Strategic Innovation through Business Intelligence: Linking Competitive Forces to Profitability

James K. Ho

Abstract—**We show how Porter's five forces that shape competitive strategies can be linked directly to long term profitability of industries, as measured by the return on invested capital. Illustrative cases from the Book Publishing and Luxury Cruise industries are used to demonstrate the linkage. The complete functional linkage was established with a 33-industry data base. As the five forces framework has become a staple approach to strategic analysis, playing a key role in both business practices and academic studies, this quantitative linkage to profitability provides analysts a powerful tool to evaluate their business propositions based on their subjective rating of the competitive forces involved. Of even greater potential is the prospect of a systematic exercise to train managers in innovative strategies through business intelligence, by benchmarking businesses facing like forces outside of one's industry, rather than conventional practices within one's own.**

Index Terms—**Strategic innovation, competitive forces, return on invested capital.**

I. Introduction

In Porter's framework of five competitive forces that shape strategies, one gets the general sense that the stronger the forces, the more difficult it is for an industry to stay profitable. In the most recent update [1], data on the return on invested capital (ROIC) was compiled for 31 industries from 1992-2006 as shown in Figure 1. However, there is no successful attempt to date to link such profitability measures directly to the competitive forces. We show that such a correlation can indeed be established. Specifically, if the five forces facing a particular industry are rated on some scale of, say, from 1 to 5, with 5 being the strongest, then the average ROIC for the industry from 1992-2006 is given by a multi-linear function of these force ratings. The closeness of fit is such that 98% of the variations in the data can be explained by this functional relationship.

A. Competitive Forces and Profitability

As the five forces framework has become a staple approach to strategic analysis, playing a key role in both business practices [2] and academic studies [3], our quantitative linkage to profitability provides analysts a powerful tool to estimate profitability of their business situations based on their subjective evaluation of the competitive forces involved. For example, in the case where a manager has determined that the five forces: competition among existing players, threat of substitutes, power of sellers, power of buyers, and threat of entry are rated 5, 4, 3, 4, 2, respectively, our function returns a ROIC of 13.4%.

Much as we can claim a remarkable closeness of fit, our function formally relates generic forces facing entire industries to their average profitability over a relatively long term of 14 years. Any application should be considered in such context. Therefore, continuing with our example, it may be most useful for our manager to realize that 13.4% can be the expected long term ROIC for the industry on hand, or the status quo. If he or she is actually contemplating a strategy that would reduce the rating of power of buyers from 4 to 2, for instance, the ROIC will improve to 16.7%. This means the manager may be elevating the business into a comparable, more profitable category of industries with an average long term ROIC of 16.7%. But it is not a prediction that his or her business will attain such profitability just by using the new strategy.

B. Brief Summary of the Five Forces

Entry of new competitors:

The ease with which new entrants can overcome any existing barriers to start competing in the industry.

Bargaining power of suppliers:

The ability of suppliers to capture more of the value in the supply chain for themselves.

Bargaining power of buyers:

The negotiating leverage with which buyers exert pressure on the industry.

Threat of substitutes:

The availability of product or service that perform the same function by distinctly different means, and at comparable or more favorable costs.

Rivalry among existing competitors:

The extent, in terms of both the basis and intensity of competition that tends to drive down an industry's profit potential.

II. Rating of Competitive Forces for US Industries

In order to establish a linkage between industry profitability and the five forces, we need to quantify the latter. Using typical guidelines derived from the original concepts for this model, we use a focus group approach to rate the intensity of the forces on a scale of 1 to 5, representing categorical ratings from Weak, Medium-Weak, Medium, Medium-Strong, to Strong, respectively. We are mindful that this exercise refers to entire industries over a span of 14 years (1992-2006). To formalize the procedures, we use SIC codes [4] to identify an industry. Then, we look up the online resource at Answers.com for a synopsis of the industry, including its brief history, organization and

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James K. Ho is with University of Illinois at Chicago, IL 60607, USA (email: jimho@uic.edu).

structure, background and development, current conditions, as well as its industry leaders. With leads from such material, we research further the competitive environment of the industry by studying in particular the section on risk factors in annual reports of representative companies. Relevant articles in the business press, reports of trade associations and industry watch groups are surveyed where available. Based on widely available templates used by business consultants and academic researchers (see e.g. [5]), we compiled checklists that can be customized for specific industries.

