Case Study: The SMB-0 Project

The Sierra Mountainbikes-zero (SMB-0) case study presented below describes a project, which did not perform much risk management or value based software engineering, and therefore had bad poor results. It is described in terms of the assessment portion of an audit report done by a consultant hired to assess the status of the project. The case study is a synthesis of two projects, which between them experienced risk items and problems very similar to the ones described.

Audit Report: SMB-0 Project

This report presents the results of a two week audit of the project. The project was undertaken by Industrial Planning and Control (IPC) Inc., under contract to Sierra Montainbikes (SMB). The report will cover the audit's charter, procedures, findings, and recommendations. In this draft of the report, the recommendations are still to be determined.

Charter

The audit charter was to determine the technical, financial, and management status of the SMB-0 project, to identify problems need solution, and to recommend solutions. The audit was to be performed by one person within a three week period

Procedures

A kickoff meeting was held with Joan Black, SMB's Chief Operating Officer (COO) and acquisition manager for the product; Brown, IPC's project manager for SBM. We agreed on the scope, charter, procedures, and information sources to be used in the audit. Interviews were held with five remaining IPC project personnel, one previous project member, and three SMB personnel. Documents reviewed included the contract, project plans, and SMB-0 specifications, plus selected portions of the code listings, user documentation, and accounting records.

Findings

The audit findings are summarized in a project background, a project chronology, and a project status assessment.

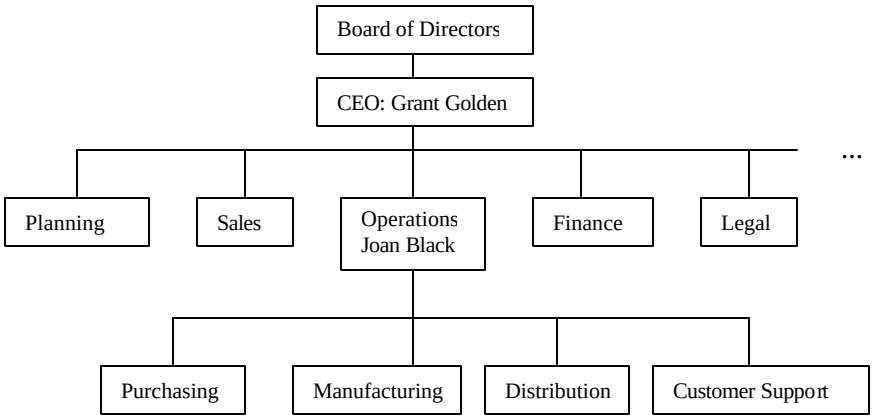
<u>Project background:</u> SMB has an outstanding reputation for high quality in their specialty area of mountain bicycles. For the year 2000, SMB had annual sales of $60M and a 25% market share in the mountain bicycle specialty area, which was growing at a rate of 10% per year. In the process of developing a new Customer Relations Management (CRM) system, SMB found that its distributors and customers were extremely dissatisfied with SMB order processing systems. Distributors encountered many significant delays and mistakes; poor synchronization between order entry, confirmation, and fulfillment, and disorganized responses to problem situations.

SMB had evolved a response to this situation based on the talents of these talented expediters called the Three Rainmakers. When an order crisis developed, they could rapidly diagnose the problem and arranged expedited treatment, particularly Grant Golden, SMB's chief Executive Officer (CEO). Unfortunately, the effects of the Three Rainmaker's inventions was to further destabilize the standard order processing and fulfillment system and bring about further delays, mistakes, and crises.

Consultant Findings: Grant Golden, a decisive CEO with a sales background, decided that the time had come for a major transformation of SMB's manufacturing and supply chain operations. He heard a lot about Lean Manufacturing, Six Sigma, Zero Defects, Total Quality Management, and other industry transformation trends. In the spring of 2001, he engaged Bobby Blue, an industrial transformation consultant coming off a successful engagement with a ??? appliance mass manufacturer, to prepare an industrial transformation into Lean Manufacturing and supply chain management for SMB.

In his report and presentation delivered on June 15, 2001, Bobby Blue confirmed that the Three Rainmakers were causing more problems than they were resolving, and recommended phasing them into sales careers. He also found that a major source of the problems was the number of operational stovepipes making coordination difficult at the SMB corporate level amount the Operations, Sales, Finance, Legal, and Planning people; and within Operations among the Purchasing, Manufacturing, Distribution, and customer support people (see Figure 1).

