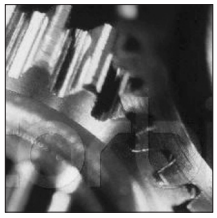

# case ten

# EMI and the CT Scanner [A] and [B]

## Teaching Note

### Synopsis

In 1971, EMI Ltd., a British music, consumer electronics, and defense company, announced that it had developed a revolutionary medical diagnostic device, the CT scanner. Computerized tomography is an important advance in diagnostic imaging that allows 3D images of the human body to be produced. The EMI CT scanner links together X-ray technology and computer imaging technology in a machine that creates 3-D images of the human head on a computer screen. The [A] case describes the situation at EMI in 1972. EMI has displayed prototypes of the CT scanner and radiologists throughout the world – but particularly in the US – are clamoring to use the device. EMI is faced with the critical decision of how it will develop, manufacture, market, and service its CT scanner. Medical electronics is an entirely new area of business for EMI and to exploit the CT scanner it must enter the US where it has little prior experience. There is considerable uncertainty at EMI as to the likely size of the market for CT scanners and what is the best entry strategy for EMI.

The [B] case outlines the situation facing EMI 5 years later. The scanner has been a massive success: demand has exceeded EMI's most optimistic expectations, and margins on the product are highly attractive. Yet EMI is facing a number of problems. A variety of manufacturing, quality, and supply chain problems have meant that EMI has been unable to meet demand, and waiting times are lengthening. At the same time, competition has emerged surprisingly quickly: 12 companies are developing or have developed CT scanners, including GE, which is the giant of

This note was prepared by Robert M. Grant. It draws upon *EMI and the CT Scanner: Teaching Note*, HBS Case No. 5-384-030, Harvard Business School Publishing, 1983.

diagnostic medical imaging in the US. Moreover, GE threatens to leapfrog EMI in technology by moving to a third-generation CT scanner that is much faster than the EMI second-generation machine. In the midst of these problems, disagreement has broken out between EMI's UK and US medical subsidiaries over the allocation of responsibilities between them and the technological development of EMI's scanners. EMI must decide how it will respond to the competitive challenges that it faces in the rapidly evolving market for CT scanners, while addressing the internal problems that are cramping its ability to respond to the huge opportunities of this market.

## TEACHING OBJECTIVES

Why do I use a case that is nearly 20 years old and relates to a situation that existed before many of my students were born? Because this is a fabulous case for exploring the management of innovation and gaining understanding of the rapid evolution that occurs in new markets and the implications that this has for strategy and competitive advantage.

The two parts of the case allow two sets of issues to be examined:

- The [A] case allows students to recognize the alternative strategies for exploiting an innovation and to analyze the factors that determine the attractiveness of each alternative.
- The [B] case offers insight into the processes and characteristics of industry evolution in technology-driven markets, the shifting basis of competitive advantage, and the need for companies to broaden and deepen their organizational capabilities.

## POSITION IN THE COURSE

I usually set aside two or three classes in my strategy courses for dealing with strategy in technology-based industries. I typically use EMI [A] and [B] as my introductory case. Despite its age, I find this case highly suitable for exploring the issues of managing innovation and managing change in fast-paced technology-based industries – its lessons are readily applicable to contemporary situations, whether in electronics, computer software, biotechnology, or health sciences.

I typically cover both [A] and [B] cases in a single class.

## ASSIGNMENT QUESTIONS

A Case: Evaluate EMI's strategy to enter the market for CT scanners. Should EMI develop a wholly owned new business to produce and market the CT scanner, or should EMI exploit its scanner innovation by licensing to other firms? What other strategic options are available to EMI and how attractive are they?

B Case: What problems does EMI's medical electronics business face in 1977? What should Powell do?

## READING

R. M. Grant, *Contemporary Strategy Analysis* (5th edn), Blackwell Publishing, 2005, chapter 10, which looks at "Industry Evolution," and chapter 11 on "Technology-based Industries and the Management of Innovation."