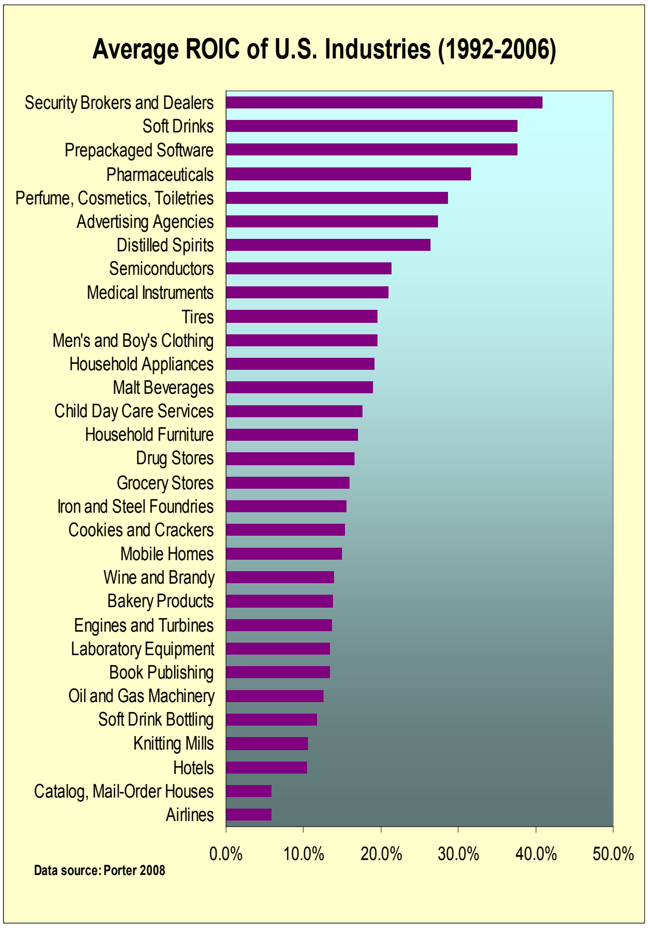

Fig. 1. Average return on invested capital (ROIC) of U.S. industries [1]

A. A Generic Model

The following is a generic model for rating the five forces:

1) Threat of new entrants (ENT)

a. Switching costs for customers are low.

b. Start-up costs are not prohibitively high.

c. Industry distribution channels are accessible.

d. There are no government or copyright/patent restrictions.

e. There are few incumbency advantages.

2) Bargaining Power of Suppliers (SUP)

a. There is threat of forward integration.

b. Suppliers have diverse customer base.

c. It is difficult to switch suppliers.

d. The supplied product/service is specialized or limited, or has a strong brand.

e. There are a few dominant suppliers, and industry is not key customer.

3) Bargaining Power of Buyers (BUY)

a. There is threat of backward integration.

b. Buyers have bargaining power because of their order quantities.

c. Product/service offered is not unique.

d. Buyer purchases same product/service from many different suppliers.

e. Buyers are price-sensitive, and can switch suppliers easily.

4) Threat of Substitutes (SUB)

a. There are products/services that perform the same function but by different means.

b. Prices of substitutes are comparable.

c. Customers are not adverse to change.

d. It is not expensive to switch suppliers.

e. There are indirect/downstream substitutes.

5) Rivalry among Existing Competitors (COM)

a. Existing competitors are providing similar and better products/services.

b. Much money is spent on advertising and marketing within the industry.

c. The industry does not have a clear market leader.

d. There are many competitors.

e. The market is not growing significantly.

B. Rating the Five Forces: Illustrative Case of the Book Publishing Industry

As an illustration of our process of rating the five forces, consider the Book Publishing Industry. A SIC search returns its code as 2713 and its scope to include establishments primarily engaged in publishing, or in publishing and printing books and pamphlets. From Answers.com we gain substantial insight as shown in the following excerpts.