The recommended a transformation into a near-zero defect and delay supply chain management system called SMB-zero (SMB-0). The recommendation included outsourcing the development of the SMB-0 software to the most cost-effective of eight leading supply chain in software developers; and a corporate restructuring effort to create and empowers Integrated Product Teams (IPT's) to bring the organizational stovepipes. From his small-appliance experience, he felt that a software Initial Operational Capability (IOC) could be developed for about $1 million within a year.



Executive Commitment At the end of the briefing, Grant Golden said, "let's do it. We need to get rid of these problems as soon as possible and push our market share up and our operations cost down. Joan, you work with Bobby to put together a Request for Proposals (RFP) for a full supply chain management and customer relations management system. I'd like the RFP ready to go in a month and a new system within a year. While you're doing that, I'll start setting up the Integrated Product Teams."

Project chronology: Joan Black and Bobby Blue scheduled one month to prepare the RFP, one month for proposal response, one month for source selection, and nine months for software development, as follows:

July 15, 2001: RFP
August 15, 2001: Proposal due
September 15, 2001: Project go-ahead
June 15, 2002: Product delivery

The competition (July-September 2001): Five companies responded to the RFP. Three more declined to bid, saying that nine months was insufficient time to develop the amount of software specified for a specialty-area supply chain. Two of the five bidders were clearly not qualified to do the job, and one company's price was much higher (over $2 million) than the two remaining bidders, IPC and Supply Solutions. , Inc., each of which bid around $1100k. SMB asked these two companies to submit a Best and Final Offer.

George Green, IPC's president, felt that the SMB job was a key win for his company. Industrial Planning and Control began as a developer of industrial process control systems using sequential requirements-first "waterfall" software processes, and had used this experience to expand into traditional manufacturing planning and control systems. Green was trying to move the company more toward integrating large commercial-off the shelf (COTS) software packages for Enterprise Resource Planning (ERP) system for manufacturing, accounting, and inventory control; Advanced Planning and scheduling (ASP) systems and Transportation Management System (TMS) into Lean Manufacturing Supply Chain Systems. He had set up a Research and Development (R&D) branch and hired some lean manufacturing and automated-agent software people to expedite the transition. He needed a real supply chain project to gain experience and establish credentials in this new area. Also, some of his systems programmers needed some contract coverage for their salaries.

As a result, IPC's Best and Final Offer proposed even more functionality than requested by SMB, reduced the price to $900k, and still committed to deliver the product in nine months.

This bid was so much more attractive than Supply Solutions bid that SMB accepted at once. Final contract negotiations ($900k, fixed price) went smoothly, and work commenced on September 15, 2001)

Project startup (September-October 2001): Ten people were assigned to the SMB project. The two key people were:

- Bill Brown, the project manager, came from an industrial process control and manufacturing control waterfall-development background. He had some familiarity with ERP systems and the new SMB CRM system, but no experience with APS and TMS systems

- Karen Gray, the deputy project manager, came from the IPC R&D branch. In her previous jobs, she led development promising advanced prototype of next-generation ASP and TMS systems which constraints-based planning capabilities, but she had not developed production-grade products before.

Brown and Gary had significantly different ideas as to how SMB-0 should operate. Brown wanted to adopt SMB's ERP and CRM systems and use a waterfall approach to gather user requirements, followed by sequential design and coding of the APS and TMS capabilities. Gray pointed out the size of representative APS and TMS packages, and said it would be impossible to develop that much software in the time available. She recommended involving SMB's key personnel, distributors, and suppliers in evaluating and selecting best-of-breed commercial APS and TMS packages and integrating them with the ERP and CRM systems. All ten of the project personnel gravitated forward discussing and researching this issue, every with some cost/schedule model results indicating a low probability of Brown's approach meeting the project budget and schedule.

After about a month, Brown felt he needed to get the other oparts of the project moving along, and agreed to the best-of-breed APS and TMS suppliers approach. But in the interests of time, he decided not to involve the SMB people, distributors, and suppliers in the selection process.

Early Success and Emerging Problems (October 2001 – February 2002): The best-of-breed suppliers were chosen based on demonstrations of their capabilities. The demos were shown to George Green and Joan Black, who were suitably impressed. Unfortunately, the distributed-database APS, the event-based TMS, and the central-database ERP system had severe architectural mismatch problems. They had incompatible graphic user interfaces (GUIs), incompatible agent protocols, and incompatible object request broker interfaces; and each presumed to own and independently modify the master event list> It took a while to find this out, because nobody had been preparing test data and test drivers for testing the interaction of the components.

