

LEARNING FROM CORPORATE MISTAKES: THE RISE AND FALL OF IRIDIUM

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EXECUTIVE SUMMARY

In mid-1998, Iridium was one of the darlings of Wall Street having more than tripled in stock price in less than a year. Armed with expertise and over 1,000 patents, the company seemed poised to capture first-mover advantage in providing global telephony via a network of low-Earth-orbiting satellites. Additionally, Iridium appeared to have identified an attractive target segment after having screened over 200,000 people, interviewed 23,000 people from 42 countries, and surveyed over 3,000 corporations. Finally, analysts cited the company's experienced top management team as yet another reason Iridium's future was bright.

One year later, however, Iridium's future appeared increasingly bleak. In November 1998, 11 years after engineers developed the concept for Iridium, the company launched its service. By April 1999, however, Iridium had only 10,000 customers and its CEO, Edward Staiano, resigned under pressure. By August 1999 the subscriber base had grown to only 20,000, putting Iridium in breach of its loan covenants.

During the same month, Iridium filed for Chapter 11 bankruptcy, making it one of the 20 largest bankruptcies in U.S. history.

What went wrong? How did Iridium shift from being a leading-edge technological marvel to a billion-dollar business blunder? Why did such a successful, and innovative, company as Motorola seemingly stumble to such a degree? This article attempts to answer these questions. The first part of the article describes the Iridium strategy and the major problems that arose in both its conception and implementation. The second part of the article examines the underlying forces – all common to students of strategy and organization – that make it possible to understand why a series of seemingly apparent blunders were actually made.

THE IRIDIUM CONCEPT

“What it looks like now is a multibillion-dollar science project. There are fundamental problems: The handset is big, the service is expensive, and the customers haven't really been

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*identified.” – Chris Chaney,
Analyst, A.G. Edwards, 1999*

*“Iridium is likely to be some of
the most expensive space debris
ever.” – William Kidd, Analyst,
C. E. Unterberg, Towbin*

Bary Bertiger, a Motorola engineer, first envisioned the idea for Iridium in 1985, after his wife complained she couldn't reach clients via her cell phone from the Bahamas. After the vacation, Bary and two other engineers working at Motorola's Satellite Communications Group in Arizona developed the concept behind Iridium – a constellation of 66 low-Earth-orbiting (LEO) satellites that would allow subscribers to make phone calls from any global location.

Although Bary Bertiger's superiors at Motorola had rejected the Iridium concept, it was no less than Robert Galvin, Motorola's chairman at the time, who gave Bertiger approval to go ahead with the project. Robert Galvin, and later his successor and son Christopher Galvin, viewed Iridium as a potential symbol of Motorola's technological prowess for all to the world to see. To the engineers at Motorola, the challenge of launching Iridium's constellation provided considerable motivation and they continued developing the project that resulted in initial service in 1998 at a total cost of over \$5 billion.

Communications satellites, in use since the 1960s, were typically geostationary satellites that orbited at altitudes of more than 22,000 miles. Satellites at this altitude meant large phones and annoying quarter-second voice delays. Comsat's Planet 1 phone, for example, weighed in at a computer-case-sized 4.5 pounds. Iridium's

innovation was to use a large constellation of low-orbiting satellites (approximately 400-450 miles in altitude). Because Iridium's satellites were closer to earth, the phones could be much smaller and the voice delay imperceptible.

In 1991, Motorola established Iridium Limited Liability Corporation (Iridium LLC) as a separate company. The partner with the largest equity share was Motorola. For its contribution of \$400 million, Motorola originally received an equity stake of 25 percent, and 6 of 28 seats on Iridium's board. Additionally, Motorola made loan guarantees to Iridium of \$750 million, with Iridium holding an option for an additional \$350 million loan.

For its part, Iridium agreed to \$6.6 billion in contracts with Motorola that included \$3.4 billion for satellite design and launch, and \$2.9 billion for operations and maintenance. Iridium also exposed Motorola to developing satellite technology that would provide the latter with significant expertise in building satellite communications systems, as well as perhaps 1,000 patents.

