HARVARD | BUSINESS | SCHOOL

9-207-121

REV: JANUARY 16, 2009

TIMOTHY A. LUEHRMAN

Stryker Corporation: In-sourcing PCBs

In late May 2003 executives in Stryker Corporation's Instruments business were actively considering a change in their sourcing strategy for printed circuit boards (PCBs), a key electronic component of many of Stryker Instrument's medical products. Currently, Stryker purchased PCBs from a small number of contract manufacturers. The Instruments business anticipated spending more than $10 million in each of the next two years on PCBs, an amount that would increase as the Instruments business grew. In recent years, the performance of some contract manufacturers had been unsatisfactory with respect to quality, delivery and/or responsiveness and Stryker had repeatedly found itself looking for new suppliers. More generally, contract manufacturers tended to operate on thin margins with scant capital. Bankruptcies were not uncommon, and even without bankruptcy, a financially weak supplier was simply less reliable. Given recent events and the shaky appearance of several current suppliers, Stryker Instruments had resolved to address the issue.

Stryker Instruments' manufacturing managers studied three options for improving the situation. Option #1 was to maintain the current basic sourcing policy for PCBs, but with important modifications. Specifically, it would protect against future disruptions by acquiring safety stocks of key materials and instituting dual sourcing of all electronic assemblies. Option #2 would boost reliability by establishing a partnership with a single supplier, one of the current group of contract manufacturers. That company would become Stryker Instruments' sole supplier of PCBs and establish a stand-alone facility for supplying them. The partnership and increased business from Stryker was expected to strengthen the supplier, further boosting its reliability. Option #3 was for Stryker Instruments to manufacture its own PCBs in its own facility near company headquarters in Kalamazoo, Michigan. Once such a facility was up and running, it might be expanded to supply PCBs to other Stryker businesses as well.

Of the three alternatives, Option #3 promised the highest degree of control over quality and delivery. From that perspective, it was most the attractive. But it also required the largest capital outlay and the largest increment to Stryker's headcount and payroll. Whether it offered an adequate return on investment was a question that had to be carefully studied. If Stryker Instruments wanted to proceed with the investment, it would have to obtain numerous approvals. Stryker Corporation's capital budgeting procedures required specific business and financial analyses of proposed expenditures. The financial analyses included studies of outlays, costs, profitability, risks, and shareholder returns. More specifically, estimates of net present value (NPV), internal rate of return (IRR) and payback period all had to be prepared before a project could receive funding.

Senior Lecturer Timothy A. Luehrman prepared this case. HBS cases are developed solely as the basis for class discussion. Cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective management.

Stryker Corporation

Stryker Corporation was a leading provider of specialty medical and surgical products with 2002 revenues and operating profits of $3.0 billion and $507 million, respectively. The corporation's divisions included Orthopaedic Implants, Medical and Surgical Equipment (MedSurg), Rehabilitative Medical Services, and International Sales. Summary operating and financial data for Stryker as a whole are presented in **Exhibit 1**.

MedSurg had 2002 sales of $1.1 billion, an increase of 13% over 2001, which came from three major business units. Stryker Endoscopy produced video-imaging and communications equipment and instruments for arthroscopic and general surgery. Stryker Medical produced hospital beds and other patient-handling equipment along with emergency medical service products. Stryker Instruments produced surgical instruments, operating room equipment and interventional pain control products. Stryker Instruments operated manufacturing facilities in Michigan, Puerto Rico and Ireland and recorded global revenues of approximately $430 million in 2002.

PCBs were used in virtually all of Instruments' key products and platforms, sometimes in more than one application. They were contained, for example, in instrument consoles, footswitches, handpieces, chargers, docks, and monitors. Stryker had considered in-house manufacturing of PCBs before – a proposal had been developed as recently as 2001, but had not been executed. In 2003, as supplier reliability continued to cause concern, the idea was once again receiving serious study.

The Proposal

An in-sourcing strategy had been studied in various forms so far and the proposal might change further before implementation. In its current version the proposal called for the construction of a new building with 30,000 square feet of space on eight acres owned by Stryker in Kalamazoo, Michigan. Site preparation, construction and improvements were expected to cost $3,030,000. This sum did not include architectural and engineering fees of $278,000. Furnishings and non-manufacturing equipment would cost $126,000. Communication equipment and IT infrastructure would cost an additional $210,000. The building would be ready for manufacturing equipment by April 1, 2004.

