A STRATEGIC ANALYSIS FOR AN ULTRA-HIGH PRESSURE WATER-JET EQUIPMENT MANUFACTURER

by

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ABSTRACT

This paper presents a strategic analysis of WJC Corporation, a pioneering and successful manufacturer of Ultra-High Pressure water-jet machines.

Ultra-high pressure water-jets are now enjoying widespread adoption as cost-effective machine tools with unique capabilities and applications. The maturing industry will continue to present many opportunities for a firm that has developed a strategy to take advantage of them. This paper analyses the industry environment, WJC's internal strategic assets, current strategy and performance, then goes on to develop, evaluate and recommend an altered strategy for WJC.

Specifically, WJC's environment and capabilities suggest it should maintain its competitive stance as a differentiator, but increase its emphasis on development of new applications. Doing so can mitigate the risk that pump technology may become a commodity in five to ten years.

Keywords: strategic analysis; strategy; water-jet industry; machine tool industry

Subject Terms: Strategic Planning -- Case studies; Industrial management – United States

DEDICATION

I dedicate this work to Jane. You encouraged me to take on the challenge of the EMBA program in the first place, and you supported me every step of the way. I could not have done it without you.

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GLOSSARY

CNC	Computer Numeric Control:
EDM	Electrical Discharge Machining: A slow but highly accurate machining method used primarily for hard conductive metals. Material is removed by a series of tiny electrical sparks
Garnet	A group of crystalline minerals, most often red, used as an abrasive, e.g. on sandpaper and in abrasive water-jets
KSFs	Key Success Factors: A small number of areas an organization must focus on in order to achieve its vision
OEM	Original Equipment Manufacturer: Describes a situation in which an OEM sells a product to a firm, which resells it, usually as part of a larger product.
psi	Pounds per Square Inch: A unit of pressure. The weight of one pound applied to an area of one square inch.
UHP	Ultra-high Pressure: In the context of water-jet cutting, usually refers to pressures of at least 55,000-psi

PREFACE

The author has altered the name of the subject firm and some other identifying information in order to protect its confidentiality. All altered information remains logically consistent with the original work.

1: AN INTRODUCTION TO WJC

1.1 An Ultra-High Pressure Water-jet Company

WJC Corporation (WJC) is a member of the ultra-high pressure (UHP) water-jet industry. This industry employs focused jets of water forced through nozzles under such high pressure that they function as the business end of a machine tool. For example, water pressurised to 87,000-psi can leave a nozzle at more 3 times the speed of sound[1]. Its resulting power is astounding: Such a water-jet can cut through materials up to 14 inches thick. UHP water-jets are used as part of cutting and cleaning systems applied to a variety of tasks. There are applications in industries including aerospace, automotive, food, consumer electronics and construction[2].

WJC is a world leader in the development, manufacturing and application of UHP water-jet systems. It designs and manufactures UHP water pumps, cutting "heads", robotic positioning systems and automation software. WJC combines these components into a system suited for a particular industrial application. WJC also invented and patented the abrasive water-jet. WJC discovered that mixing abrasive particles into the stream of water greatly increased its cutting power[3]. It also developed "dynamic" water jets, which improve accuracy of cutting and reduce or eliminate the need for other

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[1] WJC Corp., "87,000 psi HyperPressure Technology," http://wjccorp.com/waterjet-products.cfm?id=565 (accessed Mar 14, 2007).

[2] WJC Corp., "WJC Corporation 2007 February Update," http://www.wjccorp.com/uploadedFiles/Resources/Brochures/Waterjet_Brochures/Waterjet_Brochures/Investor%20Presentation.pdf (accessed March 15, 2007).

[3] The Gale Group, Inc., "WJC Corporation," *International Directory of Company Histories* (2006), http://www.answers.com/topic/wjc-corporation (accessed March 14, 2007).

machining to finish the cut. WJC sells both the integrated systems described, and supplies UHP pumps to other integrators.

1.2 A Case of Indigestion

By the mid-1990s, WJC's products held approximately 60 percent of the US water-jet market, and around 40 percent of global market share[4]. WJC has since largely maintained this pre-eminent position[5]. WJC's revenues in its 2006 financial year were US$205.4M, and it currently employs just over 800 people in 14 countries[6].

WJC is by most measures a successful company. It has recently enjoyed revenue growth of more than 15 percent per annum and better than industry average returns. However, this is the result of a recent turnaround. Before this, WJC suffered losses for its 2002 through 2005 financial years[7]. This resulted from having invested heavily in some market segments it could not successfully commercialize. The greatly improved finances were the result of WJC sharpening its product market focus, fierce attention to cost reduction and revenue growth driven by better sales and marketing.

1.3 So What Is the Problem?

Historically, WJC has been very successful in developing new water-jet technology and new applications for it. The high end of its UHP water-jet product line is almost unrivalled. However, WJC is experiencing more intense competition for its lower performance water-jet business, and in the supply of replacement parts for its equipment.

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[4] Ibid.

[5] WJC Corp., "WJC Corporation 2007 February Update," http://www.wjccorp.com/uploadedFiles/Resources/Brochures/Waterjet_Brochures/Waterjet_Brochures/Investor%20Presentation.pdf (accessed March 15, 2007).

[6] Hoovers, a D&B Company, "Hoover's Custom Report Builder - WJC Corporation" (March 2007): 1.

[7] Ibid., 22.

As a result, WJC has started to compete on price for this business. It has been able to do so effectively so far because of its continuing success in reducing COGS (Cost of Goods Sold) and SG&A (Special, General and Administrative) expenses.

This low-cost segment does not yet represent a substantial part of WJC's business. However, we can expect pricing pressures to increase as competitors continue to be attracted to the market. In addition, the industry is growing quickly at present, but will eventually mature. We can expect the low-cost segment to become a greater fraction of the market by then. WJC's strategic response to this is important. Thus far, it has focused most of its resources on the high-end market. However, as the low-cost segment grows, should WJC divert an increasing amount of attention to it?

Doing so might seem a logical response. However, there is another perspective on WJC competing in both the high and the low end of the UHP market. This might imply that it is pursuing a mixture of generic differentiation and cost leadership strategies. A serious concern with this is what Michael Porter calls "stuck in the middle". He maintains that a firm that does not choose one of the three generic strategies (he calls the third of these "focus") is in a poor strategic position. It is very likely to experience low profitability because the internal capabilities required by the three generic strategies are different[8]. For this reason, WJC should make a conscious decision regarding how it wishes to compete in the low-cost segment, not allow its strategy to emerge by default. The result is otherwise likely to be both sub-optimal and poorly aligned with WJC's internal capabilities.

[8] Michael E. Porter, *Competitive Strategy – Techniques for Analyzing Industries and Competitors* (Free Press, 1980), 40-41.

There are other challenges that WJC must take into account in the formulation of its strategy. One is the amount of cost driven by being a public company. It is a relatively complex global organization for its size. In addition, the technical difficulty of building ever higher-pressure machines is increasing. Unfortunately, performance returns on increasing pressures are also dwindling. Finally, keeping pace with demand that can be uneven in the short run, but rapidly growing over time, has proved difficult.

So, what should WJC do to remain dominant in its industry, to keep growing and to continue delivering value to shareholders?

1.4 More About WJC

1.4.1 Ownership and Control of WJC

WJC is a publicly traded company on the NASDAQ stock exchange. It is widely held, with the largest shareholder, Money Pot Management Company, LLC, owning 14.5 percent of the outstanding shares as of March 31st, 2007. Insiders own just less than 4 percent of the shares[9]. Apart from management "insiders", the overriding goals of shareholders are profit and share price appreciation. This was evident in recent activism by the largest shareholder. This shareholder wrote to WJC's board of directors, demanding that they sell the company, presumably to private equity. He believed doing so would yield a significant premium over the trading price of the shares[10].

[9] MSN, "WJC Ownership," http://moneycentral.msn.com/ownership?Symbol=WJC (accessed June 23, 2007).

[10] G. Erb (ed.), "WJC cold to suitor's demand," *Puget Sound Business Journal* (May 2, 2007), http://www.bizjournals.com/seattle/stories/2007/04/30/daily18.html (accessed June 23, 2007).

1.4.2 WJC's Corporate Organization

WJC's organizational structure consists of a corporate office and three geographical divisions (the Americas, Europe and Asia). All divisions sell largely the same products. There is some product manufacturing specialization amongst the divisions however. For example, WJC builds the UHP pumps in Kent, WA and computer-controlled cutting systems in Jeffersonville, IN. It then ships these components to the geography of the selling division.

1.4.3 WJC's Products and Customers

We can obtain a useful view of WJC's positioning strategy by constructing a PCM (Product-Customer Matrix)[11]. A PCM is a grid mapping products on one axis against customers on the other. This provides an initial picture of a firm's products and customers, and their relationships. A PCM makes apparent a firm's most important products and customer segments. We can categorize WJC's products as follows:

- Cutting systems: A UHP pump feeds a cutting head mounted on a mechanical arm. A computerised control system moves the arm with between two and five degrees of freedom. This machines material mounted on a cutting table. An abrasive (a hard crystalline mineral, usually garnet) is mixed into the water-jet to increase cutting power if a jet of pure water cannot cut the material by itself. Figure 1 shows an example.

[11] A.E. Boardman and A.R. Vining, "Defining Your Business Using Product-Customer Matrices," *Long Range Planning*, Vol. 29, No.1 (1996): 38-48.

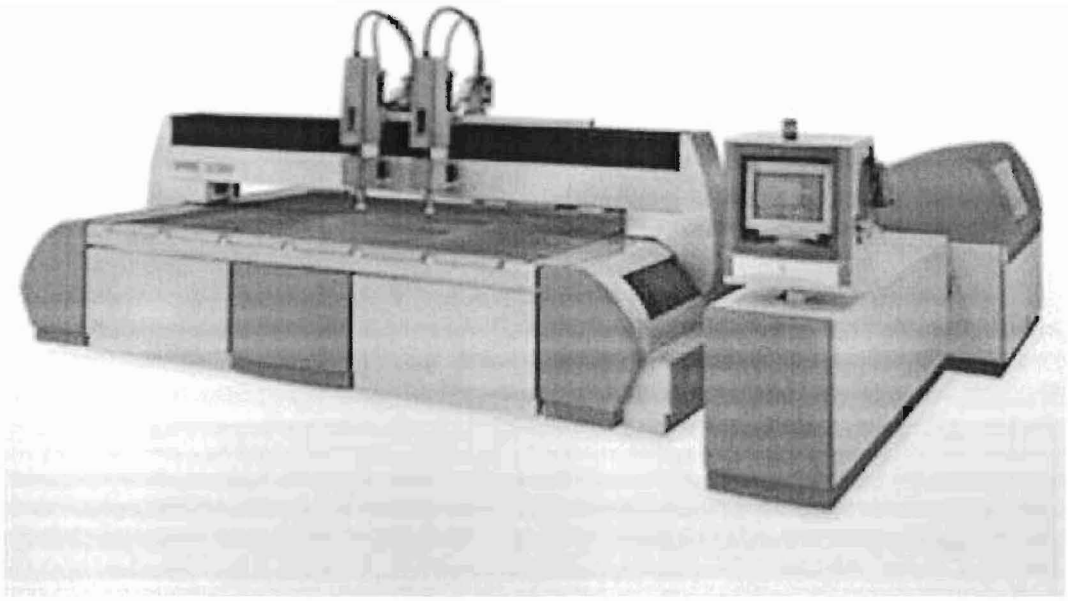

Figure 1: An X-Y water-jet shape-cutting machine

- Cleaning / Surface Preparation systems: A UHP pump drives either a hand-held cleaning "wand" (see Figure 2) or a remote-controlled unit that sticks to a surface by vacuum power. The unit also stores water and debris for proper disposal (see Figure 3). Sometimes an abrasive is used, depending on the cleaning power needed and the surface finish desired.

Figure 2: A water-jet cleaning "wand"

Figure 3: A water-jet surface preparation machine

- Specialty applications: A UHP pump feeds a cutting head mounted on a robotic arm. These machines cut complex three-dimensional shapes. They are usually custom-designed for a specialized application. We show an example in Figure 4.