Additionally, toward the late 1990s, some industry observers felt that Motorola had additional incentive to ensure Iridium succeeded – namely, protecting its reputation. Between 1994-1997, Motorola had suffered through slowing sales growth, a decline in net income, and declining margins. Moreover, the company had experienced several previous business mishaps, including a failure to anticipate the cellular industry's switch to digital cell phones, which played a major role in Motorola's more than 50% share price decline in 1998.

Top Management Team

In late 1998, Iridium had what analysts typically described as a very strong top management team, headed up by CEO Dr. Edward Staiano. Prior to joining Iridium in 1996, Staiano had worked for Motorola for 23 years, during which time he developed a reputation for being hard-nosed and unforgiving. During his final 11 years with Motorola, Staiano led the company's General Systems Sector to record growth levels. In 1995, the division accounted for approximately 40% of Motorola's total sales of \$27 billion. In leaving Motorola's payroll for Iridium's, Staiano gave up a \$1.3 million per year contract with Motorola for a \$500,000 base salary plus 750,000 Iridium stock options that vested over a five-year period.

Service Launch

"We're a classic MBA case study in how not to introduce a product. First we created a marvelous technological achievement. Then we asked how to make money on it." – Iridium Interim CEO John A. Richardson, August 1999

On November 1, 1998, after launching a \$180 million advertising campaign and an opening ceremony where Vice President Al Gore made the first phone call using Iridium, the company launched its satellite phone service charging \$3,000 for a handset and \$3-\$8 per minute for calls. The results were devastating. By April 1999, the company had only 10,000 subscribers. Facing negligible revenues and a debt interest of \$40 million per month, the company came under tremendous

pressure. In April, two days before Iridium was to announce quarterly results, CEO Staiano quit, citing a disagreement with the board over strategy. John A. Richardson, an experienced insider, immediately replaced Staiano as Interim CEO.

In June 1999, Iridium fired 15 percent of its staff, including several managers who had been involved in designing the company's marketing strategy. By August, Iridium's subscriber base had grown to only 20,000 customers, significantly less than the 52,000 necessary to meet loan covenants. Two days after defaulting on \$1.5 billion in loans, Iridium filed for Chapter 11 bankruptcy on Friday, August 13, 1999, making it one of the 20 largest bankruptcies in U.S. history. Stunned, company officials and analysts began looking for reasons behind the failure.

Reasons for Iridium's Collapse

Cellular build-out dramatically reduced the target market's need for Iridium's service. Iridium knew its phones would be too large and too expensive to compete with cellular service, forcing the company to play in areas where cellular was unavailable. With this constraint in mind, Iridium sought a target market by focusing on international business executives who frequently traveled to remote areas where cellular phone service wasn't available. Although this market plan predated the rise of cell phones, Iridium remained focused on the business traveler group through the launch of its service. As late as 1998, CEO Staiano predicted Iridium would have 500,000 subscribers by the end of 1999.

One of the main problems with Iridium's offering was that terrestrial cellular had spread faster than the company had originally expected. In the end, cellular *was* available. Due to Iridium's elaborate technology, the concept-to-development time was 11 years -- during this period, cellular networks spread to cover the overwhelming majority of Europe and even migrated to developing countries such as China and Brazil. In short, Iridium's marketing plan targeted a segment -- business travelers -- whose needs were increasingly being met by cell phones that offered significantly better value than Iridium.

Iridium's technological limitations and design stifled adoption. Because Iridium's technology depended on line-of-sight between the phone antenna and the orbiting satellite, subscribers were unable to use the phone inside moving cars, inside buildings, and in many urban areas. Moreover, even in open fields users had to align the phone just right in order to get a good connection. As a top industry consultant said to us in an interview, "you can't expect a CEO traveling on business in Bangkok to leave a building, walk outside on a street corner, and pull out a \$3,000 phone." Additionally, Iridium lacked adequate data capabilities, an increasingly important feature for business users. Making matters worse were annoyances such as the fact that battery recharging in remote areas required special solar-powered accessories. These limitations made the phone a tough sell to Iridium's target market of high-level traveling businessmen.

The design of Iridium's phone also hampered adoption. In November 1997, John Windolph, Iridium director

of marketing communications, described the handset in the following manner: "It's huge! It will scare people. If we had a campaign that featured our product, we'd lose." Yet a year later Iridium went forward with essentially the same product. The handset, although smaller than competitor Comsat's Planet 1, was still literally the size of a brick.