The book publishing industry faced a transformation entering the mid-1990s. Many observers noted that the industry, which once could be characterized as gentlemanly and literary, had quickly become more cutthroat and businesslike.

As a result, many employees within the publishing industry shifted their focus from building relationships with authors and carefully tailoring manuscripts to cutting costs and analyzing profit and loss statements.

Another factor affecting the book publishing industry was the proliferation of large, influential retail bookstore chains. While these chains expanded the over-all market for books, they also had the power to limit pricing and affect the selection of books that publishers could offer profitably.

By 2003 the book industry was in relatively good health in comparison to U.S. industries like technology, which had fared much worse in the weak economic climate of the early 2000s.

Based on such background information and further research (see e.g. [5]), teams of four to five business students are assigned to deliberate on the force ratings. We show the results, averaged from six teams [2] over two semesters, along with synopsis of supporting arguments.

Rating of Five Forces for the Book Publishing Industry:

1) Threat of New Entrants: Medium-Weak [2/5]

While switching costs for customers are low and start-up costs are not prohibitively high, small scale new entrants do not constitute serious threats to established incumbents in the industry. This is especially true with distribution channels in the form of brokers who provide access, often the only viable option in approaching institutional buyers such as public libraries, but at costs that undermine any prospect of profitability.

2) Bargaining Power of Suppliers: Medium [3/5]

Here, suppliers fall broadly into the two categories of content providers (authors, artists, editors, etc.), and production specialists (typesetters, printers, binders, etc.) With the exception of top-selling authors and select celebrities, content providers are ample in supply and do not command much negotiating power. The production aspects of book publishing have long experienced streamlining and consolidation for economies of scale (the printing of an entire run of a typical title takes only an hour or so). With automation and computer technology displacing traditional craft at ever-increasing pace, suppliers are mindful of excess capacity and content to cooperate with publishers

3) Bargaining Power of Buyers: Medium-Strong [4/5]

Buyers for the book publishing industry are primarily large retail bookstore chains. While these chains can and do indeed expand the over-all market for books, they also have the power to control pricing and influence the selection of books that publishers could offer profitably. Another significant group of buyers are brokers that supply public libraries and other institutional repository of printed books more or less on a contractual basis. Therefore, the major buyers in this industry wield substantial bargaining power as gatekeepers of the supply chain.

4) Threat of Substitutes: Medium-Strong [4/5]

As the purpose of the printed book is multi-faceted, spanning entertainment, self-enrichment, and formal education, potential substitutes include all forms of multi-media conveyor of enriched text and graphical content. The real threat is actually less in the replacement of the delivery format, but rather in the erosion of the very habit of reading. In 2003, Publishers Weekly [6] reported that unit book sales declined 16 percent between 1996 and 2001, even though consumers spent more money on books overall. In addition, younger people (those between the ages of 25 and 39) were buying fewer books than in past years, suggesting that reading may be declining in popularity with successive generations. [7]

5) Rivalry among Competitors: Strong [5/5]

While the industry may appear fragmented, with more than 25,000 companies operating in the United States in the early 2000s, it is in fact dominated by several giant publishing houses which control as much as 85 percent of the market. However, there is no clear leader in either mass or niche markets; and competition is fierce for both retailer shelf space and the attention of end customers.

We use the Star Plot (also known as Radar Plot) to display the force ratings in Fig. 2. Applying our five-forces rating procedure to all 33 industries listed in Fig. 1, we have the results recorded in Table I. It should be remarked that we paid full attention to the time span involved and made every effort to apply the evaluation to an entire industry, rather than particular companies. The significance of this clarification is best underscored by the global financial crisis of 2008 which led to the collapse of many institutions in the Security Broker and Dealers industry. The focus groups who evaluated this industry were well aware that we were addressing the period from 1992 to 2006.