The proposed facility would manufacture all of the various types of PCBs required by Stryker Instruments and hence require many kinds of manufacturing equipment. Stryker Instruments' managers and engineers were already familiar with the requisite manufacturing processes and had prepared detailed specifications for the needed equipment, including descriptions of equipment, software, and related systems by model and manufacturer; specific configurations and options to be included on the systems; quantities for each type; and installed costs. The total budget for about 70 separate categories of equipment was $2,643,258. Equipment was to be installed and ready for testing by the end of the second quarter of 2004. Actual production would begin the third quarter of that year.

As Stryker Instruments began producing its own PCBs, it would transition out of supplier agreements with third parties. This would happen fairly quickly: production transfers would take place product by product and the transition would be complete by the end of 2005. Accordingly, for part of 2004-05, Stryker would be manufacturing some PCBs while still buying some from outside suppliers. Beginning in 2006, all PCBs would be produced in-house. **Exhibit 2** shows Stryker Instruments' anticipated expenditures on PCBs for the period 2004-2009 under the old sourcing strategy using contract manufacturers, including growth in volume and expected increases in the

suppliers' prices. **Exhibit 2** also shows the anticipated production schedule for the new facility as currently proposed.

Stryker's manufacturing costs were divided into three main categories: materials, variable costs and fixed costs. Materials costs were estimated by product and based on actual costs reported under existing supplier agreements, adjusted for expected price increases. These are presented in **Exhibit 2** for the new facility's anticipated production volume. Fixed costs were estimated by period for more than 30 categories, including wages and salaries, overtime, benefits, training, depreciation, building and equipment maintenance, office supplies, etc. Certain fixed costs would be incurred beginning in the first quarter of 2004, even before the start of production. A summary of expected fixed costs, including inflation and wage increases, is shown in **Exhibit 2**. Similarly, estimated variable costs for more than 20 categories including wages, overtime, shipping supplies, scrap, etc., also are summarized in **Exhibit 2**. Variable costs would begin to be incurred in the third quarter of 2004. Of the combined fixed and variable costs shown in **Exhibit 2**, roughly half represented employee compensation and benefits; by 2006 the facility was expected to employ 56 people.

The building would be depreciated on a straight-line basis over 30 years.[1] Capital equipment would be depreciated straight-line over seven years. IT equipment and other furnishings would be depreciated over 3 years. These depreciation charges are included in the fixed costs summarized in **Exhibit 2**. Also included are expected maintenance expenditures for both the building and equipment, but not additional capital spending. Manufacturing volumes contemplated for 2009 represented 100% of the facility's rated capacity.

Finally, the project would benefit from terms of trade established with suppliers of certain PCB components and materials. About 60% of the materials purchased by Stryker for manufacturing PCBs would qualify for generous payment terms of net 120 days. Even better, the 120 days did not commence until Stryker actually took a given component from its stock. In effect, the supplier owned the component until that point, even though Stryker had physical possession of it. Further, the fact that payment was not due for 120 days meant that Stryker typically would be paid for finished goods by *its* customers before it was required to pay its materials supplier. Under existing arrangements with contract manufacturers, the contract manufacturer benefited from this arrangement rather than Stryker. Indeed, under the existing policy, Stryker paid its contract manufacturers much more quickly—in 15 to 60 days, depending on the contract, for an average of about 30 days. **Exhibit 3** presents a calculation of the anticipated change in accounts payable associated with the new sourcing strategy.

In its various financial analyses Stryker would apply a 36% tax rate. The company generally used a hurdle rate of 15% for net present value calculations (for projects deemed riskier than usual a higher rate would apply). **Exhibit 4** presents selected capital market data as of May 2003.

[1] Architectural and engineering fees were not depreciated as part of the building, but rather expensed .