Poor operational execution plagued Iridium. Manufacturing problems also caused Iridium's launch to stumble out of the gate. Management launched the service before enough phones were available from one of its two main suppliers, Kyocera, which was experiencing software problems at the time. Ironically, this manufacturing bottleneck meant that Iridium couldn't even get phones to the few subscribers that actually wanted one. The decision to launch service in November 1998, in spite of the manufacturing problems, was made by CEO Staiano, although not without opposition. As one report put it, "(John Richardson) claimed to be vociferous in board meetings, arguing against the November launch. Neither the service, nor the service providers, were ready. Supply difficulties meant that there were few phones available in the market."

Iridium's partners did not provide adequate sales and marketing support. Although at first Motorola had difficulty attracting investors for Iridium, by 1994 Iridium LLC had partnerships with 18 companies including Sprint, Raytheon, Lockheed Martin, and a variety of companies from China, the Middle East, Africa, India, and Russia. In exchange for investments of \$3.7 billion, the partners received equity and seats on Iridium LLC's board of directors. In 1998, 27 of the 28

directors on Iridium's board were either Iridium employees or directly appointed by Iridium's partners.

Iridium's partners would ultimately control marketing, pricing, and distribution when the service came on line. Iridium's revenues came from wholesale rates for its phone service. Unfortunately for Iridium, its partners, outside the U.S. in particular, delayed setting up marketing teams and distribution channels. "The gateways were very often huge telecoms," said Stephane Chard, chief analyst at Euroconsult, a Paris-based research firm. "To them, Iridium was a tiny thing." So tiny, in fact, that Iridium's partners failed to build sales teams, create marketing plans, or set up distribution channels for their individual countries. As the Wall Street Journal reported, "with less than six months to go before the launch of the service, time became critical...Most partners didn't reveal they were behind schedule."

Financial Impact of the Bankruptcy

At the time of the bankruptcy, equity investments in Iridium totaled approximately \$2 billion. Most analysts, however, considered the stock worthless. Iridium's stock price, which had IPOed at \$20 per share in June 1997, and reached an all time high of \$72.19 in May 1998, had plummeted to \$3.06 per share by the time Iridium declared bankruptcy in August 1999. Moreover, the NASDAQ exchange reacted to the bankruptcy news by immediately halting trading of the stock, and actually delisted Iridium in November 1999. Iridium's partners -- who had also made investments by building ground stations, assembling management teams, and marketing Iridium services -- were left

with little to show for their equity. Iridium's bondholders didn't fare much better than its equity holders. After Iridium declared bankruptcy, its \$1.5 billion in bonds were trading for around 15 cents to the dollar as the company entered restructuring talks with its creditors.

WHAT REALLY WENT WRONG?

Iridium will go down in history as one of the most significant business failures of the 1990s. That its technology was breathtakingly elegant and innovative is without question. Indeed, Motorola and Iridium leaders showed great vision in directing the development and launch of an incredibly complex constellation of satellites. Equally as amazing, however, was the manner in which these same leaders led Iridium into bankruptcy by supporting an untenable business plan.

Over the past several years, there have been perhaps thousands of articles written about Iridium's failure to attract customers and its resulting bankruptcy. Conventional wisdom often argues that Iridium was simply caught off-guard by the spread of terrestrial cellular. By focusing almost strictly on *what happened*, such an analysis provides little in the way of valuable learning. A more interesting question is *why* Iridium's failure happened -- namely, why the company continued to press forward with an increasingly flawed business plan.

Three Forces Combined to Create Iridium's Failure

Three forces combined to create Iridium's business failure. First, an "escalating commitment," particularly among Motorola executives who pushed

the project forward in spite of known and potentially fatal technology and market problems. Second, for personal and professional reasons Iridium's CEO was unwilling to cut losses and abandon the project. And third, Iridium's board was structured in a way that prevented it from performing its role of corporate governance.