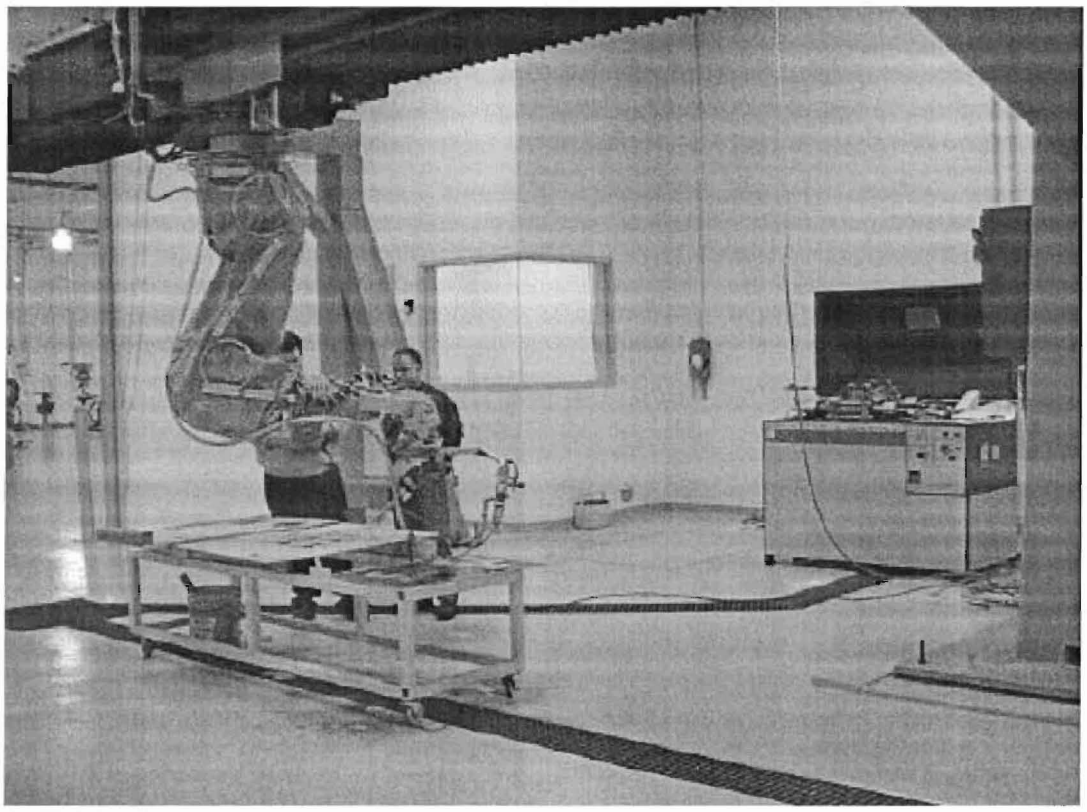

Figure 4: Multi-axis, water-jet powered shape-cutting robot

- Pumps: WJC sells some of its lower-pressure pumps to third party integrators. The integrators use them to build inexpensive cutting systems for less demanding applications. See Figure 5.

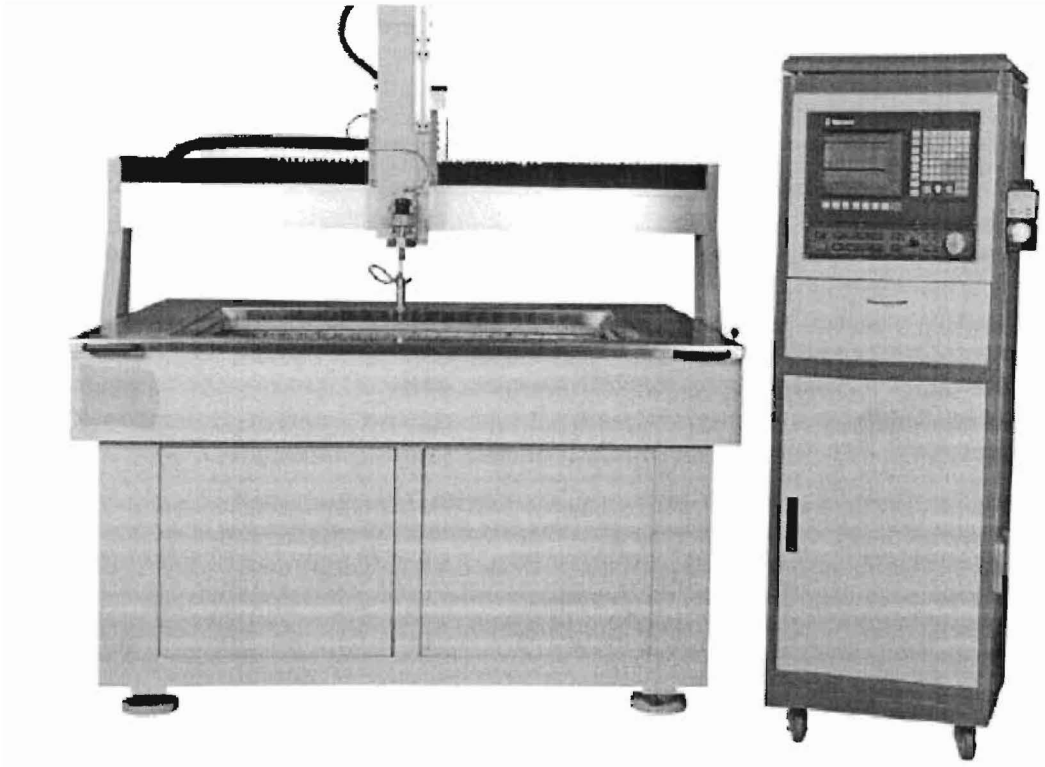

Figure 5: OEM cutting table powered by WJC water-jet pump

- Parts: UHP pumps and water handling systems have many parts that wear out with use, due to the mechanical stresses they are under during operation. A typical machine consumes 5 percent of its original purchase price in spare parts every year[12]. See Figure 6.

[12] WJC Corp., "WJC Corporation 2007 February Update" (2007): 8. http://www.wjccorp.com/uploadedFiles/Resources/Brochures/Waterjet_Brochures/Waterjet_Brochures/Investor%20Presentation.pdf (accessed March 15, 2007).

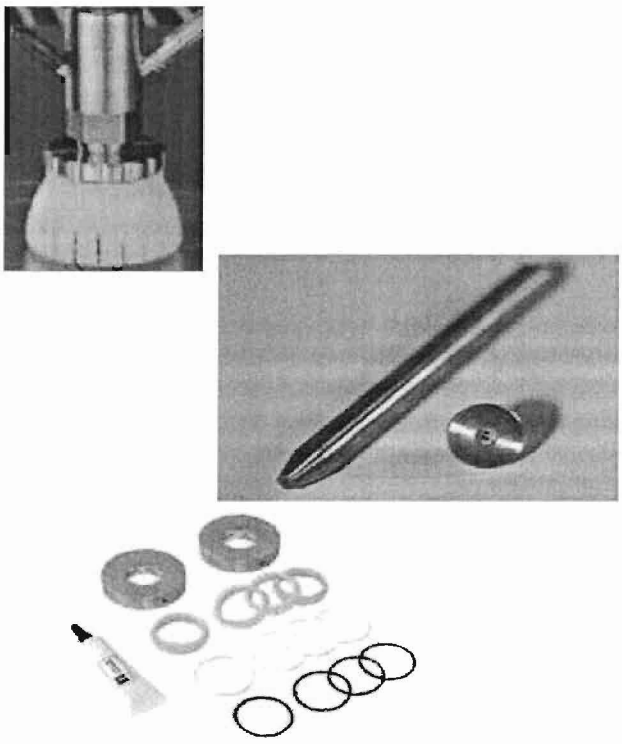

Figure 6: Water-jet after-market parts

WJC sells the products described above in a number of market segments. These include aerospace companies, automotive manufacturers, "job shops" (typically small firms that do custom cutting and shaping jobs for other firms), manufacturers who have enough job-shop work to in-source it, boat builders, construction firms, surface cleaning companies, bridge and highway infrastructure maintainers, makers of complex equipment covers and even artists. In Table 1, we show the proportions of WJC's revenues derived from the products in each of its major customer segments.

In this chapter, we have introduced WJC Corporation. WJC leads the UHP water-jet industry with its pumps, parts and systems. In the next chapter, we will explore the UHP water-jet industry in detail. Thereafter, we will study WJC and its business strategy within the context of the industry.

Table 1: Product-Customer Matrix for WJC

Products	**Customers**								
	Aerospace	Automotive	Job shops	Stone & tile	Electronics	In-house Manufacturing	Surface Cleaners	Other	% of Total by Product
Cutting Systems	10%	5%	30%	2%	-	5%	-	6%	44%
Specialty Applications	10%	10%	-	-	5%	-	-	5%	15%
Surface Preparation Systems	-	-	-	-	-	-	3%	2%	10%
OEM Pumps	-	-	5%	-	-	-	-	2%	5%
Parts	26%								26%
% of Total by Segment	20%	15%	35%	2%	5%	5%	3%	15%	100%

2: ANALYSIS OF THE UHP WATER-JET INDUSTRY

In this chapter, we will examine the UHP water-jet industry in detail. We will start by describing its supply chain and apparent key success factors. Then we will explore the nature of competition in the industry, and finally look to what the future holds.

2.1 The UHP Water-jet Industry's Supply Chain

We can gain some useful insight into the structure of the water-jet industry by constructing an industry supply chain, or flow of goods diagram[13]. Conceptually the flow is straightforward. Raw materials, such as steel and plastic, are machined into components. These components are assembled into pumps, and integrated cutting or cleaning systems. They are sold to end users, either directly or through distributors. This picture is complicated by the fact that different industry participants are vertically integrated to varying degrees, and by the flows of after-market parts and supplies. See Figure 7.

Some analysts have defined the industry for UHP water-jet firms very broadly. For example, Hoovers classifies WJC under "Industrial Machinery & Equipment Manufacturing"[14]. Categorizing water-jets as machine tools is plausible, but it makes more sense to define water-jet firms as a separate industry since they have proved to be

[13] Anthony E. Boardman, Daniel M. Shapiro and Aidan R. Vining, "A Framework for Comprehensive Strategic Analysis", *Journal of Strategic Management Education* (2004).

[14] Hoovers, a D&B Company, "Hoover's Custom Report Builder - WJC Corporation" (March 2007): 12.

an effective substitute for other cutting technologies. Water-jets have become established as the most appropriate technology for many applications. WJC in particular does not often encounter situations where it competes against other machine tool technologies.

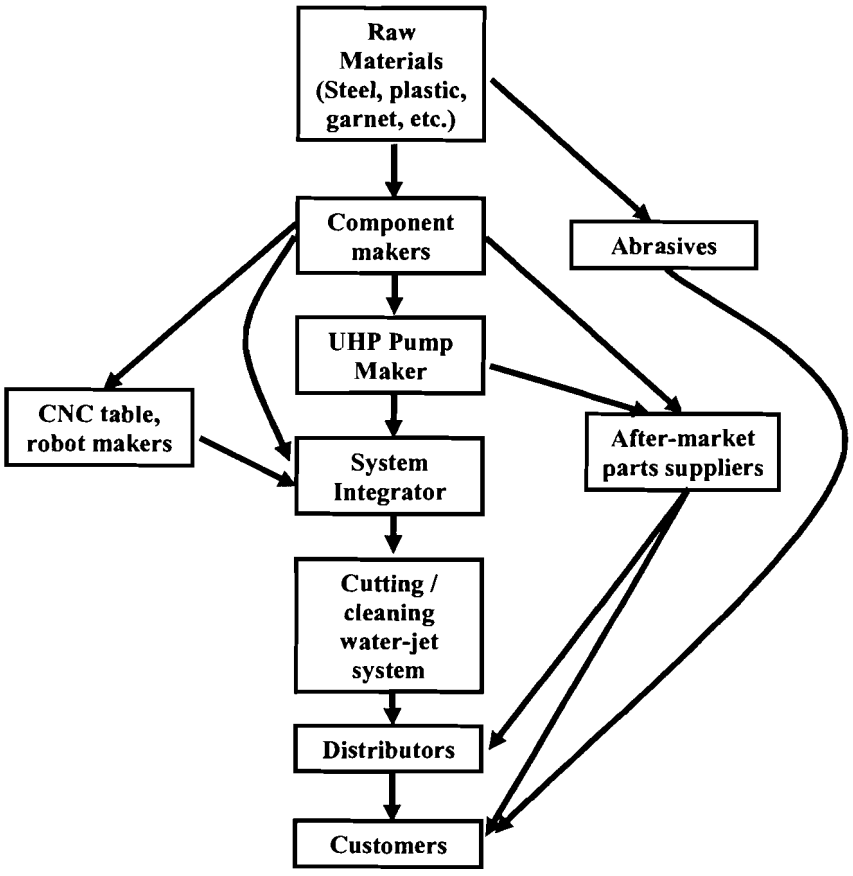

Figure 7: UHP water-jet industry supply chain

2.2 Key Success Factors in the UHP Water-jet Industry

It is useful to identify plausible Key Success Factors (KSFs) arising from our descriptions of WJC and the UHP water-jet industry. This helps us better understand WJC's position in the industry.

2.2.1 Performance

An obvious KSF for the UHP water-jet industry is technological performance. This encompasses many elements, such as reliability of the system, cutting power, cost-efficiency, cutting speed, cutting range (i.e. the thickness of material the water-jet can cut), cutting accuracy and finish quality (smoothness and variability) of the cut material.

