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A Hypermap for Supply Chain Management

James K. Ho

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***Abstract*—**We present a prototype interactive (hyper) map of strategic, tactical, and logistic options for Supply Chain Management. The map comprises an anthology of options, broadly classified within the strategic spectrum of efficiency versus responsiveness, and according to logistic and cross-functional drivers. They are exemplified by cases in diverse industries. We seek to get all these information and ideas organized to help supply chain managers identify effective choices for specific business environments. The key and innovative linkage we introduce is the configuration of competitive forces. Instead of going through seemingly endless and isolated cases and wondering how one can borrow from them, we aim to provide a guide by force comparisons. The premise is that best practices in a different industry facing similar forces may be a most productive resource in supply chain design and planning. A prototype template is demonstrated.

***Keywords*—**Competitive forces, strategic innovation, supply chain management.

I. Introduction

PORTER'S five forces framework [7] has become a staple approach to strategic analysis, playing a key role in both business practices and academic studies (see e.g. [2], [4], [6]). Our premise is that businesses facing similar competitive forces should be able to learn from one another, and proven strategies in one industry can become innovative ones in another. In particular, in Supply Chain Management where strategic decisions revolve around the trade-off between efficiency and responsiveness, there is an emerging litany 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 co-ordinates on such a map, we introduce a rating scheme for competitive forces, which forms the basis of research linking such forces to profitability [5]. This in turn provides force profiles that allow us to "index" supply chain decision options. Finally, we present a design to implement this knowledge base as an interactive hypermap so that supply chain managers can query cases by selecting force profiles of interest.

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.

James K. Ho is with the University of Illinois at Chicago, IL 60607 USA (312-996-0819; fax: 312-413-0385; e-mail: jimho@ uic.edu).

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

In order to establish a profile of the five forces facing any particular business, we need to quantify them. 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.

1. Threat of New Entrants
   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
   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
   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.

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

4. Threat of Substitutes
   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
   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.

As an illustration of our process of rating the five forces, consider the Book Publishing Industry [3].

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 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.

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 market 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 Figure 1.

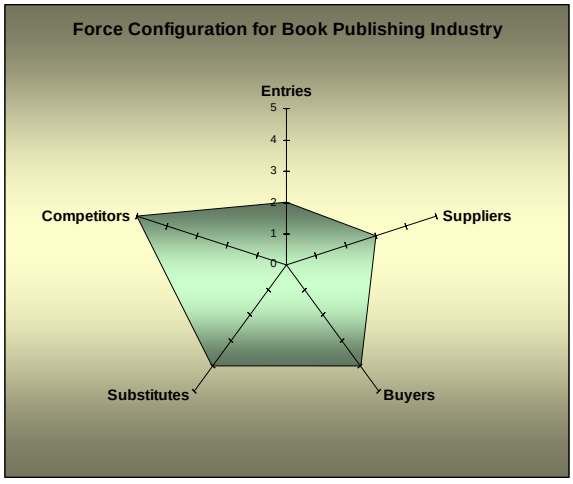


Fig. 1 Competitive force ratings for Book Publishing Industry

III. How Businesses Facing Similar Forces Share Strategies

The Super Bowl, which is the championship game of the National Football League in the US, is the major annual sporting event that in 2010 drew an audience of over 100

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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. Table 1 lists the advertisers for Super Bowl XLIV, played in February 2010 [8]. Applying our procedure of competitive force rating to these advertising companies, we found that their share a common 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. This serves as an illustration of our premise that businesses from diverse industries facing similar competitive forces may benefit from common strategies.