Karen Gray was able to resolve some of the problems with some intelligent connectors, but others remained intractable. After the fifth time that Bill Brown reminded her that this was likely to happen that they should have developed their own APS and TPS, Karen Gray said, "I quit." As the other project members had no experience in dealing with agent protocol incompatibilities, Sam Silver, IPC's agent expert, was brought aboard to this those problems.

Problem interactions (February-April 2002): By mid-March, work was proceeding on the various rescue efforts. Although he didn't have a specific schedule of events, Bill Brown was optimistic that the project's problems were solved, so he continued to report that the project was on schedule.

Unfortunately, there were more problems than the realized, and even further problems were developing. Attempts to modify Karen Gray's intelligent connectors frequently encountered mysterious side effects, so it was decided to leave them as is, and to build wrappers around them. This was harder to do than originally envisioned, and slowed down the performance.

Sam Silver had been experimentally developing a new Agent Coordination Language, and found that it solved some of the agent protocol incompatibilities nicely. When he showed this to a friend working for SMB, the friend was enthusiastic about the result. Silver interpreted this as customers' direction, and started replacing all the agent interactions with his language constructs.

The extent of this redirection was not evident to Bill Brown until mid-April. When he found out about it and discussed it with Silver, he was concerned that it was a much bigger job than Silver could carry out in the time available. But Silver assured him that he could do it, and said that he had to proceed this way because that was what the customer wanted. Brown decided not to make an issue of this with the customer, as he was not eager to discuss other issues with the customer as well.

Brown's main difficulty was in integrating the components of SMB-0. It was taking virtually all of his time and attention. Each set of connectors now existed in several versions, and it was hard to determine which was the right version to use at any given time. Also, there were no interface specifications for the components, so when interface problems occurred, they were hard to diagnose. Worse yet, when an interface problem was identified, there was no incentive for the vendor's to help in fixing it.

IPC's rescue attempt (April-May 2002): By this time, it was late April, and Bill Brown knew that there was no way that his current team could solve their problems and deliver SMB-0 by June 15. So he appealed to George Green, saying that customer wishes had caused IPC to add some new capabilities such as the agent coordination language. These functions would be very valuable to IPC, but they were causing him to have schedule problems with integration. If Green could provide him with four experienced people for six weeks to help with integration, the rest of Brown's team could concentrate on getting their components finished, and he could deliver on schedule.

George Green considered going to SMB to ask for schedule and budget relief to compensate for the added SMB-0 capabilities. Bill Brown recommended against this, saying that there was no written request from SMB for the added features, and the likely result of the request would be a nonproductive delay. Green therefore decided to pull four people off some other IPC projects for six weeks to work on integrating the SMB-0 components.

The four rescuers were capable people, but they knew nothing about SMB-0. There was very little documentation available, and it was generally out of date. So the new people had to spend a great deal of time asking questions of the component developers, with the result that the developers' progress slowed sown even further.

Universal Micros assesses the situation (May-June 2002): By the end of May, it was clear that very little progress had been made, and that a June 15 delivery was impossible. George Green decided to present the strongest situation possible to SMB. He arranged a meeting with SMB at which he:

- Demonstrated the strongest features of Karen Gray's integration of the APS, TPS and ERP systems.
- Presented a summary of the added SMB-0 capabilities requested by SMB personnel
- Stated that by June 1, IPC could deliver a package of software that literally satisfied the rather loose terms in the contract, but said that nobody would be happy with that outcome
- Cited IPC's additional $100K investment in getting SMB-0 to work, and requested another $300K and four months' calendar time from SMB to deliver the full SMB-0 product. He stated that integration was 71% complete, and that he would contribute another $100K to expedite completion.

Joan Black and the other SMB attendees were not at all pleased by this proposal. They had been busy with the internal SMB aspects of the SMB-0 transformation, and had taken IPC's on-track progress reports at face value. They were not impressed with the demo. The wrappers caused intermittent slowdowns. And the occasional off-nominal stimulus would too often produce a "Not Implemented" response.

Even so, Grant Golden was tempted to accept the IPC offer. The SMB personnel were largely prepared for the cutover, although there were serious objections to the SMB-0 product from prospective SMB, distributor, and supplier users. Golden decided to buy information to reduce risk by engaging an external consultant to assess the situation and to evaluate SMB's options. George Green agreed to have IPC fully support the consultant's audit. As a result, the author of this report performed a two-week audit of the SMB-0 project between June 14 and June 29, 2002.