This is both an important competitive differentiator in the water-jet industry, and a major part of the reason why water-jets are a compelling substitute for other cutting technologies in the first place: They allow machine shops to realize greater efficiency and productivity, as well as eliminate the adverse effects of heat on a material.

An implication of this KSF is that any firm selling systems differentiated by their performance needs a strong research and development capability to keep its products differentiated. Water-jet performance is improving steadily, and yesterday's high-performance system will eventually become tomorrow's low-cost, low-performance system.

2.2.2 Quality and Reliability

Hand-in-hand with performance goes quality: The makers of water-jet systems must deliver them according to specification or they will have an adverse impact on customer satisfaction. A malfunctioning water-jet costs money in lost production time and potentially causes quality problems with the customer's own products. For similar reasons a water-jet system must be reliable, i.e. it must continue to operate within specifications, without failing too often, and without needing undue downtime for maintenance.

2.2.3 Pre and Post-Sales Service

The complexity of integrated, custom-designed, application-specific UHP water-jet systems makes both comprehensive, competent pre-sales support and post-sales service vital. Water-jet companies need good pre-sales support to educate customers, and to help convince them that their technology works better than other cutting machines[15].

There are several reasons why after-sales service is important: Firstly, the customer must get the advice and training it needs to succeed in achieving optimal performance from the water-jet system. Second, based on analysis of WJC sales data, 32 percent of revenue comes from repeat customers and 34 percent through word-of-mouth referrals[16]. Finally, because of the high pressures used, and particularly with abrasives, the machines consume about 5 percent of their purchase price in spare parts a year[17]. This accounts for 25 percent of WJC's revenue, at better than 50 percent gross margin[18].

Clearly then, good care of existing customers is essential: So much revenue depends on their satisfaction. Customer care means good, fast field support and rapid parts supply, for example.

2.2.4 Systems Integration

We define UHP systems integration as the creation of complete, custom-designed, optimal solutions using UHP water jets for specific applications. There are characteristic

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[15] Paula L. Stepankowsky, "WJC's Strategy Puts a Premium on Custom Orders," *Wall Street Journal,* Jul 26, 2006, Eastern edition, B.2B.

[16] Ibid.

[17] WJC Corp., "WJC Corporation 2007 February Update" (2007): 8. http://www.wjccorp.com/uploadedFiles/Resources/Brochures/Waterjet_Brochures/Waterjet_Brochures/Investor%20Presentation.pdf (accessed March 15, 2007).

[18] Ibid.

differences in cutting different materials for different applications[19]. This makes system integration a KSF as well.

Related to strong integration capabilities, the ability to identify plausible new applications for UHP water-jets is a KSF. Successful application of water-jets to a particular problem by one firm has usually resulted in competitors starting to follow suit. The company that can identify and exploit new water-jet applications first has a useful competitive advantage.

2.3 Forces of Competition in the UHP Water-jet Industry

Porter's Five Forces model is a useful tool to evaluate the attractiveness of an industry[20]. We will use it to evaluate the strength of the competitive forces in the water-jet industry in five categories – the intensity of rivalry amongst industry players, the threat of new entrants to the industry, the threat posed by substitutes or potential substitutes and the respective bargaining power of buyers and suppliers.

2.3.1 Rivalry is Getting Stronger

In this section, we will examine how vigorously WJC and other water-jet industry players compete. A number of factors influence rivalry. We discuss these in some detail below.

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[19] Paula L. Stepankowsky, "WJC's Strategy Puts a Premium on Custom Orders," *Wall Street Journal,* Jul 26, 2006, Eastern edition, B.2B.

[20] Michael E. Porter, "How Competitive Forces Shape Strategy," *Harvard Business Review* 57, no. 2 (March-April 1979): 137-145.

2.3.1.1 The Industry is Growing, but Moderately Cyclic

The UHP water-jet industry is currently growing quickly. This will tend to reduce the intensity of rivalry amongst competitors: It is often easier to go after new business, than to try to take it away from a competitor. This can change quickly, however, if the industry stops growing as fast.

An important factor regulating the rate of growth is how cyclic the industry is. A cyclic industry can vary from rapid growth to negative growth as the broader economy goes through its normal cycle. Indeed, the UHP water-jet industry is arguably cyclic. North American water-jet sales for WJC, and other UHP firms, were flat during the recession of 2001 to 2003[21]. Some might contend that this suggests the industry is less subject to the economic cycle. However, this is obviously a far lower growth rate than the 15-20 percent annual growth rates reported by the most successful water-jet makers since then.

This cyclicality makes sense given that the customers for machine tools are also in cyclical industries. For example, Klier points out that the auto industry is not only cyclical, but that the amplitude of the cycle is even greater than that of the GDP cycle[22]. First Research Inc. notes that demand in the US machine tool manufacturing industry is closely linked to general US industrial activity[23].

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[21] WJC Corp., "WJC Corporation 2007 February Update" (2007): 12. http://www.wjccorp.com/uploadedFiles/Resources/Brochures/Waterjet_Brochures/Waterjet_Brochures/Investor%20Presentation.pdf (accessed March 15, 2007).

[22] Thomas Klier, "Structural change and cyclicality of the auto industry," *Chicago Fed Letter* Issue 159 (November 2000): 1.

[23] First Research Inc., "Machine Tool Manufacture Industry Profile Excerpt," http://www.firstresearch.com/Industry-Research/Machine-Tool-Manufacture.html (accessed June 25, 2007).

More anecdotally, WJC executives have noted that job shops do not buy UHP water-jet cutting systems during manufacturing downturns. Job shops do not get many orders during a recession, and job shops are WJC's largest customer segment. First Research Inc. corroborates this: It states that demand is dependent on US manufacturing activity for this industry of around 23,000 independent machine shops with combined annual revenues of $30B[24]. In other words, Job shops make up a large domestic market segment for WJC, but it is undoubtedly cyclic.

It is worth noting that an individual firm can mitigate the effects of cyclicality through geographic and industry diversification of customers. Diversification takes advantage of these customers' varying positions in their own business cycles. Consequently, global firms like WJC, may enjoy some competitive advantage over smaller players.

2.3.1.2 Economic Structure and Implications

In economic terms, the UHP water-jet industry is an oligopoly. This means that a relatively small number of sellers dominate it[25]. In addition, it has the following characteristics:

- Output capacity is not easy to adjust, due to the need for capital equipment and skilled labour.

[24] First Research Inc., "Machine Shops Industry Profile Excerpt," http://www.firstresearch.com/Industry-Research/Machine-Shops.html (accessed June 25, 2007).

[25] WikiMedia Foundation, s.v. "Oligopoly," http://en.wikipedia.org/wiki/Oligopoly (Accessed July 4, 2007).

- There is limited information available about the strategic choices of competitors. However, they generally do not cooperate with each other. Instead, they respond to each other's strategic moves to maximize their own competitive advantage.
- The density of competitors varies geographically. For example, WJC has more competitors in Europe than North America.
- The density of competitors varies by product segment. There are not many manufacturers of UHP pumps. However, there are a lot more system integrators who can buy the pumps and standard CNC (Computer Numeric Control) tables to make their own cutting machines. This is similar to the more broadly defined machine tool manufacturing industry. First Research Inc. notes that in the US this industry is fragmented, consisting of around 7,000 companies, with the largest 50 firms holding less than 30 percent of the market[26].

Real industries do not often conform exactly to the features or constraints assumed in classical economic models. Nevertheless, they can provide useful insights. One model in particular (Cournot competition), resembles the water-jet industry. Each firm tries to maximize its profits, with the expectation that its own decision of how much output to produce will not affect the output decisions of its rivals. An implication of this model is that there are opportunities for economic rents in the industry, but that they will

[26] First Research Inc., "Machine Tool Manufacture Industry Profile Excerpt," http://www.firstresearch.com/Industry-Research/Machine-Tool-Manufacture.html (accessed June 25, 2007).

be limited to less than monopolistic levels by competition. Another is that firms have an incentive to collude, in order to increase prices and profits to monopolistic levels[27].

In summary, the economic structure of the water-jet industry suggests that we can expect firms like WJC to generate healthy economic profits. We can also expect those profits to erode as the number of competitors in the industry increases.

2.3.1.3 WJC's Competitors

WJC has a number of smaller competitors, but there are only a few of nearly similar scale to WJC. As noted earlier, WJC has a substantial market share (40% to 60% depending on geographical region). In 1994, WJC and Ingersoll-Rand (which subsequently became a division of KMT) held approximately 90 percent of the US UHP pump market between them. As a result, the US government blocked a proposed merger between them on anti-competitive grounds[28].

Some of WJC's significant competitors are subsidiaries of much larger, but also much more diversified, companies than WJC. Considered separately, these division-based competitors are all much smaller then WJC.

While WJC had only one substantial North American competitor in 1994, more competitors have emerged since then. A list of WJC's current competitors follows. We describe them in order of significance to WJC. We do not list all of the smaller players, only the more interesting examples:

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[27] WikiMedia Foundation, s.v. "Cournot Competition," http://en.wikipedia.org/wiki/Cournot_competition (accessed July 2, 2007).

[28] *United States v. WJC Corp. and Ingersoll-Rand Co.*, Civ. No. 94-71320 (E.D. Mich., filed April 14, 1994).

- KMT Waterjet Systems, a division of the KMT Group is still an important WJC competitor. In addition to water-jets, KMT has businesses in precision grinding, robotics and sheet metal working. Its water-jet division enjoyed revenues of US$98 Million in 2006[29].
- Uhde High Pressure Technologies is a German division of ThyssenKrupp Technologies. It has about 200 employees and revenues of US$53 Million.
- Former WJC employees founded OMAX Corporation in 1993. By 2003, it had grown to over 60 employees. It is significant because it holds some patents relating to software control of water-jet equipment technology. It has also been in a legal dispute with WJC since November 2004 over them, as well as other patents held by WJC.
- The Italian firm, Interpump Group, generates total revenues of US$486 Million. Revenue for its industrial division is US$204 Million. UHP pumps form only a part of this division however.
- Gardner Denver Inc is a much larger competitor, with US$1.67 Billion in total revenue. However, it has diversified into many businesses. What it calls its "fluid transfer" business comprised approximately 20 percent of its revenues in 2005[30]. Again, water-jets are only a part of this division.
- WOMA Apparatebau is a German-based company. Primarily it sells components such as UHP pumps to other integrators. Its US subsidiary is small, but Gardner Denver describes it as a significant competitor in its annual report.

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[29] Karolin Machine Tool AB, "KMT Year-End Report 2006," http://www.kmtgroup.com/opencms/en_ZZ/investor/reports/index.html?releaseid=262832 (accessed March 16, 2007).

[30] Gardner Denver, Inc., "2005 Annual Report," http://library.corporate-ir.net/library/64/649/64980/items/216914/2005%20Annual%20report.pdf (accessed March 16, 2007).

- Kennametal is also much larger than WJC, with US$2.33 Billion in total revenues. However, it competes with WJC only in selling after-market parts, particularly the nozzles & mixing chambers. This is valuable, high-margin business because the abrasive mixing chambers, and the nozzles which follow them in the path of the water-jet, wear out more quickly than any other part in abrasive water-jet cutting applications.
- Jet Edge is a Minnesota based organization of only 60 people and annual revenues of US$15 Million. What is interesting about it is the "rave reviews" on service it seems to get from its customers.
- Hughes Pumps in the UK has revenues of approximately US$3 Million.
- Some significant integrated systems competitors, such as Huffman Corporation in South Carolina, PaR Systems in Minnesota and M. Torres in Spain, do not manufacture pumps themselves. Like WJC, they supply advanced 5-axis machining systems, but use pumps from WJC competitors, usually KMT.
- Power Jet is part of Nuclear Engineering Holdings Ltd UK, and has 135 employees. While it has provided solutions for other applications, much of its focus appears to be on applying water-jets to the nuclear industry.
- Kamat Pumpen GmbH, in Germany, has 70 employees. Little other information is publicly available.
- Jetstream Waterjet Cutting Systems in Australia provides an interesting example of the evolution of low-cost, low-performance water-jet systems. Its product is comprised of "off the shelf" Australian, American and Chinese technology. Jetstream does not have its own pump technology however, requiring an external

UHP water source. Realistically, its use is appropriate only where low performance requirements mean little application specificity. However, there is no doubt that less-demanding applications are an increasing fraction of the water-jet market.

From the list above, we note that WJC has only a few competitors in core pump technology. However, it has a greater number of competitors in both systems and parts. The number in pumps is growing slowly, but the number in systems and parts is growing more quickly. WJC's management estimates that it now has at least fifty competitors in the latter two categories. We will explore the reasons for this in our discussion of new entrants.

2.3.1.4 No easy exit

The relatively high fixed costs, specialized skills and intellectual property of any substantial water-jet manufacturing business are also relevant to industry rivalry. The sunk costs of these resources make getting out of the business difficult for an incumbent competitor.