## CASE DISCUSSION AND ANALYSIS

### [A] Case

I focus very heavily upon a single issue: what are the strategy options available to EMI? What are the criteria we should use in assessing the attractiveness of each of these options? From the students' input I create a table on the board that shows strategy options and key choice criteria. I typically end up with something like that shown below:

| | LICENSE | OUTSOURCE CERTAIN FUNCTIONS | JOINT VENTURE | ACQUISITION | INTERNAL COMMERCIALIZATION ("GO-IT-ALONE") |
|---|---|---|---|---|---|
| *Control* | V. weak | Moderate | Moderate | Strong | V. strong |
| *Appropriability* | Depends on patent position. Probably weak | Strong | Moderate (some risks) | Strong | Strong |
| *Time-scale of returns* | If EMI not directly involved in manufacture and marketing, continuous innovation difficult | Potentially long-term returns if EMI can build a strong global market position before competitors can get established. Such a base would allow EMI to continuously innovate in scanners and diversify in medical electronics | | | |
| *Speed in accessing the market* | Potentially fast, but concerns that "licensees might not promote the scanner aggressively" | If distribution, marketing, and servicing outsourced (possibly manufacture too), rapid global penetration possible | Depends upon success of collaboration – JV with established X-ray co. could speed build-up of manufacturing, sales, and service capabilities | Acquiring existing producer of X-ray equipment should facilitate global rollout | Probably slow – EMI has to put it all together from scratch |
| *Dependence on complementary resources* | Low – only needs the innovation | Relieves EMI of need to set up downstream facilities in every country | EMI can draw upon partners' resources and capabilities – but EMI needs JV management skills | EMI can acquire existing resources and capabilities – but also needs to integrate them | Requires resources and capabilities across the full range of business functions |
| *Other issues* | Doesn't meet EMI's objective of "major strategic diversification" | | By acquiring or partnering with an existing X-ray producer, EMI neutralizes a potential competitor | | Probably the highest-risk option – requires heaviest investment, and greatest challenge for senior management |

Alternatively, it may be easier simply to list the advantages and disadvantages of each strategic option:

| | ADVANTAGES | DISADVANTAGES |
|---|---|---|
| *License* | Investment requirements low – risks low | Doesn't achieve EMI's strategic goal of building a new business |
| | If EMI doesn't possess the complementary resources needed to exploit its scanner, then licensing, though unsatisfactory, may be the best it can do if it is unable to acquire the resources and capabilities needed to secure competitive advantage in this area of business | Not clear that this permits EMI to appropriate the potential value of its invention:<br>– patent position weak: risk that potential licensees will simply copy without buying licenses<br>– uncertainty over the market potential<br>– lack of commitment by established suppliers of X-ray equipment may result in inability to realize the full potential |
| *Alliance* | May combine the benefits of the other two options. In particular, allows EMI to directly exploit its existing invention while permitting it to continue R&D in this field, and while also giving EMI access to the existing manufacturing, sales, service resources and capabilities of an established player. May also "neutralize" a potential competitor | Does EMI have the capabilities to manage a JV or other form of alliance? Danger that the partner will use the alliance to learn EMI's technology, then will abandon EMI to pursue independent development of its scanner business |
| *Go-it-alone* | Should maximize EMI's potential profit margin from the invention if it is a commercial success. If EMI wishes to diversify, then:<br>– medical electronics looks an attractive industry (growth, limited buyer power, modest price competition, high margins)<br>– EMI is entering with a unique, innovative product which should put it in a strong position in this market. Initial investment quite small | The riskiest option. Will require, ultimately, a big investment if EMI is to establish itself as a global supplier of medical diagnostic equipment. EMI doesn't possess the resources and capabilities needed to compete in this business in the long run. If the patent position is weak, then EMI can expect rivalry. In that case, competitive advantage will depend not just on technology, but on complementary resources (e.g., manufacturing facilities/capabilities, marketing capabilities, sales and service network). EMI's other businesses (records, defense electronics, some consumer electronics) do not suggest much hope for EMI to transfer these capabilities over. Also, the critical market is the US where EMI lacks experience |

Once the alternative options appear – of which the extremes are to "go-it-alone" or to license – a lively discussion of the relative merits of each typically ensues. Two of the key issues in this are:

1. *The patent position.* The case implies that the patent position is weak – EMI itself only envisages "3 or 4 years" before competitors appear. However, there is much uncertainty concerning the protectiveness and defensibility of the patents. The case hints that since the CT scanner assembles existing

technologies, patents may be weak. However, much is likely to depend upon how aggressively EMI defends its patents.