Problem 1: Escalating commitment. During the 11 years that passed between Iridium's initial concept to its actual development, its business plan eroded. First, the gradual build-out of cellular dramatically shrank Iridium's target market – international executives who regularly traveled to areas not covered by terrestrial cellular. Second, it became apparent over time that Iridium's phones would have significant design, operational, and cost problems that would further limit usage.

Motorola's decision to push Iridium forward in spite of a deeply flawed business plan is a classic example of the pitfalls of "escalating commitment." The theory behind escalating commitment is based in part on the "sunk cost fallacy" – making decisions based on the size of previous investments rather than on the size of the expected return. People tend to escalate their commitment to a project when they (a) believe that future gains are available, (b) believe they can turn a project around, (c) are publicly committed or identified with the project, and (d) can recover a large part of their investment if the project fails.

Motorola's involvement in the Iridium project met all four of these conditions. In spite of known problems, top executives maintained blind faith in Iridium. To say that Iridium's top management was unaware of Iridium's potential problems would be wholly

inaccurate. In fact, Iridium's prospectus written in 1998 listed 25 full pages of risks including:

- a highly leveraged capital structure
- design limitations -- including phone size
- service limitations -- including severe degradation in cars, buildings, and urban areas
- high handset and service pricing
- the build-out of cellular networks
- a lack of control over partners' marketing efforts

During Iridium's long concept to development time, there is little evidence to suggest that Motorola or Iridium made any appreciable progress in addressing any of these risks. Yet Iridium went forward, single-mindedly concentrating on satellite design and launch while discounting the challenges in sales and marketing the phones. The belief that innovative technology would eventually attract customers, in fact, was deeply ingrained in Motorola's culture.

Indeed, Motorola's history was replete with examples of spectacular innovations that had brought the company success and notoriety. In the 1930s, Paul Gavin developed the first affordable car radio. In the 1940s, Motorola rose to preeminence when it developed the first hand-held two-way radio, which was used by the Army Signal Corps during World War II. In the 1950s, Motorola manufactured the first portable television sets. In the 1969, Neil Armstrong's first words from the Moon were sent by a transponder designed and manufactured by the company. In the 1970s and 1980s, Motorola enjoyed success by developing and manufacturing microprocessors and cellular phones.

By the time it developed the concept for Iridium in the early 1990s, Motorola had experienced over 60 years of success in bringing often startling new technology to consumers around the world. Out of this success, however, came a certain arrogance and biased faith in the company's own technology. Just as Motorola believed in the mid-1990s that cellular customers would be slow to switch from Motorola's analog phones to digital phones produced by Ericsson and Nokia, their faith in Iridium and its technology was unshakable.

Problem 2: Staiano's leadership was a double-edged sword. Dr. Edward Staiano became CEO of Iridium in late 1996 – before the company had launched most of its satellites. During his previous tenure with Motorola, Staiano had developed a reputation as intimidating and demanding – imposing in both stature, at 6'4", and in temperament. Staiano combined his leadership style with an old Motorola ethic that argued leaders had a responsibility to support their projects. Staiano also had significant financial incentives to push the project forward, rather than cutting losses and moving on. In both 1997 and 1998, he received 750,000 Iridium stock options that vested over a five-year period. Indeed, this fact didn't escape Staiano's attention when he took the CEO position in late 1996, stating: "If I can make Iridium's dream come true, I'll make a significant amount of money."

Ironically, the demanding leadership style, commitment to the project at hand, and financial incentives that made Ed Staiano such an attractive leader for a start-up company such as Iridium turned out to be a double-edged sword. Indeed, these same

characteristics also made him unwilling to abandon a project with a failed business plan and obsolete technology.

Problem 3: Iridium's board did not provide adequate corporate governance. In 1997, Iridium's board had 28 directors – 27 of who were either Iridium employees or directors designated by Iridium's partners. The composition, not to mention size, of Iridium's board created two major problems. First, the board lacked the insight of outside directors who could have provided a diversity of expertise and objective viewpoints. Second, the fact that most of the board was comprised of partner appointees made it difficult for Iridium to apply pressure to its partners in key situations -- such as when many partners were slow to set up the necessary sales and marketing infrastructure prior to service launch. In the end, Iridium's board failed to provide proper corporate oversight and limited Iridium's ability to work with its partners effectively.