2.3.1.5 In Summary, Increasing Rivalry

We have seen that the water-jet industry is growing quickly, but is cyclic. We have noted that its economic structure implies that firms can enjoy economic profits. We have observed that WJC is the leader in this industry, but its rivals are growing in number. In addition, once a competitor has entered the industry, it will tend not to leave

easily. In summary, we can best describe the intensity of rivalry amongst competitors in the UHP water-jet as moderate, but increasing.

2.3.2 New Entrants – Pumps Are Hard, Tables Are Easy

It is important to note that barriers to entry are considerably different for UHP pump manufacturing and for water-jet systems integration at the cheaper end of the market. Barriers are quite low for the cheap systems, since small start-ups can easily buy pumps and standard CNC (Computer Numerical Control) tables from OEMs (Original Equipment Manufacturers). They can easily combine them into simple water-jet cutting systems, either for use in their own job-shop, or for sale.

Indeed, the number of such competitors WJC encounters in the marketplace has increased as industry profits attract newcomers. For example, WJC personnel noticed about thirteen water-jet competitors at the 2007 "Coverings" trade show for the tile and stone industry. There were only three at the 2004 show.

The barriers to entry are much higher for pump manufacturers. Proprietary technologies, associated patents and specialized engineering expertise mean newcomers must invest heavily in developing their own technologies. Even when they succeed at doing so, they need to contend with established brand identities.

In the market for more advanced cutting systems, barriers are somewhat higher, though not as high as for pumps. Here UHP pumps are integrated into more complex, computer-controlled systems and tuned for specialized applications. High-end tables and robotic systems are less standard and require more expertise. This forces a newcomer

either to invest in such complementary technologies, or to collaborate with an established system integrator. Established integrators are unlikely to help their potential competition.

This narrows the field of potential entrants to existing makers of advanced machine tools based on cutting technologies other than water-jets. High-performance pump suppliers usually have relationships with incumbent integrators or, like WJC, are integrators themselves. This has not stopped entrants getting the pumps they need, however. A few large machine tool manufacturers are currently developing their own water-jet systems based on OEM pumps.

Importantly, customers who have already invested in water-jets for their application experience significant switching costs. This is mostly due to the specialized training required to operate any sophisticated new system efficiently. A customer's investment in such training, as well as the water-jet system itself (e.g. US$600,000 for an electronic chip-cutting machine) represents a substantial sunk cost. This means any technological advance introduced by a newcomer will have to be large, or the cost of the competing system sufficiently low. This factor is not relevant for new customers or new applications however.

Historically, industry incumbents have not retaliated very strongly against newcomers. This may be because the industry is growing at more than 20 percent annually[31] and it is difficult for newcomers to compete in pumps. Entrants have certainly become a threat in systems integration though. Perhaps incumbents are starting to respond more vigorously as a result. The recent tendency appears to be for larger firms to

[31] WJC Corp., "WJC Corporation 2007 February Update" (2007): 23. http://www.wjccorp.com/uploadedFiles/Resources/Brochures/Waterjet_Brochures/Waterjet_Brochures/Investor%20Presentation.pdf (accessed March 15, 2007).

acquire small ones if they succeed in growing much beyond a fraction of 1 percent of the market.

Given the factors described above, it is clear that the UHP water-jet industry has moderate to low barriers to entry, depending on the segment considered. As a result, the number of UHP water-jet competitors has increased a lot in the last few years. This is particularly true of those supplying less sophisticated systems and lower-pressure water-jet equipment than the upper end of WJC's product line.

This more intense competition will quickly erode the profits captured in low-end systems integration. There are still some profits in the supply of pumps for these systems, but there are more suppliers of these as well than at the high end.

2.3.3 Substitutes – More Often Complementary Than Threatening

There are several potential substitutes for UHP water-jets, particularly for cutting applications. These include lasers, Electrical Discharge Machining (EDM), conventional saws, milling machines, plasma torches and sonic knives. However, these substitutes have quite different performance, price, and operating cost characteristics. For example, there is no close substitute for water-jet technology where the adverse impact of heating on a material is of concern. While there are certainly applications for which cheaper cutting technologies make more sense, water-jets outperform all others at the price. There are also applications where a water-jet is currently the only solution.

An additional factor reducing the threat of substitutes is that water-jets can be complementary as well as being a superior substitute. For example, where finer tolerances are required than can be achieved with a water-jet alone, a part can be "rough

machined" with it, and then milled to the desired finish. This is an order of magnitude faster than milling alone.

It is worth noting that almost all of these other cutting technologies existed before water-jets became prominent. The water-jet market grew rapidly because water-jet cutting was often a superior substitute in many applications. Barring the introduction to the market of a disruptive new cutting technology, it is unlikely that customers will choose to substitute their water-jet system in favour of any of the others mentioned. Even if they were inclined to do so, the switching costs described in our discussion of new entrants would discourage them. Therefore, we can conclude that the threat of substitutes is low.

2.3.4 Buyers – Price Is Not At the Top of Their List

There are a large number of buyers relative to the number of significant competitors in the water-jet business. For example, WJC provides its systems to more than two dozen buyers in the aerospace industry alone[32]. While some of these companies, by virtue of their size (e.g. Boeing), are very important to WJC, none of them accounts for more than 7 percent of sales[33]. Many customers are quite profitable, and not especially price sensitive: WJC's water-jet system sales in North America have grown more than 300 percent since 2001, despite increased prices[34]. This is likely because customers experience substantial returns on investment in water-jet systems. They reduce their own manufacturing costs by a much greater amount than their relatively small

[32] Ibid., 5.
[33] Ibid.
[34] Ibid., 17.

water-jet investment. In addition, some manufacturing tasks would be difficult or impossible without water-jets.

Nevertheless, there are clearly limits to the price elasticity of demand for UHP water-jets: The value added to the customer in return for their investment in a water-jet system has to be demonstrable. The marginal benefit a customer receives is the limit of the price they would be willing to pay. This tends to be proportional to the sophistication and degree of application specificity of the system. Price sensitivity is greater in job-shop customers, for example. For them a water-jet represents a relatively large investment and their requirements are usually simpler in the first place.

Even in job-shops, while price is important it is still usually not the overriding consideration. One job-shop owner and prospective WJC customer characterised the price premium for a mid-range water-jet as meaning the difference between a Lexus and a Toyota as his wife's next car. It is telling that he nevertheless selected a more capable WJC product over low cost models available from WJC or its competitors.

WJC's unique products, status as the most recognized water-jet brand worldwide, and the switching costs for customers described earlier, all support water-jet market prices. WJC's gross profit margin of 45.8 percent in its 2006 financial year[35] is evidence of that. Some of WJC's water-jet industry competitors enjoy margins only a little lower[36]. Even for its lower-cost products, WJC still has gross margins of approximately 30 percent.

[35] Hoovers, a D&B Company, "Hoover's Custom Report Builder - WJC Corporation" (March 2007):17.
[36] Ibid., 26.

Finally, water-jet cutting is still in the "early adopter" phase of the technology adoption process. Due to the inherent complexity of the integrated, and often application-specific, water-jet cutting systems, customers require and request a lot of information and support from the industry. This serves both to educate them and to maximize the effectiveness of their technology investment.

All of the above implies that buyers' bargaining power is relatively low in the water-jet industry at present. This could increase, however, as the low-cost segment of the industry grows, and price becomes an important consideration in a greater proportion of water-jet purchases.

2.3.5 Suppliers – Eager to Please

Materials costs, followed by overhead and labour, drive the majority of the manufacturing costs of UHP water-jet systems. However, while suppliers must machine components to fine tolerances, they are not especially unique or complex. They can be substituted with similar parts (perhaps with some need to adjust the water-jet product design), and have many potential suppliers. Therefore, perhaps other than the specialized labour employed by UHP water-jet manufacturers, suppliers to the industry do not have a great deal of bargaining power. That said WJC feels relationships with parts suppliers do matter. A great deal of up-front coordination is required to establish supply chain links for the unique parts WJC custom designs and has manufactured for it.

2.3.6 The Water-jet Industry Is Attractive

Three of the five forces of competition on the industry are relatively weak. The exceptions are the threat of new entrants and rivalry amongst existing competitors. Both

of these are moderate and apparently increasing. We show the five forces graphically in Figure 8.

We can conclude that the UHP water-jet industry is an attractive one for WJC. Considered at a slightly more granular level, the supply of UHP pumps and specialized systems seem to be its most attractive market segments at present.

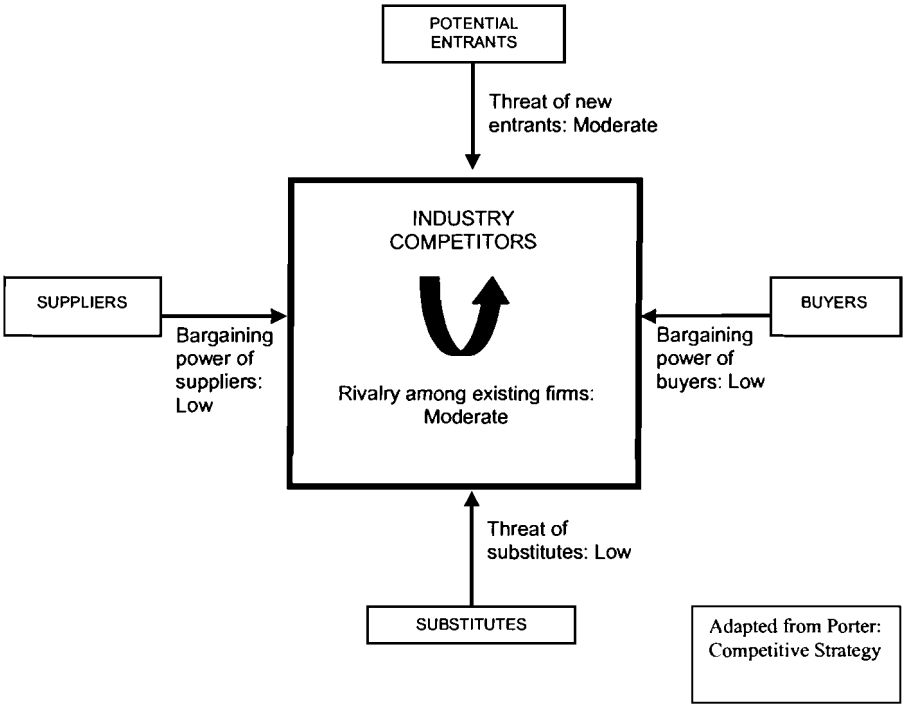

Figure 8: UHP Water-jet Industry Competitive Forces

2.4 Expected Evolution of the Water-jet Industry

We have explored the current state of the UHP water-jet industry. The future state of the industry is of equal importance to strategy. In this section, we will review the industry's life cycle and what its current stage implies. We will also guess what lies ahead for the industry by exploring the broader external forces that act on it.

2.4.1 The UHP Industry Is In Its Growth Phase

Figure 9 shows where the UHP water-jet industry appears to be in its life cycle. The industry life-cycle concept is useful in that it provides clues about expected growth rates, profitability, and so on. One should be cautious, however, because factors such as technological change can suddenly change the shape of the curve. Nevertheless, it appears that the industry will experience strong growth for the next few years.

Independent market size estimates for the water-jet industry are not publicly available. However, First Research Inc. points out that in the broader US machine tool manufacturing industry, firms have combined annual revenues of $25 Billion. It estimates that machining centres alone account for 15 percent of this, or $3.75 Billion[37]. As we have pointed out, water-jet systems are a viable technology for use in a large proportion of machining applications. This suggests the potential market is quite large indeed.

WJC in particular estimates that its global markets have annual revenue potential of more than $1 Billion[38], i.e. more than double the size of the market of which WJC says it enjoys a 40 percent share today. This may be conservative, given the size of the machine tool market. In addition, WJC's sales into many of its market segments have been growing at a compounded rate of more than 25 percent a year since 2004[39].

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[37] First Research Inc., "Machine Tool Manufacture Industry Profile Excerpt," http://www.firstresearch.com/Industry-Research/Machine-Tool-Manufacture.html (accessed June 25, 2007).

[38] WJC Corp., "WJC Corporation 2007 February Update" (2007): 9. http://www.wjccorp.com/uploadedFiles/Resources/Brochures/Waterjet_Brochures/Waterjet_Brochures/Investor%20Presentation.pdf (accessed March 15, 2007).

[39] Ibid., 17.