2. *EMI's existing resources and capabilities.* CT scanners involve a major step into the unknown for EMI. In particular:
   - EMI must operate in the US market.
   - Most components and subassemblies are outsourced – a new mode of manufacturing for EMI.
   - The CT scanner would require an extensive geographical network of service engineers – EMI had no experience of such a system.
   - EMI knows little of the healthcare market.

EMI may also need a multiphase strategy. Perhaps it needs to develop the scanner business itself in the initial stages – if only to reveal to the world the market and financial potential of the innovation. After this it perhaps needs to seek a partner in order to scale up.

## [B] Case

The B case moves us forward in time from March 1972 to early 1977; during this 5-year period big changes have occurred. Most importantly, the EMI scanner has been more successful than even its most optimistic champions imagined.

I typically start off by asking the students: "How has EMI's medical electronics business been performing?" The immediate answer is: "Very well." A brief perusal of EMI's financial statements shows that the medical electronics business earned a profit margin on sales of 30 percent. To achieve this kind of return after a new product has been on the market for only 4 years and while sales are growing at over 100 percent a year is pretty good! However, it is also clear that not everything is looking fine. EMI is faced with a number of current problems and several more are looming on the horizon. It's best to divide these into internal and external problems.

### *1. Internal problems*

The most pressing problems are internal.

- EMI's manufacturing performance is dire. It cannot satisfy demand and waiting lists are long – the risk is that EMI is squandering its first-mover advantage by creating an opportunity for rivals. These manufacturing problems include poor supply chain management, poor quality management.
- Disagreement between the US and UK subsidiaries. This seems to be less to do with national differences than with reflecting the functional orientation of each: the US side is sales and marketing oriented and sees EMI as failing to understand or serve the market. The UK side is technology driven – mainly by Houndsfield's vision.

What are the sources of these problems? I ask students if interfunctional and international disagreements are unusual in companies. The answer, of course, is no – such rivalries and disagreements are an everyday part of organizational life. What is different about EMI is that it appears to lack the leadership and the organizational coordination needed to resolve these differences:

- *The leadership problem.* EMI's medical electronics business is run by a *committee* – these committee members represent their own constituencies. *Not a leadership form for effectively resolving internal disputes.* Real leadership is provided by Powell – *but he is the CEO of the whole corporation.*
- *Organizational structure a mess.* If students have difficulty articulating the problems with EMI's organizational structure, I ask them to refer to the organizational chart in figure 10.4 of the Casebook. There are separate US and UK medical electronics subsidiaries each reporting to the corporate HQ. R&D is located in neither but in the corporate R&D lab. Who is the head of EMI Medical worldwide? Basically it is the CEO, Powell, who also has EMI's other divisions (defense, music, and consumer electronics) reporting to him. As we see above, coordination between the different medical businesses is achieved by CEO intervention and through the forum of the medical committee comprising representatives of the different subsidiaries. Yet, medical electronics is clearly a global business – major scale economies and little need for national product differentiation. Without a single worldwide medical electronics division it is difficult to see how the various internal conflicts can be successfully resolved.

## 2. External problems

- *The market.* The immediate threat is the introduction of "certificate of need" licensing. However, even without this there must be concern over the continued growth in the market. Despite the wide disparity of market forecasts, the basic reality is that there are only 3,600 hospitals with more than 100 beds in the US. While the US was only 35–40 percent of the world market for X-ray equipment, it was likely that market penetration elsewhere would develop at a much slower pace. With so many new competitors with a combined capacity of around 900 units annually, it seems that the US market is heading for saturation irrespective of federal government regulation of hospital purchases of CT scanners.
- *Competition.* Longer term this seems to be the critical consideration. So far EMI is doing great – high margins, strong revenue growth, great cash flow. So long as it was the only supplier of CT scanners, it could prosper despite horrendous internal problems. But the remarkable speed of entry signals the emergence of a new stage in the competitive game. By December 1976, the case notes that there were 16 companies exhibiting CT scanners with combined capacity of around 900 units per year. Again, with a US market

potential of less than 4,000, over 500 already installed, and product capacity of 900 units or more, it would seem that, unless there is rapid market growth outside of the US, the industry is headed for a period of intense competition. Moreover, several of these competitors looked a real threat to EMI – several threaten not just to undercut EMI on price, but also to leapfrog it on technology.