Exhibit 1 Stryker Corporation—Selected Financial and Operating Data for Stryker Corporation (figures in US$ millions, except employees)

	2002	2001	2000
Net sales	$3,012	$2,602	$2,289
Gross profit	1,898	1,637	1,473
RD&E expense	144	144	124
SG&A expense	1,187	1,000	898
Operating profit	521	454	417
Net interest expense	41	66	98
Net earnings	$329	$255	$211
Cash & marketable securities	$38	$50	$54
Working capital	444	460	380
Net property, plant & equipment	519	444	378
Capital expenditures	139	162	81
Depreciation & amortization	186	172	169
Total assets	2,838	2,439	2,441
Long-term debt (including current portion)	502	723	1,013
Stockholders' equity	1,521	1,072	866
Dividends	$24	$20	$16
Number of employees	14,045	12,839	12,084

Source: Stryker Corporation 2006 Annual Report.

Historical figures have been restated to reflect the adoption of SFAS 123R.

Exhibit 2 Stryker Corporation—Selected Cost Projections under Different Sourcing Policies

Quarterly Data: 2004–2005

	2004 Q1	2004 Q2	2004 Q3	2004 Q4	Total 2004	2005 Q1	2005 Q2	2005 Q3	2005 Q4	Total 2005
Projected PCB Purchases under current sourcing	2,559,479	2,559,479	2,559,479	2,559,479	10,237,918	2,559,479	2,559,479	2,559,479	2,559,479	10,237,918
PCB Purchases assuming transition to in-sourcing	2,559,479	2,559,479	2,559,479	2,559,479	10,237,918	2,559,479	852,000	388,186	-	3,799,665
Decrease in purchases from contract manufacturers	-	-	-	-	-	-	1,707,479	2,171,293	2,559,479	6,438,252
Manufacturing costs for Stryker facility										
Materials						-	1,306,515	1,504,869	1,504,869	4,316,253
Variable costs	-		229,600	229,600	459,200	229,600	392,701	523,232	523,232	1,668,764
Fixed costs	252,000	252,000	374,444	374,444	1,252,888	374,444	417,256	535,412	535,412	1,862,524
Total Stryker manufacturing cost	252,000	252,000	604,044	604,044	1,712,087	604,044	2,116,473	2,563,512	2,563,512	7,847,541

Annual Data: 2004–2009

	2004	2005	2006	2007	2008	2009
Projected PCB Purchases under current sourcing	10,237,918	10,237,918	11,773,605	14,363,798	16,518,368	20,152,409
PCB Purchases assuming transition to in-sourcing	10,237,918	3,799,665	-	-	-	-
Decrease in purchases from contract manufacturers	-	6,438,252	11,773,605	14,363,798	16,518,368	20,152,409
Manufacturing costs for Stryker facility	-					
Materials	-	4,316,253	5,745,591	6,922,397	7,960,757	9,712,123
Variable costs	459,200	1,668,764	1,668,927	1,336,177	1,421,416	1,525,709
Fixed costs	1,252,888	1,862,524	2,139,445	2,239,932	2,324,005	2,412,930
Total Stryker manufacturing cost	1,712,087	7,847,541	9,553,963	10,498,507	11,706,178	13,650,762

Source: Stryker Corporation documents and Casewriter estimates.

Exhibit 3 Stryker Corporation—Effect on Accounts Payable, Out-sourcing vs. In-sourcing of PCBs

	2004	2005	2006	2007	2008	2009
Old A/P = 30 days of CM purchases	841,473	841,473	967,694	1,180,586	1,357,674	1,656,362
New A/P = 120 days of 60% of Materials[a]	841,473	851,425	1,133,377	1,365,514	1,570,341	1,915,816
Change in A/P, new vs. old	-	9,953	165,683	184,928	212,667	259,454

Source: Casewriter estimates.

[a]A/P assumed to be the same under both policies during 2004.

Exhibit 4 Stryker Corporation—Contemporaneous Interest Rate Data

Yield (annual %) on Selected US$ Bonds at May 31, 2003

U.S. Treasury Bonds	
1-year	1.18%
5-year	2.52
10-year	3.57
20-year	4.52
Corporate Obligations	
Short-term	
90-day commercial paper	1.19
Long-term	
Moody's Aaa	5.22
Moody's Baa	6.38

Source: U.S. Federal Reserve.