LESSONS LEARNED

Executives Should Evaluate Projects such as Iridium as Real Options

Projects with long concept-to-development times pose unique problems for executives. These projects may seem like good investments during initial concept development; but by the time the actual product or service comes on line, both the competitive landscape and the company's ability to provide the service or product have often changed significantly.

To deal with long concept-to-development times, executives should evaluate these projects as real options. A simple model would be a two-stage project. The first stage is strategic in

nature and provides the opportunity for a further investment and increased return in the second stage. When the initial stage is complete, however, the company must reevaluate the expected return of future investments based on a better understanding of the product/service and the competitive landscape.

Iridium is a textbook example of a project that would have benefited from this type of analysis. The Iridium project itself essentially consisted of two stages. During stage one (1987 to 1996), Motorola developed the technology behind Iridium. During stage two (1996-1999), Motorola built and launched the satellites – and the majority of Iridium’s costs occurred during this part of the project.

Investment in R&D for Iridium was Appropriate – Follow-on Investment Was Not

Looking back, it would be unfair to assert that the initial decision to invest in R&D for Iridium was a mistake. In the late 1980s, Iridium appeared to have a sound business plan. Travel among business executives was increasing and terrestrial cellular networks didn’t cover many of their destinations. It was certainly not unreasonable to foresee a large demand for a wireless phone that had no geographic boundaries. In turn, the investment in R&D was reasonable as it provided the option to deploy (or not deploy) the complex Iridium satellite system 9 years later.

By 1996, however, when Iridium had to make the decision of whether to invest in building and launching satellites, much had changed. Not only had the growth in cellular networks drastically eroded Iridium’s target market, but Iridium’s own technology

was never able to overcome key design, cost, and operational problems. Put simply, Iridium didn’t have a viable business plan. Armed with this additional insight, a reasonable evaluation of the project would have precluded further investment.

Executives Must Build Option Value Assessments into their Business Plans

The key to using the option value approach is to include it in the business plan. Specifically, executives must specify *a priori* when they will reevaluate the project and its merits. During this evaluation, the company should objectively evaluate updated market data and its own ability to satisfy changing customer demands. The board of directors plays a key role in this process by making sure that inertia doesn’t carry a failed project beyond its useful life. This is particularly important when company executives have ancillary reasons, such as concerns about personal reputation or compensation, to press forward in spite of a flawed business plan.

Top executives were publicly committed to, and identified with, Iridium. Just as important as its financial investment in Iridium was Motorola’s psychological investment in the project. Motorola’s chairmen, Robert Galvin and later his son Christopher Galvin, publicly expressed support for Iridium and looked to it as an example of Motorola’s technological might. Indeed, it was Robert Galvin, Motorola’s chairman at the time, who first gave Bary Bertiger approval to go ahead with Iridium, after Bertiger’s superiors had rejected the project as being too costly. In the end, both Galvins staked much of Motorola’s

reputation on Iridium's success and the project provided Motorola and the rest of its partners with a great deal of cache.

Costs of Risky Projects can be Reduced Via Opportunities for Contracting and Learning

Motorola did gain important benefits from its relationship with Iridium. In fact, Motorola signed \$6.6 billion in contracts to design, launch, and operate Iridium's 66 satellites, and manufacture a portion of its handsets. David Copperstein of Forrester Research described Motorola's deal with Iridium as "a pretty crafty way of creating a no-lose situation." Other analysts were less complimentary: "That contract (Motorola's \$50 million a month agreement with Iridium to provide operational satellite support) is absurdly lucrative for Motorola," said Armand Mussey, an analyst who followed the industry for Banc of America Securities, "Iridium needs to cut that by half."

These contracts – while lucrative – also gave Motorola an incentive to push Iridium forward regardless of its business plan. Even if Iridium failed, Motorola would still generate significant new revenues along the way. In quantifying the importance of Motorola's contracts with Iridium, in May 1999 Wojtek Uzdelewicz of SG Cowen estimated that Motorola had already earned and collected \$750 million in profits from its dealings with the company. Based on these offsetting profits, he placed Motorola's total exposure in Iridium to be between \$1.0-\$1.15 billion – much less than many observers realized.