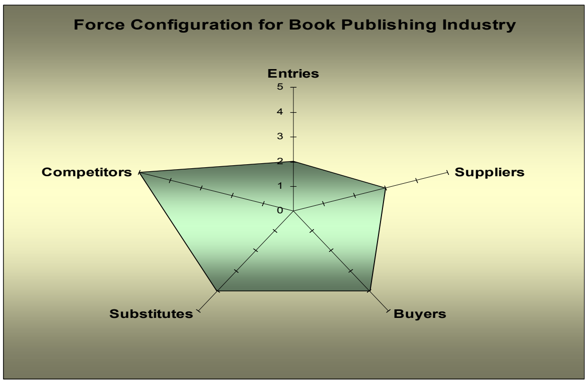

Fig. 2. Competitive force ratings for book publishing industry

C. Competitive Force Ratings of US Industries (1992-2006)

TABLE I: RATING OF COMPETITIVE FORCES FOR U.S. INDUSTRIES (1992-2006)

Forces	ENT	SUP	BUY	SUB	COM
U.S. Industries					
Security Brokers and Dealers	2	1	1	1	4
Soft Drinks	1	1	2	2	4
Prepackaged Software	2	2	3	1	2
Pharmaceuticals	2	4	2	2	2
Perfume, Cosmetics, Toiletries	3	2	2	1	4
Advertising Agencies	3	3	2	1	4
Distilled Spirits	3	2	2	3	3
Semiconductors	2	3	4	2	4
Medical Instruments	3	3	4	1	4
Men's and Boy's Clothing	5	2	4	1	4
Tires	3	2	5	1	5
Household Appliances	3	2	4	2	5
Malt Beverages	4	2	3	5	3
Child Day Care Services	4	3	4	3	3
Household Furniture	4	3	4	2	4
Drug Stores	4	3	4	3	3
Grocery Stores	4	2	4	2	5
Iron and Steel Foundries	3	3	4	3	4
Cookies and Crackers	3	3	4	3	4
Mobile Homes	3	3	4	4	3
Wine and Brandy	5	2	4	2	5
Bakery Products	5	2	5	2	4
Engines and Turbines	3	5	5	2	3
Book Publishing	2	3	4	4	5
Laboratory Equipment	3	4	5	3	3
Oil and Gas Machinery	4	3	5	2	4
Soft Drink Bottling	3	4	4	3	5
Knitting Mills	4	3	4	4	4
Hotels	5	3	4	2	5
Catalog, Mail-Order Houses	5	3	5	4	5
Airlines	5	5	4	3	5

III. Evidence of Direct Linkage

While it is an intuitive premise of the five forces model that the stronger the forces, the more difficult it is for an industry to sustain profitability, direct linkage has never been established. With the numerical ratings in Table 1, we can already observe that higher force ratings do correspond to lower profitability in Figure 1. The first concrete evidence of a direct linkage was provided by the case of the Cruise Industry. We first used this as a stimulating platform for discussing supply chain management issues in an MBA class. As part of the study, we performed the five forces rating procedure described above. The industry is identified with SIC 4481 as Deep Sea Transportation of Passengers which includes establishments primarily engaged in operating vessels for the transportation of passengers on the deep seas. Here are excerpts from the description of the industry at Answers.com.

The North American cruise industry, which includes the United States and Canada, has represented approximately 90 percent of the worldwide cruise market in recent years. In 2001 alone, the industry's benefit to the U.S. economy totaled $20 billion, according to the Cruise Lines International Association (CLIA). This included some $11 billion of direct spending on U.S. goods and services. By 2002, approximately 167 ships were serving the North American market, with an aggregate capacity of 173,846 berths.

Since the mid-1980s, the cruise industry has conducted extensive market and consumer research. As a result, the industry has added new destinations, new ship design concepts, new on-board/on-shore activities, new themes, and new cruise lengths to reflect the changing vacation patterns of the public.

Despite weak economic conditions, rising unemployment levels, and concerns about terrorist attacks, CLIA reported that the North American cruise industry achieved record years in both 2001 and 2002, helping to sustain an annual growth rate that averaged more than 8 percent from 1980 to 2001.

Here are the force ratings for the Cruise Industry with summary supporting arguments.

1) Threat of New Entrants: Medium-Weak [2/5]

There is a threat of new entrants as evidenced by Disney cruise lines. However start-up costs are high and it is not easy to perfect the complex operations and branding necessary for building customer loyalty.