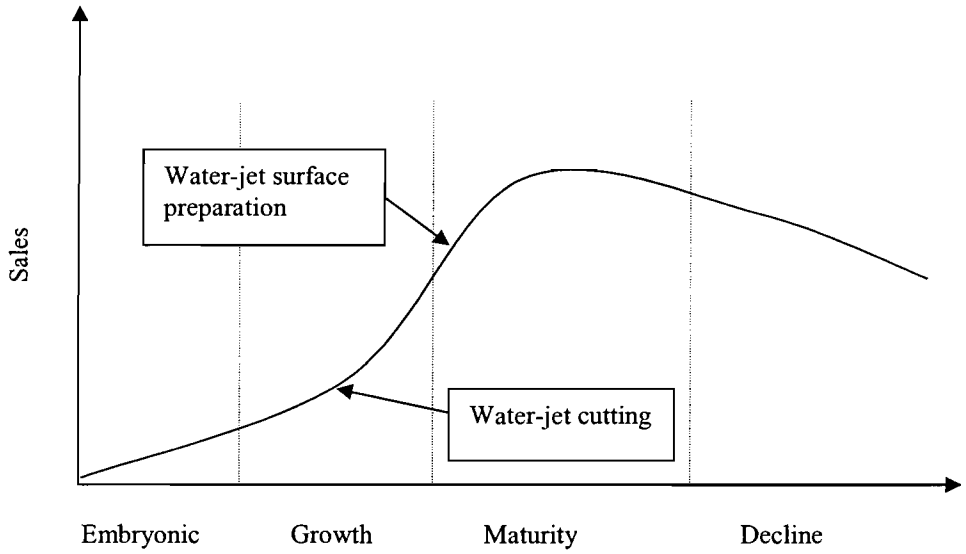

Figure 9: UHP water-jet industry life cycle

The acronym PEST (Political, Economic, Social and Technological) embodies a useful model for understanding the possible evolution of an industry in response to exogenous influences. PEST helps evaluate the impact on the industry of expected macro-environmental political, economic, social and technological changes. We detail the more relevant influences noted by WJC executives below.

2.4.2 Politics Vary

The varying political environment around the world is a consideration for any industry participant that competes globally. This can be both positive and negative from the point of view of a particular firm. It exposes a firm to country-specific risks it may not face domestically. However, geographical diversity can also insulate the firm from the impact of unexpected regulatory changes in one of the countries in which it operates. In addition, with the increasing trend towards globalization, more open markets and

lower trade barriers, firms with global reach will benefit from the availability of new market opportunities. WJC, for example, is currently enjoying rapid sales growth in its Chinese market.

A final political factor is largely specific to WJC for the moment as the dominant industry player: Any acquisition WJC wishes to make will be subject to scrutiny by government anti-trust authorities. Indeed, as already noted, the US government prevented WJC and Ingersoll-Rand from merging in 1994. It did so because this would have created a single firm with a domestic market share of more than 90 percent[40].

2.4.3 The Economics Are Mostly Favourable For Now

We have already noted the cyclical nature of the UHP industry. Certainly, an economic downturn in the US would be a significant drag on WJC's growth. The US is WJC's largest geographical segment, and the largest domestic customer segment is job shops. WJC's management feels demand for water-jet systems would decline significantly in a recession. Industrial production continues to grow at 1.6 percent however, despite indicators such as the slowing of the housing market and the widening current account deficit in the US[41].

The aging of the "baby boomer" generation is a demographic shift likely to affect the industry. This will lead to a tighter employment market, and therefore increase labour costs, which comprise a significant part of industry COGS (Cost of Goods Sold). Similarly, more intense competition for R&D staff, such as engineers, may affect firms'

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[40] *United States v. WJC Corp. and Ingersoll-Rand Co.*, Civ. No. 94-71320 (E.D. Mich., filed April 14, 1994).

[41] The Economist Newspaper Ltd., "Economic and Financial Indicators," *The Economist* 383, no. 8534 (June 2007): 105.

ability to innovate. WJC in particular has recently had some difficulty filling open positions for skilled trades and professionals. Unemployment is particularly low in the Seattle market right now. WJC is competing for the best people against some prominent firms, such as Boeing, Microsoft, T-Mobile, Amazon, Expedia and Starbucks.

The final factor we will comment on in this category is the growing trend towards outsourcing. This has been beneficial for the UHP water-jet industry: For example, WJC has found that as its big aerospace customers outsource the manufacturing of more components, it is able to sell a larger number of water-jet systems to these upstream suppliers than it estimates it would have sold to the aerospace firms themselves.

2.4.4 Social Concerns – Green Is Good

The UHP water-jet industry has benefited from the increasing importance of environmental issues. Abrasive water-jets do not use any environmentally hazardous substances (only water and garnet). This trend will probably continue, and contribute to the profitability of the industry.

2.4.5 Is There a Disruptive Technology Just Ahead?

The use of composites is increasing rapidly, not only in aerospace, but also in many manufacturing sectors. Water-jets are ideally suited to cutting and shaping them, so this should encourage continuing industry growth.

Water-jet technology has continued to improve steadily as well. Ongoing performance improvements should keep opening up new application opportunities. However, there appear to be some significant long-term technology challenges ahead.

Ever-higher pressures make systems more challenging to build, and there are undoubtedly physical limitations to just how high they can go.

An additional concern for the industry is what the next disruptive machine tool technology might be. The UHP water-jet industry has itself benefited from being such a disruptive technology. In that light, complacency would be ill advised. By definition, the introduction of a disruptive technology is unexpected, but it is worth engaging in regular environmental scans to identify candidates.

One possible threat is ultrasonic technology. It is used for some cleaning applications and, recently, cutting soft materials such as food and some composites. It has some useful attributes, such as a very clean process. No one has applied them to cutting very thick or very hard materials yet. However, no one applied water-jets to such materials either until the introduction of the abrasive kind.

2.5 Summary – An Attractive and Growing Industry

In this chapter, we have seen that the UHP water-jet industry is an attractive and growing industry. It has a future that continues to look promising. This is attracting new entrants, though more to some parts of it than to others. As a result, we can expect rivalry to become more intense in future. We have also seen that performance, quality and service are key success factors for industry participants. In the next chapter, we will explore WJC's strengths and weaknesses. We will also discuss what they mean in terms of its ability to compete in the water-jet industry.

3: WJC'S ABILITY TO COMPETE

In this chapter, we will conduct a detailed internal analysis of WJC. We will identify and explore WJC's resources and capabilities in detail. These are fundamental to a firm's competitive advantage, if any.

3.1 WJC's Strengths and Weaknesses

The purpose of our analysis is to identify WJC's internal strengths and weaknesses. We will assess them in terms of whether they contribute to or detract from WJC's potential for competitive advantage in the UHP water-jet industry. WJC needs to tailor its strategy to take best advantage of the internal resources and capabilities it has, or can reasonably develop, and minimize the detrimental impacts of its weaknesses. In doing so, WJC can optimize its alignment with the industry KSFs discussed earlier.

To analyse WJC's strengths and weaknesses, we use a modified value chain[42] as an organizing principle. A value chain divides the value-adding activities of a business into different generic primary and support categories. Using it as a visual tool lends focus and thoroughness to our examination of how WJC's strengths or weaknesses add or subtract value, via their effects on how the business performs its activities[43].

We conducted a survey of WJC executives to identify strengths and weaknesses and their associated value chain activity categories. We show the result in Figure 10. We

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[42] Michael E. Porter, *Competitive Advantage: Creating and Sustaining Superior Performance* (New York: Free Press, 1985): Chapter 1.

[43] W. Jack Duncan, Peter M. Ginter and Linda E. Swayne, "Competitive advantage and internal organizational assessment," *Academy of Management Executive* Vol. 12, No. 3(1998): 6-16.

call out the strengths and weaknesses for each value chain activity and number them for easy reference in the subsequent steps of our analysis. These steps are to categorize the strengths and weaknesses and assess their importance as sources of competitive advantage and disadvantage. After that, we go on to discuss them in more detail.

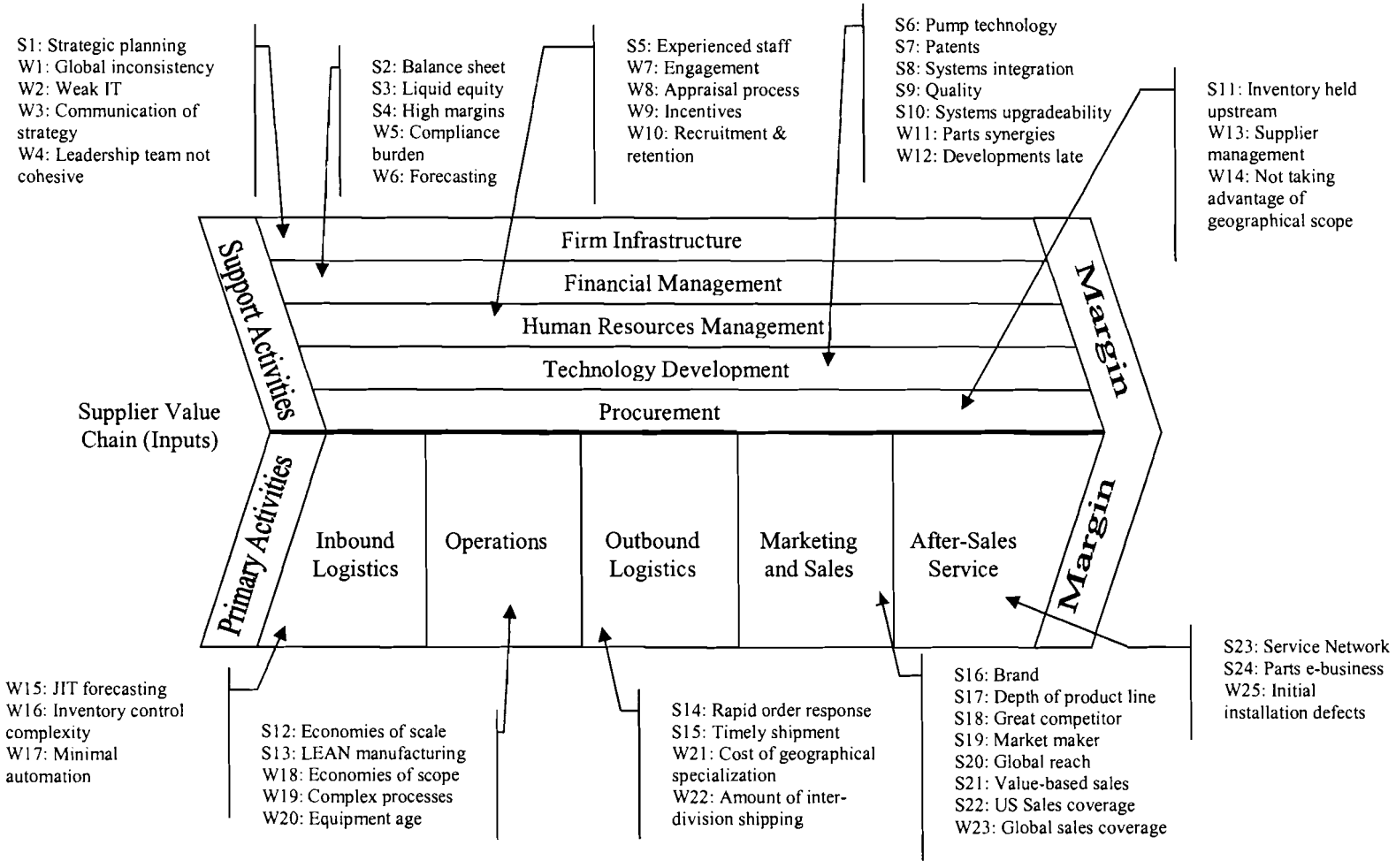

Figure 10: WJC's Strengths and Weaknesses Related to Primary and Support Activities in Porter's Modified Value Chain

3.2 WJC's Competitively Relevant Strengths and Weaknesses

The next step in our assessment process is to categorize strengths and weakness as resource or capability related: We can define resources as tangible or intangible assets. They include such things as land, machinery, financial capital, people with particular expertise, patents, goodwill, reputation, culture, etc. Capabilities are mechanisms or abilities to combine resources in novel and useful ways. Both resources and capabilities matter a great deal because "sustained competitive advantage is based on the acquisition of resources that possess a unique relationship to the external environment and are integrated in innovative ways[44]."

After we categorize the strengths and weakness, we assess them along dimensions of value, rareness, imitability and sustainability. These dimensions allow us to gauge how much of an advantage or disadvantage a strength or weakness represents:

- Value: How valuable is a resource or capability to a customer if we have it? How valuable is it to a competitor if they have it and we do not?
- Rareness: How many of our competitors have a resource or capability? It is not a competitive advantage if all our competitors possess it. It is a disadvantage if a competitor has it and we do not.
- Imitability: It is an advantage if we have a resource or capability that a competitor does not have and cannot obtain. Similarly, it is a disadvantage if we have no means of obtaining a competitor's resource or capability.

[44] W. Jack Duncan, Peter M. Ginter and Linda E. Swayne, "Competitive advantage and internal organizational assessment," *Academy of Management Executive* Vol. 12, No. 3(1998): 10.