Further, Iridium would ultimately expose Motorola to developing satellite technology and the patent protection that

came with it. This exposure came at a time when Motorola was interested in entering the satellite communications industry beyond Iridium, in projects such as Craig McCaw's Teledesic – a \$9 billion project consisting of a complex constellation of low-Earth-orbiting (LEO) satellites designed to provide global high-speed Internet access.

Strategic Leadership of CEOs and Boards Can Make, or Break, Strategic Initiatives

In an era where executive compensation is dominated by stock options, the Iridium story should give pause to those who see only the benefits of options-based pay. Financial incentives are extremely powerful, and companies that rely on them for motivation must be particularly careful to consider both intended and unintended consequences. Would CEO Staiano have been more attentive to the numerous warning signs with Iridium if stock options didn't play such a large role in his compensation package? The heavy emphasis on options gave Staiano an incentive to persist with the Iridium strategy; it was the only opportunity he had to make the options pay.

The lessons of the board of directors at Iridium are just as stark. Surely few boards can operate with 28 members, most representing different constituencies surely holding different goals. That all but one board member was a member of the Iridium consortium similarly speaks volumes about the vigilance of the board in fulfilling its oversight function. Actually, this type of board, consisting as it does of representatives of investors, is becoming more common in high-technology startups. Companies like General

Magic, Excite At Home, and Net2Phone have all had multiple investors, typically represented on the board, and not always agreeing on strategic direction. In fact, General Magic's development of a personal digital assistant was severely hampered by its dependence on investors such as Apple, Sony, IBM, and AT&T. With Iridium, the magnitude of the ancillary contractual benefits Motorola derived from Iridium appear rather out-sized given Iridium's financial condition. An effective board should be simultaneously vigilant and supportive, a tall order for an insider-dominated, multiple-investor board.

Conclusion

What is fascinating about studying cases like Iridium is that what look like seemingly incomprehensible blunders are really windows into the world of managerial decision-making, warts and all. In-depth examinations of strategy in action can highlight how such processes as escalating commitment are real drivers of managerial action. When organizational stumble, observers often wonder why the company, or the top management, did something so "dumb". Much more challenging is to start the analysis by assuming that management is both competent and intelligent and then ask, why did they stumble? The answers one gets with this approach tend to be at once both more interesting, and revealing. Students of strategy and organization can surely benefit from such a probing analysis.

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implementation, and the resulting bankruptcy. One of the best overviews of the entire project can be found in Steve Frank's analyst report at Morgan Stanley Dean Witter, "Iridium World Communications: A New Shoe for 'Get Smart!'," March 18, 1998 (http://www.bschool-investext.com/PDF/INV/105925_2644871.pdf). An excellent article outlining the contractual benefits Motorola derived from Iridium is in a piece by Ida Picker in the *Seattle Times* called, "Despite Stunning Failure, Motorola Wins", October 24, 1999. Joanna Glasner, a writer at *Wired News*, wrote several insightful articles, including "Iridium: Edsels in the Sky?", May 10, 1999 and "A Buyer for Iridium?", December 3, 1999. Finally, a terrific piece on Iridium's technological arrogance appears in L. Cauley, "Losses in Space – Iridium's Downfall," *Wall Street Journal*, August 18, 1999, A1.

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focus on best practices and organizational successes, there are several interesting articles on corporate failure and mistakes. Perhaps the largest body of work comes out of the organizational learning framework, and includes C. Argyris, "Double Loop Learning in Organizations," *Harvard Business Review*, 1977, 55, 115-125; D. A. Levinthal and J. G. March, "The Myopia of Learning," *Strategic Management Journal*, 1993, 14, 95-112; and S. B. Sitkin, "Learning Through Failure: The Strategy of Small Losses," in B. M. Staw and L. L. Cummings (Eds.), *Research in Organizational Behavior*, 1992, 14, 231-266 (Greenwich, CT: JAI Press). Other good sources include J. E. Russo and P. J. Schoemaker's *Decision Traps* (New York: Doubleday, 1989) (on decision-making failures) and C. M. Christensen's *The Innovator's Dilemma* (Boston: Harvard Business School Press, 1997) (on innovation failures). Finally, the first author of this article is currently working on a new book on corporate mistakes that will be published in 2003.