2) Bargaining Power of Suppliers: Medium [3/5]

Ship builders are in a strong negotiating position as there are few qualified suppliers in the field. For other provisions and services, sources are more abundant. Due to the purchasing power 3/ of cruise lines, suppliers including critical materials such as fuel tend to cater to them in order to keep their business.

3) Bargaining Power of Buyers: Medium-Strong [4/5]

Buyers (tourists) have substantial bargaining power since apart from price segmentation according to the level of luxury, services provided by industry are not clearly differentiated. Empty cabins are essentially perishable commodities, and buyers can learn to shop prudently without much risk of impulsive purchases. This effect is accentuated by the easy flow of online information, so that supply and demand can be matched even without traditional intermediaries such as travel agents.

4) Threat of Substitutes: Medium-Strong [4/5]

As far as options for vacation packages go, substitutes abound for cruises. Theme parks and other land-based resorts make it easy for customers to switch, unless they insist on being sea-borne. The rigid schedules and lack of flexibility in the itineraries may also deter many potential customers.

5) Rivalry among Competitors: Strong [5/5]

In spite of the extensive consolidation 4/ in this industry, customers still have ample alternatives to consider. There are at least 26 American, 25 European, 2 Australian, and 1 Asian major cruise lines in operation (24 are members of the CLIA).

We see then the Cruise Industry turns out to have exactly the same five-force configuration as the Book Publishing Industry. The question arises naturally whether their profitability records bear similar resemblance. The ROIC for the Book Publishing Industry is an average of 13.25% from 1992-2006. For the Cruise Industry, we do not have exactly comparable data, but attempt to deduce the best estimates from publicly available information. Using data from annual reports from 2002 to 2007 for the two leaders in the industry: Carnival Corporation & PLC, and Royal Caribbean Cruises LTD, we compute ROIC as shown in Table II.

TABLE II: ROIC FOR LEADERS IN THE CRUISE INDUSTRY (2002-2007)

Carnival Corporation & PLC	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**
NOPAT=	2707	2569	2496	2119	1350	1104
Total Assets	34181	30552	28349	27636	24491	12335
Cash	943	1163	1178	643	1070	667
Current Liabilities	7260	5415	5158	5034	3315	1620
Debt	5285	5301	4685	5610	6526	2859
Invested Capital=	20693	18673	17328	16349	13580	7189
ROIC=	13.08%	13.76%	14.40%	12.96%	9.94%	15.36%
					Average=	13.25%
Royal Caribbean Cruises LTD.						
NOPAT=	901	858	872	754	526	551
Total Assets	14982	13393	11256	11964	11323	10539
Cash	231	105	125	629	330	243
Current Liabilities	2340	1872	1989	2274	1505	1170
Debt	5124	4667	3394	3922	5206	5199
Invested Capital=	7287	6749	5748	5139	4282	3927
ROIC=	12.36%	12.71%	15.17%	14.67%	12.28%	14.03%
					Average=	13.54%

Averaging over the two leaders, we obtain 13.39% ROIC for the period 2002 to 2007 for the Cruise Industry, which is remarkably close to the 13.25% observed for the Book Publishing Industry, albeit for a different time frame of 1992-2006. We consider this agreement strong evidence that there is direct linkage between the five forces ratings and the ROIC.

A. The Functional Linkage

The broader assumption is that businesses facing similar competitive forces may benefit from similar strategies. As an illustrative example, consider the Super Bowl, the major annual sporting event that in 2010 drew an audience of over 100 million on television. A 30-second commercial spot during the telecast cost between USD 2.5 and 3 plus million. An obvious question for researchers is what businesses advertise on this program and what do they have in common. Using the above generic model for rating competitive forces, we have found that they share a common competitive force profile characterized by high Competition and Buyer Power, medium to low Supplier Power and Threat of Entry, and low Threat of Substitution. Although the relative sizes and marketing resources vary tremendously, they must all consider the high cost advertising strategy to be worthwhile.

The observation that industries having similar configurations of force ratings may indeed have similar profitability measures suggests that we look for a full functional relationship between the force ratings and ROIC. That means we want a formula to return a value for ROIC given the input ratings of the five forces. Using the following notation for the five independent variables corresponding to the force ratings.