- Sustainability: How well will we be able to sustain the value, rareness and inimitability of our resource or capability? How well can a competitor sustain its advantage?

We use the following scale for each of the dimensions above. Our assessment of WJC's categorized strengths and weaknesses follows in Table 2.

- Inadequate/uncompetitive: Below the minimum needed to be in the business
- Adequate/unattractive: At the minimum needed to compete at all
- Attractive: Better than the minimum, but neither a remarkable advantage or disadvantage
- Potential: Worthy of attention and an important strategic consideration
- Competitive: Is a clear competitive advantage or disadvantage
- Distinctive: Not only competitive, but cannot be imitated

Table 2: Assessment of WJC's Internal Factors for Strategic Advantage

Strength(S)/ Weakness(W)	Power of the Strength / Weakness			
Resources	**Value**	**Rareness**	**Imitability**	**Sustainability**
S2: Strong Balance sheet	Potential	Competitive	Competitive	Potential
S3: Liquid equity	Attractive	Potential	Unattractive	Unattractive
S4: High margins	Competitive	Competitive	Competitive	Potential
S5: Staff experienced in water-jets	Competitive	Competitive	Competitive	Competitive
S7: Patents	Distinctive	Competitive	Distinctive	Distinctive
S9: Quality	Competitive	Potential	Competitive	Competitive
S10: Systems upgradeability	Potential	Potential	Attractive	Potential
S12: Economies of scale	Potential	Competitive	Potential	Competitive
S16: Brand	Distinctive	Competitive	Distinctive	Competitive
S17: Depth of product line	Competitive	Distinctive	Competitive	Competitive
S21: Value-based Selling skills	Potential	Attractive	Attractive	Competitive
S22: US Sales coverage	Competitive	Competitive	Competitive	Competitive
S23: Service Network	Competitive	Competitive	Competitive	Competitive
W4: Leadership team not cohesive	Unattractive	Unattractive	Unattractive	Unattractive
W5: Compliance burden	Unattractive	Unattractive	Unattractive	Unattractive
W7: Employee Engagement	Unattractive	Unattractive	Unattractive	Attractive
W9: Incentives structure	Unattractive	Unattractive	Potential	Potential
W18: Economies of scope	Attractive	Potential	Potential	Potential
W20: Old manufacturing machinery	Unattractive	Unattractive	Potential	Potential
W23: Global sales coverage	Potential	Potential	Potential	Attractive

Strength(S)/ Weakness(W)	Power of the Strength / Weakness			
Capabilities	**Value**	**Rareness**	**Imitability**	**Sustainability**
S1: Strategic planning	Potential	Attractive	Potential	Potential
S6: Pump technology development	Distinctive	Distinctive	Competitive	Competitive
S8: Systems integration capabilities	Competitive	Potential	Competitive	Competitive
S11: Inventory held upstream	Attractive	Adequate	Inadequate	Adequate
S13: LEAN manufacturing	Competitive	Competitive	Attractive	Competitive
S14: Rapid order response	Competitive	Distinctive	Potential	Competitive
S15: Timely shipment	Potential	Potential	Attractive	Potential
S18: Great competitor	Competitive	Competitive	Potential	Competitive
S19: Market maker	Competitive	Competitive	Competitive	Potential
S20: Global reach	Competitive	Distinctive	Competitive	Competitive
S24: Parts e-business	Competitive	Potential	Potential	Potential
W1: Global process inconsistency	Inadequate	Unattractive	Unattractive	Potential
W2: Weak IT capabilities	Inadequate	Unattractive	Potential	Potential
W3: Communication of strategy	Inadequate	Unattractive	Unattractive	Attractive
W6: Forecasting	Unattractive	Unattractive	Unattractive	Adequate
W10: Recruitment & Retention	Unattractive	Unattractive	Unattractive	Unattractive
W11: Parts synergies	Unattractive	Attractive	Potential	Attractive
W12: Developments late	Unattractive	Unattractive	Attractive	Attractive
W13: Supplier management	Unattractive	Attractive	Attractive	Potential
W14, W21, W22: Not taking advantage of geographical scope in procurement & logistics	Unattractive	Unattractive	Unattractive	Potential

Strength(S)/ Weakness(W)	Power of the Strength / Weakness			
Capabilities	**Value**	**Rareness**	**Imitability**	**Sustainability**
W15: Inaccurate JIT forecasting	Unattractive	Unattractive	Unattractive	Attractive
W25: Initial installation defects	Uncompetitive	Uncompetitive	Unattractive	Unattractive
W16,17: Manual & complex Inbound logistics	Unattractive	Unattractive	Unattractive	Attractive

3.3 WJC's Strengths and Weaknesses as Sources of Competitive Advantage

We consider strengths competitively relevant if we have rated it as distinctive or competitive on a substantial number of dimensions. Similarly, a weakness is competitively relevant if it gets a substantial number of inadequate or unattractive ratings. We evaluate the remaining competitively relevant strengths or weaknesses in terms of their ability to add or subtract value as a cost or uniqueness driver. The result for WJC is in Table 3, along with the location on the value chain of the strength or weakness.

Table 3: **WJC's Relevant Strengths and Weaknesses as Potential Sources of Competitive Advantage and Disadvantage**

Strength / Weakness	Description	Potential source of advantage / disadvantage	Location on Value Chain
S4 Resource	High margins	Cost driver	Financial Management
S5 Resource	Staff experienced in water-jets: Drives unique capabilities	Uniqueness driver	HR Management
S7 Resource	Patents	Uniqueness driver	Technology Development
S9 Resource	Quality: Key Success Factor	Uniqueness driver	Technology Development
S16 Resource	Brand	Uniqueness driver	Marketing & Sales
S17 Resource	Depth of product line: Gives sales force tremendous credibility	Uniqueness driver	Marketing & Sales
S22 Resource	US Sales coverage: Close to the customers. Results in responsiveness & better relationships	Uniqueness driver	Marketing & Sales
S23 Resource	Service Network: Key Success Factor	Uniqueness driver	After-Sales Service
S6 Capability	Pump technology development	Uniqueness driver	Technology Development
S8 Capability	Systems integration capabilities	Uniqueness driver	Technology Development
S13 Capability	LEAN manufacturing	Cost driver	Operations
S14 Capability	Rapid order response: Key Success Factor, especially on parts supply	Uniqueness driver	Outbound Logistics
S18 Capability	Great competitor: Winning 92-95% of head-to-head competitions	Uniqueness driver	Marketing & Sales
S19 Capability	Market maker: Tremendous booster of both brand and credibility	Uniqueness driver	Marketing & Sales
S20 Capability	Global reach: Very desirable for customers who are global too	Uniqueness driver	Marketing & Sales

Strength / Weakness	Description	Potential source of advantage / disadvantage	Location on Value Chain
W4 Resource	Leadership team not cohesive: Reduces organizational effectiveness	Uniqueness driver	Firm Infrastructure
W5 Resource	Compliance burden: Being a small public firm drives high overhead costs.	Cost driver	Financial Management
W7 Resource	Employee Engagement: Not awful, but very important to e.g. customer service	Uniqueness driver	HR Management
W1 Capability	Global process inconsistency: Lost opportunities for synergy	Cost driver	Firm Infrastructure
W2 Capability	Weak IT capabilities: Poor decision support	Cost driver	Firm Infrastructure
W3 Capability	Communication of strategy: Reduces organizational effectiveness	Uniqueness driver	Firm Infrastructure
W6 Capability	Forecasting: Results in sub-optimal procurement and operations	Cost driver	Financial Management
W10 Capability	Recruitment & Retention: Need great people to add value	Uniqueness driver	HR Management
W14, W21, W22 Capability	Not taking advantage of geographical scope in procurement & logistics	Cost driver	Procurement & Outbound Logistics
W15 Capability	Inaccurate JIT forecasting: Results in stock-outs, delays, upset customers	Uniqueness driver	Inbound Logistics
W25 Capability	Initial installation defects: Upsets customers	Uniqueness driver	After-Sales Service
W16,17 Capability	Manual & complex Inbound logistics: Unnecessary costs	Cost driver	Inbound Logistics

3.4 Understanding WJC's Competitive Advantages and Disadvantages

We now have a clear understanding of WJC's competitively relevant strengths and weaknesses and their effect on its value chain. We go on to explore some of them in

more detail. We must not only evaluate resources and capabilities in terms of possible corresponding generic strategies. We must also seek to integrate understanding of WJC's strengths and weaknesses with knowledge of the external opportunities and threats facing it[45].

3.4.1 The Best Pump Technology

We identified technology performance as a Key Success Factor earlier. WJC has great strength in this regard. It currently has water-jet pumps that operate at higher pressures than any competing unit does: WJC manufactures pumps that operate at up to 87,000-psi. Most others have pumps around 40,000-psi to 50,000-psi. Only one smaller competitor (Uhde High Pressure Technologies) currently has 87,000-psi water-jet technology. In addition, only WJC makes single stage pumps operating at such high pressures. Multi-stage pumps are much less reliable. As a result, WJC has the highest performing and most reliable systems in the industry.

Not only is WJC the pump technology leader now, but it has an outstanding pump technology development capability. In addition, its technology patents constitute a significant barrier for competitors to overcome. Due to both factors, WJC has successfully remained at least two years ahead of its competitors. Clearly, WJC's strong lead in technology affords it opportunities for continued growth, both by attracting new customers to water-jet technology and by winning business from competitors with inferior technology.

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[45] W. Jack Duncan, Peter M. Ginter and Linda E. Swayne, "Competitive advantage and internal organizational assessment," *Academy of Management Executive* Vol. 12, No. 3(1998): 13.

There is a threat here as well though. One competitor has caught up with an 87,000-psi pump. Though smaller, Uhde could have access to substantial resources as a division of ThyssenKrupp. It also has 200,000-psi pumps used for other applications. Uhde could gain technological superiority in pumps if it ever succeeds in making such high-pressure units sufficiently reliable for use in industrial water-jets. There are significant technological barriers it will have to overcome to do so however. Other competitors are also working hard to close WJC's lead in pumps.

A factor mitigating this threat is that pump performance is not enough by itself. Integrating pumps into usable systems is a KSF as well, particularly for higher-pressure pumps. A competitor who catches up in pump technology would need either to possess this capability, or collaborate with someone who did. Finding systems integration capability is not difficult for lower pressures. Using higher pressures adds substantial complexity however.

Increasing system complexity with ever-higher pressures is actually a long-term threat for WJC as well as a short-term barrier to competitors. Given the forces involved, WJC has to build its highest-pressure systems more sturdily, and controlling the water-jet becomes more difficult. There also appear to be diminishing returns in cutting performance above approximately 120,000-psi. As a result, the end of the pump-performance race may be in sight.

Finally, the high-end market may erode as older technology moves down-market. This has happened in other industries before. The increasing performance of low-end pumps will likely prove sufficient for an ever-greater proportion of applications. This

would result in steady commoditization of pump technology, perhaps in as little as five years from now.

3.4.2 And a World-Class System Integrator Too

WJC has a highly competitive systems integration capability to go along with its core competency in pumps. It has built many of the most advanced systems deployed in the marketplace. It dominates the aerospace segment with such systems for example. In addition, WJC has successfully developed various complete, custom and proprietary systems for several new applications of water-jet technology. In conjunction with WJC's strength in pump technology, the result is application specific machines that outperform those of the competition.

It is important to remember, however, that WJC is not the only integrator, and the field gets increasingly crowded further down the performance spectrum. A considerable number of firms with only a few employees buy OEM pumps and standard CNC tables, and combine them for less demanding, general-purpose cutting applications.

WJC's current approach of providing an end-to-end solution is certainly not the only viable one. For example, KMT focuses only on the manufacture of pumps, cutting heads and accessories, leaving the building of systems to integrators.

3.4.3 With a Complete Line of Products

WJC's senior sales and marketing executives have cited the "completeness" of its product line as an important competitive advantage: WJC sells systems ranging in price from millions of US dollars to as little as $60,000. It does not actually sell many of its low-end models. The fact that it has one available to go along with its unrivalled, top-of-

the-line models, lends its sales people a great deal of credibility in articulating the value added by the more expensive machines. This usually results in the customer choosing a more sophisticated model than the relatively low performance, bare-bones $60,000 unit.

3.4.4 Pioneering New Applications

WJC has been first to bring several new applications of water-jet technology to the market. It is widely acknowledged as an industry pioneer. However, this inventiveness has occasionally been a double-edged sword. In the early 1990s, WJC suffered from poor financial performance because of wide and fragmented efforts to develop new applications for water-jets. It often failed to consider thoroughly whether there was a market for the resulting technology[46].