TABLE I
ADVERTISERS DURING SUPER BOWL 2010

Industry	COMPANY/BRAND	30 Second Slots
Apparel	Dockers	1*
Automobile	Audi of America	2
Automobile	Chrysler's Dodge	2
Automobile	Honda	1
Automobile	Hyundai	2
Automobile	Kia	1*
Automobile	Volkswagen of America	1
Auto sales	Cars.com	2
Beverage	Anheuser-Busch InBev	10
Beverage	Coca-Cola	4
Beverage	Dr Pepper Snapple Group	1*
Cell phones	Motorola	1
Computer	Intel	1
e-Commerce	GoDaddy.com	2
Electronics	Vizio	1
Financial service	E-Trade	1
Flower delivery	Teleflora	1
Food service	Denny's	2
Food service	Yum Brands' Taco Bell	1
Footwear	Skechers	1*
Info service	kgb	1*
Health product	Unilever's Dove Men Care	1*
Job placement	Monster	1
Job placement	Careerbuilder	1
Movies	Universal Pictures	1
Movies	Viacom's Paramount Pictures	3
Movies	Walt Disney Pictures	1
NGO	Focus on the Family	1*
Public service	U.S. Census Bureau	1*
Snack food	Doritos (PepsiCo/Frito-Lay)	3
Snack food	Mars' Snickers	1
Snack food	Diamond Foods' Pop-Secret and Emerald Nuts	1*
Sports	NFL	3.3
Telecommunication	Qualcomm's FloTV	1
Telecommunication	TRUTV (Time Werner)	1*
Telecommunication	Boost Mobile	1*
Tire	Bridgestone	2
Travel/Leisure	NBC Universal's Universal Orlando	1
Travel/Leisure	HomeAway	1*

* indicates first time advertiser

IV. STRUCTURAL DRIVERS OF SUPPLY CHAIN MANAGEMENT

In order to map all known strategic, tactical, and logistic options for Supply Chain Management, we use the structural framework in [1] as schematized in Figure 2. There are six structural drivers: three are logistical and three are cross-functional. These are briefly identified below.

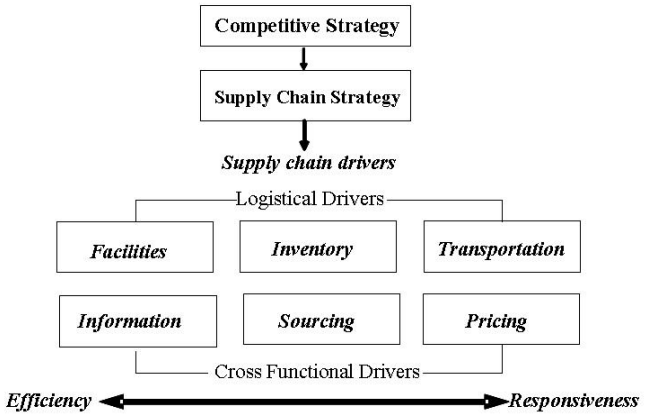


Fig. 2 Structural drivers of supply chain management

Logistical Drivers:

Facilities:
locations of production, inventory storage, and transshipment operations

Inventory:
raw materials, work in progress (WIP), and finished products

Transportation:
distribution of inventory within a supply chain using various modes and routes

Cross-functional Drivers:

Information:
data, models and analysis to monitor every aspects of facilities, inventory, and transportation may be the most critical driver of supply chain performance

Sourcing:
make or buy decisions
procurement functions, negotiations and management of relations with suppliers

Pricing:
product positioning and pricing structures in sales and marketing

V. A HYPERMAP FOR SUPPLY CHAIN MANAGEMENT

Within the above structural framework for Supply Chain Management, it is easy to recognize 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

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guide: indeed a "map" to navigate the sea of potentially useful ideas. We present the design of a prototype template for this purpose. See Figure 3. The spectrum of trade-off between efficiency and responsiveness is color-coded from deep blue to deep red, respectively, with graduated shades going through a neutral white in the middle. Navigation on the hypermap is by competitive force profile as exemplified in Figure 1. Four such profiles are shown at the bottom of Figure 3. As the knowledge base grows, further indexing can be employed. The user, presumably 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. An example instance is illustrated in Figure 4, where the highlighted options are hyperlinked to further details. While truly innovative strategies are desirable, it is difficult to produce systematically. Now 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 that 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.

