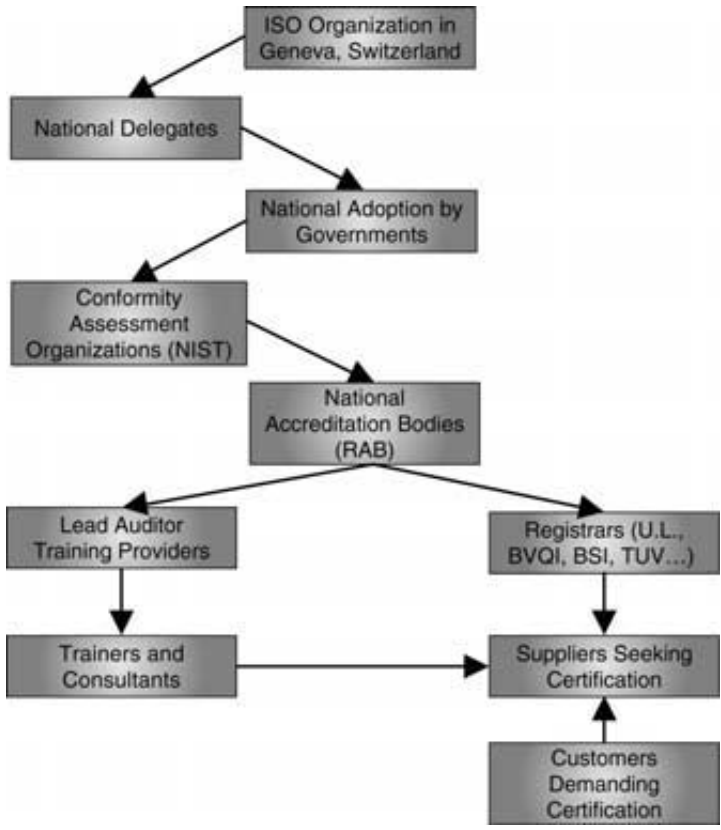


FIGURE 13-1. Organizational structure for ISO 9001 certification.





**FIGURE 13-2.** Six Sigma improvement methodology.