A good example is how WJC developed technology to pasteurize food without heat. This application used WJC's UHP water pumps to create pressures that destroy bacteria in food. There was considerable excitement in both the water-jet and food industries. Unfortunately, WJC lacked the financial resources and food industry expertise to bring the technology to market successfully. WJC had no choice but to exit this business after having already invested US$70 Million in it[47].

Nevertheless, WJC's greatest opportunities may lie in using its systems integration prowess to develop new water-jet applications. Not only can it expand the overall water-jet market this way, it would initially be the only supplier for any of its new applications. As such, WJC could enjoy above normal returns once it had recouped its initial investment.

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[46] The Gale Group, Inc., "WJC Corporation," International Directory of Company Histories (2006), http://www.answers.com/topic/wjc-corporation (accessed March 14, 2007).

[47] Ibid.

3.4.5 Like a Swiss Watch...

WJC water-jet systems have a market reputation for quality. They operate reliably within cutting performance specifications as long as the customer maintains them properly. This is partly a result of WJC's focus on improving quality over the last few years. Its stated aim has been manufacturing with "fewer defects".

Interestingly, WJC has stated an additional aim to reduce the cost of quality[48]. This may seem counter-intuitive: Higher quality products tend to cost more. However, correcting defects cost less the earlier in the manufacturing process they are fixed. WJC has realized this. On the other hand, this may be an early sign of increasingly intense cost-competition in the water-jet market. In any event, given that machine quality is a KSF, especially in the premium market, this is a significant asset for WJC.

3.4.6 ...Once You Get It Going

WJC's water-jet quality strength is somewhat offset by a rate of initial problems at installation that is troubling, though far from catastrophically high. WJC completes assembly of large systems on site. WJC has some of the parts shipped directly from third-party component suppliers. WJC's field service team believes that defects in these parts are usually the cause of teething troubles. Once they are resolved, the machines operate to specifications, but this means that the customer's initial impression of WJC suffers. Extraordinary, and no doubt expensive, efforts in customer service are required to restore trust.

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[48] WJC Corp, "Velocity: Global Transformation Project - Business Strategy Workshop Output" (January 13, 2007): 6.

3.4.7 Creating a Market

WJC has a sales presence in 14 countries - more than any competitor does, though some competitors may be stronger in their local geography. In the US, WJC has initiated a "Sales Optimization" program. It has added direct sales staff and is using agents as "finders and qualifiers" of new sales leads[49]. WJC has also been instrumental in raising broader awareness of water-jet technology. For example, it provided Orange County Choppers with a water-jet machine featured prominently on The Learning Channel. It has also been successful in associating itself with other strong brands, such as Boeing and NASA. WJC's salespeople assert that its status as a "market maker" has been a tremendous boost to WJC's brand and their own credibility.

3.4.8 The Customers Want After-Sales Service

WJC believes that after-sales service and support has become one of the most important decision criteria for buyers of machine tools. In an interview conducted for this paper, WJC's CEO cited a survey of machine tool customers in which service ranked most important, ahead of both technology and price.

After-sales service used to be somewhat of a weakness for WJC. To overcome this, WJC instituted an "Adopt a Customer" program. Its aim was to increase the percentage of US customers within a 3-hour drive of an FSE (Field Service Engineer) from 62 percent to 92 percent. Customers have responded favourably to this[50].

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[49] WJC Corp., "WJC Corporation 2007 February Update" (2007): 14. http://www.wjccorp.com/uploadedFiles/Resources/Brochures/Waterjet_Brochures/Waterjet_Brochures/Investor%20Presentation.pdf (accessed March 15, 2007).

[50] Ibid., 15-16.

More broadly, WJC has unrivalled geographical reach, with a solid service presence in 14 countries worldwide. WJC compares favourably to competitors on this KSF. That affords it opportunities to win business from them. In theory, there is some level of threat from smaller competitors with niche strategies. They could win some business in their niche from WJC by servicing it at a higher level than would make sense at the margin for WJC. There are few signs that this is happening so far though.

An important aspect of after-sales service is the provision of replacement parts. Customers consider rapid turnaround as vital. This is very high-margin business for WJC, driving a substantial part of its profits. WJC's e-commerce channel for parts orders has proved to be enormously popular. Customers now order a majority of parts this way. WJC also has excellent parts order performance. It turns most orders around in the same day and delivers 98 percent on time.

The availability of cheaper after-market parts, e.g. from Kennametal, is a threat in this arena. WJC's response to this has been two-fold. It has provided better access to FSEs as described. It is also using multi-level branding of parts to compete with low cost alternatives when necessary[51]. Naturally, WJC would like to minimize its use of the latter strategy due to the lower margins it earns this way.

3.4.9 The Leading Brand

It would be hard to overstate the value of WJC's brand in the water-jet marketplace. The marketplace rarely questions the performance of any product with WJC's brand. Most customers given a "money is no object" decision would choose WJC.

[51] Ibid., 8.

This narrows the options for WJC's competitors. Usually, the only tactic available to them is attacking WJC on price.

Such is WJC's reputation that even small, price-sensitive job-shops will often choose WJC. Their risk-aversion outweighs their normal price-sensitivity: The failure of their water-jet systems would affect many job shops' business very badly.

3.4.10 A Strong Balance Sheet

We will examine WJC's financials later in this paper. Suffice it to say for the moment that WJC has a stronger balance sheet than do most of its current competitors. Clearly, this resource affords WJC some strategic options not available to them.

One concern for WJC is that there are a few very large firms, such as Mitsubishi, with water-jet technology in their portfolio. WJC suspects that Mitsubishi has not had much success with water-jets largely due to a lack of focus. Certainly, companies like Mitsubishi have very substantial resources and capabilities. It could prove to be a formidable competitor if it decided to throw its full weight behind its water-jet efforts.

3.4.11 Great People

WJC has an invaluable asset in its people. There has been a recent influx of new employees with fresh ideas. In addition, many employees have been with WJC for a long time, decades in some cases. Their depth of industry knowledge and experience is unmatched.

Unfortunately, WJC has lost some valuable contributors in the organizational turmoil of its more difficult years. As a result, many of these former employees now

work for competitors. Indeed, former employees founded at least one of WJC's significant competitors.

3.4.12 Global Reach

WJC's global reach is a significant differentiator for it. This is especially the case with respect to customers who are multinationals themselves. This has helped WJC dominate the aerospace market segment. Large firms manufacture components of their products all over the world. These firms value WJC's capacity to supply them with the same water-jet technology and service wherever they have manufacturing operations. WJC is currently unique amongst its competitors in having this capability. It would require substantial resources for any of them to duplicate it. Therefore, WJC's geographical reach is an important strategic asset.

WJC has not yet taken much advantage of one aspect of its global reach, however. WJC currently manufactures all of its pumps in Washington, advanced systems in Indiana, and specialized applications in Ontario. It incurs significant logistics costs in moving parts to these plants, and finished goods from them to each other and to customers. WJC has not yet analyzed opportunities to manufacture in locations that might lower costs or add value to customers, through more timely delivery and in other ways. Similarly, WJC is missing opportunities to optimize procurement geographically.

3.4.13 ...And Global Complexity

A negative side to WJC's global reach is its relative complexity in comparison to operating in a single country. As is the case for any global firm, it must account for regulatory, cultural, market segmentation and other regional differences. WJC has found

this more difficult because it acquired many of its overseas divisions and then left them to operate with a great deal of independence. As a result, there are many inconsistencies in business processes across divisions.

Now WJC has recognized the competitive advantage of acting globally. These inconsistencies are making that considerably harder than it should be. Costs are increased, supply chain and inter-divisional accounting challenges abound and regulatory compliance in many divisions has proved to be an expensive challenge.

WJC's weak IT systems are making these issues worse. The systems are failing to provide the levels of automation and decision support WJC needs. Even within individual divisions, this has resulted in business processes that are unnecessarily complicated, and riddled with workarounds.

WJC executives are of the opinion that its geographically inconsistent business processes and inadequate IT capability will seriously constrain its growth if they are not rectified. WJC is investing heavily in IT now in order to remove this constraint. However, renewed IT systems will not realize their potential until WJC has harmonized its business processes. WJC is in the early stages of undertaking this effort.

3.4.14 To Be or Not to Be...Public

In addition to the issues of geographical complexity described above, WJC is subject to a greater regulatory compliance burden because it is a public company. Naturally, WJC incurs substantial costs in complying with regulations. This is competitively relevant because few of its rivals are public companies.

It would be disingenuous to suggest that being a public company has been bad for WJC in all respects however. It was access to public equity markets that enabled WJC to settle otherwise unsustainable levels of debt during the course of its turnaround. As noted earlier, however, at least one shareholder has asserted publicly that it would be better for WJC to go private now.

Some WJC executives have expressed a final complaint about being public. That is the cycle of quarterly reporting, which increases accounting and investor relations costs. In addition, more than a few observers have contended that quarterly reporting is a major cause of short-term management thinking that is sub-optimal from the point of view of long-term economic value added[52].

3.4.15 Communication Breakdown

An employee survey conducted at WJC in April indicated that the overall level of engagement amongst WJC employees is about average. It had also improved significantly from the prior year[53]. However, employees consistently rated having a clear strategy and communication from executive level management poorly. Interestingly, ratings became progressively better with increasing management rank. WJC's senior team believes they have a clear strategy, although we noted some varying opinions during executive interviews for this paper.

Assuming it is true that WJC has a clear strategy, these low-rated factors together suggest that the real problem is communication. Executives have not succeeded in communicating the strategy fully or clearly enough to employees at all levels of the

[52] Dean Krehmeyer, Mathew Orsagh and Kurt N. Schacht, "Breaking the Short-Term Cycle," *CFA Centre for Financial Market Integrity* (2006): 2.

[53] WJC Corp., "WJC employee engagement survey" (April 2007).

organization. Evidently, this is a threat to WJC's performance. Employees lacking clear "line-of-sight" to corporate strategy are more likely to engage in sub-optimizing behaviour from the point of view of the firm as a whole.

As noted earlier, there has been a substantial influx of new employees at WJC. This has been particularly true in the ranks of management. As a result, WJC's corporate culture is in a state of flux. This will be a distraction and result in sub-optimal performance until the culture settles into a new state. On the other hand, it affords WJC an opportunity to mould a culture that could have a long-term and substantial positive influence on its performance. Realizing such an outcome will require greatly improved communications throughout the organization. Fostering employee understanding of how they fit into the overall strategy will require the same.

3.4.16 Is WJC Socially Awkward?

The final weakness we will review is WJC's management of relationships with stakeholders. WJC's relationships are not actually bad in most cases. However, it does not seem to pay much conscious heed to relationships in their own right. As a result, WJC is probably missing some opportunities to drive better performance, or lower costs, or both, by building stronger partnerships. For example, doing so with key suppliers might result in better quality, reliable delivery, lower prices and a host of other benefits.

Similarly, long-term parts and maintenance contracts with customers, or at least cultivating and measuring high quality relationships with them, could provide WJC with some protection of its lucrative after-market for parts. Finally, WJC's legally contested

acrimony with one of its competitors is expensive at the very least. Only time will tell which party to the dispute will be better off afterwards. Probably neither will be.

3.5 Summary - WJC's Strategic Assets

Strategic assets are defined as resources or capabilities that are unique, sustainable, create synergy amongst different parts of the business, and create a competitive advantage[54].

In summary, the information in this chapter allows us to identify WJC's strategic assets as its brand, pump technology development capability, systems integration capability, patents, geographical coverage and after-sales service capability. However, in order to leverage them for sustained growth, WJC needs to overcome its organizational weaknesses in communication and in consistency of global business processes.

In the next chapter, we will explore how WJC currently tries to use these strategic assets for competitive advantage in the water-jet industry.

[54] Anthony E. Boardman, Daniel M. Shapiro and Aidan R. Vining, "A Framework for Comprehensive Strategic Analysis," *Journal of Strategic Management Education* (2004): 19.

4: WJC'S CURRENT STRATEGY

WJC does not currently think of its strategy in terms of the framework used in this paper. However, discussions with executives make it clear that WJC sees its competitive stance as differentiation. It describes its "business strategy" in terms of the following goals[55], of which it believes it has completed the first two:

- Restore appropriate leverage
- Rationalize WJC's portfolio
- Grow organically
- Rapidly develop and deliver new products and services
- Reduce product costs and operating expenses
- Upgrade the organization's capabilities
- Grow "Core" revenue acquisitively

Regarding some other germane elements of strategy, WJC has stated that its vision is to be the global leader in the development and application of UHP water technology. It also describes "integrating pumps into systems that make our customers profitable[56]" as a value proposition. Finally, it espouses customer satisfaction as a company value.

[55] WJC Corp, "Velocity: Global Transformation Project - Business Strategy Workshop Output" (January 13, 2007): 12.

[56] Ibid.