- ENT: Threat of New Entrants
- SUP: Bargaining Power of Suppliers
- BUY: Bargaining Power of Buyers
- SUB: Threat of Substitutes
- COM: Rivalry among Existing Competitors

A Multiple Linear Regression of the ROIC data in Fig. 1 to the values of these variables in Table 1 yielded the function

$$\text{ROIC} = 63.42 - 2.50*\text{ENT} - 2.67*\text{SUP} - 3.21*\text{BUY} - 2.54*\text{SUB} - 2.70*\text{COM}$$

The closeness of fit is indicated by an R Square of 0.98.

The use of this linkage can be illustrated with the example of the Cruise Industry. Suppose certain players make a strategic move that reduces the force rating of rivalry among existing competitors from 5 (strong) to 4 (medium-strong), they may have elevated their position from an industry with long-term average ROIC of 13.92% to one of 16.52%. We reiterate the emphasis on long-term industry-wide averages so that there is no misconception of any specific prediction of profitability. Nonetheless, such quantitative estimates should be useful for the evaluation of strategic options.

IV. Strategic Innovation

We showed how Porter's five forces that shape competitive strategies can be linked directly to long term profitability of industries, as measured by the return on invested capital. The five forces are rated on a scale from 1 (weak) to 5 (strong) and a functional relationship is derived to estimate the long-term average ROIC for U.S. industries. Apart from direct application to industry-wide strategic analysis or for individual enterprises, as a quantitative tool for analysts to evaluate business propositions based on their subjective rating of the competitive forces involved, this linkage has a more intriguing potential. While truly innovative strategies are desirable, it is difficult to produce systematically. Now managers can be guided by the forces-profitability relationship to benchmark industries outside of their own to identify others facing like forces. Best practices from elsewhere which have been shown to be effective in force reduction can be copied as "innovation" within one's own industry. Systematic programs can be developed along this line for human resource training in strategic management.

Within the specific context of Supply Chain Management, for example, it is well recognized that all strategic decisions revolve around the trade-off between efficiency and responsiveness. There is an emerging knowledge base of successful strategies in diverse business environments. However, going through seemingly endless and isolated cases and wondering how one can borrow from them would not be productive. It will be helpful for managers to have a better guide: indeed a "map" to navigate the sea of potentially useful ideas for strategic innovation. In [8] the design of a prototype template for this purpose was presented. Navigation on the hypermap is by competitive force profile. A supply chain manager armed with a specific profile of his/her own business environment, browses through the indices to select similar profiles. The corresponding case will be brought up showing relevant strategic options and where they are positioned on the trade-off spectrum. With such business intelligence support systems, managers can be guided by the force profiles to benchmark industries outside of their own to identify others facing like forces. Best practices from elsewhere which have been shown to be effective can be copied as "innovation" within one's own industry. Systematic programs can also be developed along this line for human resource training in supply chain management.

Notes

1) The Standard Industrial Classification (abbreviated SIC) is a United States government system for classifying industries by a four-digit code. See e.g. U.S. Department of Labor, Occupational Safety & Health Administration (SIC) System Search at http://www.osha.gov/pls/imis/sicsearch.html. A practical guide is provided by the Milner Library at the Illinois State University: Industry and Competitor Analysis, available at http://www.library.ilstu.edu/assets/pdf/handouts/indusanl.pdf.
2) Three teams were undergraduate seniors in a Competitive Strategy class while the others were MBA and MS candidates in a Supply Chain Management class.
3) The list of supplies provisioned onboard the Celebrity cruise ship Constellation for an average 7-day cruise may include 24,236 pounds of beef, 13,851 pounds of fish, 20,003 pounds of fresh fruit, and 3,260 gallons of milk. Source: http://en.wikipedia.org/wiki/Provisioning_(cruise_ship)
4) For example, Carnival Cruise Lines, apart from its own eponymous division, owns and operates the Holland America Line, Windstar Cruises, Cunard Cruise Line, Seabourn Cruise Line, and Costa Crociere S.p.A. Celebrity Cruises, founded in 1972 and one of the largest companies in the luxury segment of the cruise industry, merged with Royal Caribbean in 1997 to become one of the world's largest cruise lines by passenger capacity.

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