### *3. The threat from GE*

Delving a little further into the issue of competition, I ask: "Are there any competitors that EMI should be particularly worried about?" The obvious answer is: "GE" (because of its huge size and resources and the fact that it has already developed a third-generation, fan-beam scanner). To understand the extent to which EMI is threatened by GE's entry, let us compare the two companies' resources and capabilities:

| | EMI | GE |
|---|---|---|
| Technology | The pioneer. Houndsfield the key technological resource | Introducing third-generation, fan-beam scanner. Leader in medical electronics generally, plus strong in all the constituent technologies: semiconductors, X-rays, computers |
| Financial resources | Corporate sales approx. $1.2 billion. Erratic cash flows | One of the world's largest companies. Corporate sales approx. $16 billion. Exceptional financial strength |
| Manufacturing | Limited experience. Gaining expertise slowly | A world leader in manufacturing medical electronic equipment |
| Sales | 20 sales personnel in US | 300 sales personnel in US |
| Service | 20 service centers. 150 engineers – 91 to every two or three machines (= high cost) | 1,200 service engineers. Able to spread costs over wide range of diagnostic equipment (= economies of scope) |
| Reputation | Strong reputation in CT scanners, especially among radiologists and radiographers. Poor reputation for customer service | Well known in medical electronics. Strong corporate reputation |
| Installed base | 650 machines worldwide, of which 500+ in the US. Dominant share of installed base | None |

## Recommendations

The key to developing an effective action plan for EMI is to gain some time perspective on the issues. In the short run, EMI is facing a number of acute internal problems – with regard to operations, organization, leadership, and development

choices. These need to be addressed quickly. Indeed, working on these is essential whatever the longer term strategy for EMI is. For example, the internal mess needs to be sorted out even if EMI is to sell its medical business.

At the forefront of these issues is the division of responsibility between the US and UK subsidiaries. Northbrook, currently assembling scanners, is seeking to source within the US. Given the limits on the UK production capacity, this may make sense; however, there is some risk that this could lead to differentiation between US-built and UK-built scanners. Generally, the US (world leader in medical electronics) looks a better manufacturing base for CT scanners. On the development side, the issue is complex – the danger is that, if Northbrook is given development responsibility, this will lead to costly duplication.

At the organizational level, a worldwide medial electronics division, with a capable divisional CEO, is essential.

Looking beyond the immediate short-term period, the basic issue is whether EMI stays in the business or gets out. The critical issue is whether EMI can compete with GE over the long term. If there are doubts over this then EMI needs to exit, possibly seeking to sell its business to one of the established X-ray companies (possibly Philips or Siemens, or maybe Picker).

If EMI is to stay in the business, then the students must articulate what EMI needs to do in order to upgrade its manufacturing, improve its supply chain management, stay abreast of technological development, defend its patents, improve its customer service, and combat regulation in the US. This may involve an alliance or joint venture with an established supplier.

In between these two extremes is the possibility that EMI might spin off its medical business; possibly selling significant equity stakes to one or more existing medical electronics companies.

## The Aftermath

Following the end of the B case in 1977, events moved swiftly for EMI:

- EMI establishes third generation as a priority. Responsibility given to US subsidiary.
- R&D expenditures mount; project delayed; Houndsfield and team fly out to US to assist.
- "Certificate of need" introduced.
- Demand peaks in 1977; rapid decline in US sales of CT scanners in 1978–80.
- Prices fall rapidly; several competitors exit.
- Losses at EMI Medical threaten solvency of EMI as a whole.
- EMI merges with Thorn to form Thorn-EMI.
- 1980: Thorn sells EMI Medical to GE for £20 million; Houndsfield receives Nobel prize for medicine.

## ISSUES ARISING

### [A] Case

The central issue is: what is the optimal strategy for exploiting an innovation?

- Identifying the range of alternative strategies.
- Selecting the optimal strategy: matching the resource/capability requirements of the strategy to the resources and capabilities possessed by the firm.

### [B] Case

- The process of industry evolution:
  - changes in industry structure;
  - changes in competition and key success factors;
  - implications for the resources and capability that the firm must develop.
- The need for dual strategies:
  - exploiting existing resources and capabilities to compete in today's market;
  - developing the resources and capabilities needed to compete in the future.
- First-mover vs. follower advantage:
  - In this case the follower (GE) won;
  - What determines the relative advantages of first movers and followers?
- Organizational structure and organizational capability – to what extent are capabilities dependent upon an appropriate organizational structure?