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James K. Ho is a professor of Information & Decision Sciences at the University of Illinois at Chicago. His recent research focuses on topological analysis and data mining in online auctions, e-commerce, and supply chain management.

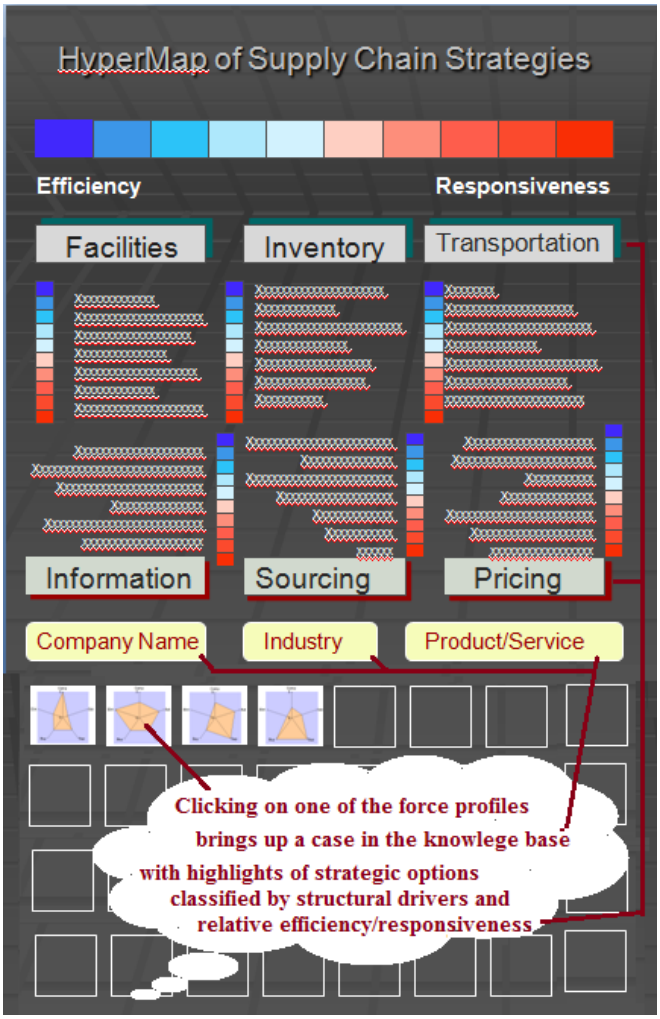


Fig. 3 Prototype design of hypermap of supply chain strategies

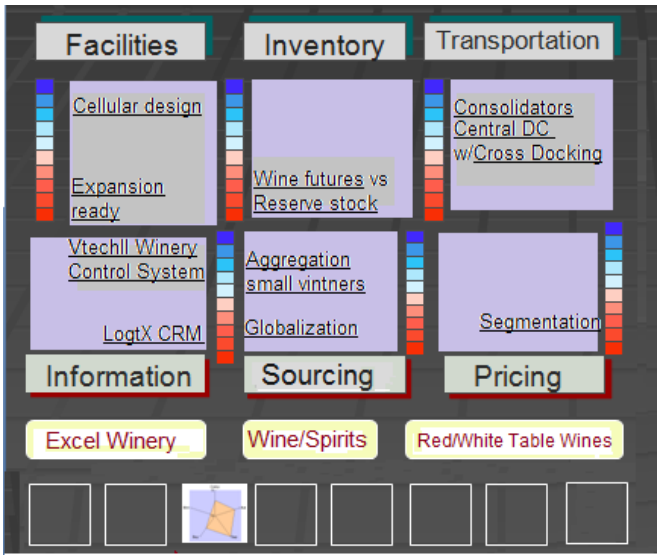


Fig. 4 An example instance of the hypermap