In the remainder of this chapter, we will combine the explicit elements described above, and other implicit ones, to articulate WJC's strategy. We will do so in terms of the following four levels of strategy:

- Corporate strategy: Defines the scope of a firm, i.e. the businesses or industries in which it operates.
- Positioning strategy: Defines the market segments in which the firm participates.
- Competitive stance: Defines whether the firm's focus is on differentiation or on cost-leadership.
- Functional strategy: Defines how the firm organizes its functional areas to support the other levels of strategy.

4.1 Corporate Strategy – Focused on the UHP Water-jet business

WJC is engaged in a single line of business, the development and application of UHP water-jet technology. Geographically it is quite diverse, but carries on essentially the same business in all locations. Variations occur primarily at the positioning and functional levels.

WJC is very much growth-oriented. It has ambitions of doubling its revenues in a three-to-four year timeframe. Historically, WJC had grown by acquisition. It is now committed to organic growth however. It has left the possibility of acquisitive growth open, as long as any acquisition is consistent with its "core".

While targeted acquisitions may be an effective means of achieving its aggressive revenue goals, WJC should be aware that this would likely do nothing to enhance

shareholder value. Much evidence shows that most gains in corporate acquisitions go to the sellers, and little to shareholders of the buying firm[57].

4.2 Positioning – Pumps, Parts, Systems

WJC sells UHP pumps, application-specific systems and parts for both of these. It is product focused rather than customer focused. It sells primarily the same products to many markets. Even where it optimizes systems for particular applications, WJC will sell them to as many market segments as possible. That said, within the UHP water-jet market, WJC's product-customer focus is quite broad. It sells a substantial number of products to many markets. If it had not exited some segments, as a result of its decision to rationalize its portfolio of UHP business, describing it as a hegemony would not have been far off the mark.

WJC sold its Hydrodynamic Cutting Services division (a provider of UHP abrasive water-jet cutting services on oil wells and offshore structures) in 2004, its food pasteurization equipment unit in 2005 and closed its robotic systems division in 2006. Where it still participates in these sectors at all, it is by selling pumps via down-stream integrators. For example, WJC still sells pumps to its former food unit, FoodPro.

In broad terms, WJC itself thinks of its market segments as being machining (cutting) or surface preparation related. To a lesser extent, it adds OEM pump sales to down-stream system integrators. Of these, the machining segment is currently the most important by a wide margin.

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[57] Gregor Andrade, Mark Mitchell and Erik Stafford, "New Evidence and Perspectives on Mergers," *Journal of Economic Perspectives* 15, no. 2 (2001): 103-120.

4.3 Competitive Stance – Adding Value

In terms of generic competitive stance[58], WJC clearly sees itself as a differentiator. It pushes out the demand curve, adding value to its customers. It does this through research and development into new pump technology and new applications, manufacturing practices that produce high quality products and following up with outstanding after-sales service.

WJC also pays significant attention to pushing down the cost curve through LEAN manufacturing. More recently, it has done so though supply chain optimization and automation efforts. It does not see this as a cost-leadership strategy, but more as a means of increasing margins and having more flexibility to respond to cost-competition when it encounters it.

WJC participates in the low cost market via OEM sales. It only sells its older, lower-performance pumps this way, i.e. those that competitors have already matched. WJC thus avoids cannibalizing its own high-performance systems business. Although these older pumps face more intense price competition, the WJC brand and quality still realizes a higher price for them than competitors' units. The OEM pump segment currently represents only a small fraction of WJC's revenue.

WJC's executives feel that they are not risking the "stuck in the middle" trap[59] by selling into the low-end market. They maintain that WJC expends minimal resources on this market. In addition, they see it partly as necessary to having a complete product line, as discussed earlier. They also see it as money that would otherwise be "left on the table".

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[58] Michael E. Porter, *Competitive Strategy – Techniques for Analyzing Industries and Competitors* (Free Press, 1980), 34-46.

[59] Ibid., 40-41.

4.4 Functional Strategy – Vertically Integrated

We have already described WJC's functional activities in some detail. In summary, WJC has vertically integrated to a substantial degree. However, it routinely contracts-out upstream component making where it does not believe it can particularly add value, or where it can procure them at lower cost without sacrificing too much quality.

WJC uses its pumps primarily, but not exclusively in its own systems: It sells some downstream into non-core markets (e.g. to its former subsidiary, FoodPro, in the food processing equipment market). It also sells its lower-end models to integrators who sell low-cost, WJC-branded systems into the less performance-demanding end of the water-jet cutting market.

Finally, WJC is engaged in some other partnerships. An example is providing the water-jet technology for the hybrid wire EDM (Electrical Discharge Machining) and UHP water-jet machining centre recently introduced by Sodick Co., Ltd. of Japan[60]. The technologies are complementary because the water-jet cuts 20 times faster than the wire EDM and the wire EDM cuts much more accurately than the water-jet.

4.5 Consistency of Strategic Elements – They All Fit

WJC's current strategy is generally consistent. For example, it has aligned its high-performance, high-quality line of products, after-sales service and value proposition of enhancing customer profitability well with its competitive stance of differentiation. Its research, development, and manufacturing operations support its positioning and

[60] Sodick Co., Ltd., "Hybrid Wire EDM," http://www.sodick.jp/product/hybrid/index.html (accessed June 30, 2007).

competitive stances. We can point to only one inconsistency in this respect. The company's focus on reduction of product costs and operating expenses, and the low end of its product line are more consistent with a cost-leadership stance.

We would caution that this is not to say that a differentiation strategy allows a firm to ignore costs. It merely relegates them to a secondary consideration[61]. Whether WJC is at risk of diverting too much of its attention from its primary strategic target is largely a matter of opinion. It does not seem to be the case at this time.

In this chapter, we have described WJC's current strategy for competing in the water-jet industry. This raises the obvious question of how successful it has been. In the next chapter, we will answer that question.

[61] Michael E. Porter, *Competitive Strategy – Techniques for Analyzing Industries and Competitors* (Free Press, 1980), 37.

5: FINANCIAL PERFORMANCE – RISEN FROM THE ASHES

This chapter will analyse WJC's performance over the last five years. Financial performance is usually the most important yardstick by which we measure a public company, and we will start there. We will also evaluate WJC on some non-financial factors that are important to it.

5.1 Income Statement and Balance Sheet

There is no doubt that WJC went through some difficult financial times in the early part of the decade. It was technically bankrupt (i.e. with negative shareholders' equity) at the end of its 2004 fiscal year. Since then, WJC has staged a remarkable recovery, turning in solid results in 2006 and 2007. The financial markets have responded favourably. WJC's market capitalization has increased from less than $18 Million in 2003 to nearly $500 Million at the end of the 2006 financial year.

Tables 4 and 5 show some salient highlights from WJC's financial statements, for its 2003 through 2007 fiscal years. As we can see, WJC's revenues and gross profits increased steadily throughout the period under consideration. However, ballooning overhead costs and a crippling debt load overwhelmed them until 2005. By the end of the 2005 fiscal year, WJC had restored the health of its balance sheet, and the income statement soon followed suit.

Table 4: Highlights of WJC's Income Statements

($ in thousands)	2003(A)	2004(A)	2005(A)	2006(A)	2007(A)
Revenues	144,115	132,861	172,966	205,432	225,000
Cost of Goods Sold	(108,074)	(82,803)	(106,943)	(111,276)	(121,875)
Gross Profit	36,041	50,058	66,023	94,156	103,125
EBIT	(46,577)	(1,540)	8,397	18,950	27,919
Net income	(69,987)	(11,274)	(21,197)	7,410	19,429

Table 5: Highlights of WJC's Balance Sheets

($ in thousands)	2003(A)	2004(A)	2005(A)	2006(A)	2007(A)
Total current assets	100,981	84,812	84,666	100,042	115,556
Total assets	147,701	129,272	118,467	119,268	138,697
Total current liabilities:	107,690	93,569	78,512	57,638	57,638
Total non-current liabilities	35,139	43,920	10,491	4,490	4,490
Total shareholders' equity	4,872	(8,217)	29,464	57,140	76,569
Total liabilities and shareholders' equity	147,701	129,272	118,467	119,268	138,697

5.2 The Levers of Performance (Ratios)

We can gain considerable insight into a company's financial performance through standard financial ratio analysis. Table 6 presents some useful ratios we have calculated, in the categories of profitability, liquidity, financial "leverage" and operational efficiency.

Table 6: WJC financial performance ratios

	2003(A)	2004(A)	2005(A)	2006(A)	2007(A)
Gross margin	25.01%	37.68%	38.17%	45.83%	45.83%
EBIT margin	-32.32%	-1.16%	4.85%	9.22%	12.41%
Net profit margin	-48.56%	-8.49%	-12.26%	3.61%	8.63%
Return on Equity	n/a	n/a	n/a	12.97%	25.37%
Return on Net Assets	n/a	n/a	n/a	29.21%	33.12%
Financial leverage (assets/equity)	30.32	-15.73	4.02	2.09	1.81
Debt to equity	18.49	-10.56	0.65	0.12	0.09
Interest coverage	-4.17	-0.12	0.41	11.39	34.90
Current ratio	0.94	0.91	1.08	1.74	2.00
"Acid" ratio	0.56	0.62	0.77	1.34	1.61
Asset turnover	0.98	1.03	1.46	1.72	1.62
Inventory days	138.07	116.30	82.66	74.71	68.21
Receivable days	87.63	107.16	80.87	60.75	55.47
Payable days	41.37	66.66	71.13	68.26	62.33
Cash days	38.10	35.26	28.37	64.29	83.87

As we can see, WJC has effectively used the "levers of performance" to restore its financial health: Increases in selling prices and lower manufacturing costs increased gross margin from 25 percent to over 45 percent. At the same time WJC reduced overhead costs and the amount of inventory carried, leading to its EBIT (Earnings Before Interest and Taxes) margin recovering from less that -30 percent in 2003 to better than 9 percent in 2006. Finally, WJC issued stock and paid down its debt, reducing its financial leverage from a dangerously high level of 30.3 to about 2.1 in its 2006 financial year. Instead, as shown by the "cash days" figure, it has accumulated more than double its former cash reserves as a proportion of its requirement for working capital.

In summary, WJC has successfully positioned itself with the financial resources it needs to execute its strategy.

5.3 Economic Value Added

A fundamental goal of any for-profit firm is to generate economic rents (profits in excess of an investment's opportunity cost) for its shareholders. Standard accounting measures, such as those already presented, do not effectively answer whether shareholders are enjoying economic returns higher than the cost of capital for a firm. A better measure of this is economic value added (EVA), as defined by Kay[62]. WJC's EVA for its 2004 to 2007 fiscal years is shown in Table 7:

Table 7: Economic Value Added by WJC

($ in thousands)	2004(A)	2005(A)	2006(A)	2007(A)
Economic Value Added	(17,394)	(904)	10,066	15,453

Unsurprisingly, WJC "destroyed" economic value in 2004 and 2005 due to its operating losses. Since then it has generated shareholder profits greater than the opportunity cost of their investments.

5.4 Other Performance Considerations

As we described in chapter 4, WJC has articulated some non-financial performance considerations (values, goals, measures of success, etc.) as well. Some authors would applaud this, having proposed the balanced scorecard (BSC) as an approach[63] to even out what they see as an over-emphasis on financial performance. WJC

[62] John A. Kay, *The Foundation of Corporate Success: How Business Strategies Add Value* (Oxford and New York: Oxford University Press, 1995).

[63] David P. Norton and Robert S. Kaplan, "Using the Balanced Scorecard as a Strategic Management System," *Harvard Business Review* 74, no. 1 (1996):75-86.

does not have a BSC per-se. However, it has been explicit in adopting goals that include customer and employee satisfaction along with profit.

As we noted earlier, WJC's measurements of employee satisfaction, via its annual employee engagement survey, have been slightly below average, in comparison to a representative peer group chosen by the consultant conducting the survey. Engagement has been improving over the last year however.

WJC does not measure customer satisfaction systematically, but believes it has achieved high levels of it based on anecdotal evidence. Another supporting piece of evidence is the "Frost & Sullivan Customer Value Enhancement Award" WJC won in 2005[64]. WJC may be better able to measure this important performance goal in future by conducting regular, independent customer satisfaction surveys.

This chapter has described WJC's current performance in financial and non-financial respects. In summary, the company has overcome its former weakness, and has generally pleased its stakeholders over the last few years. WJC will have to improve upon this performance continuously if it is avoid further activism from shareholders seeking ever-better returns.

In the next chapter, we will summarize WJC's current situation, discuss its likely future given its present strategy, and consider what WJC should do next.

[64] WJC Corp., "WJC Receives 2005 Frost & Sullivan Customer Value Enhancement Award," http://www.wjccorp.com/about-wjc.cfm?id=412 (Accessed June 30, 2007).

6: AN ASSESSMENT OF WJC'S CURRENT STRATEGY

In this chapter, we will summarize WJC's situation, then predict its future performance in broad terms given its current strategy. We will also note how this differs from WJC's desired performance and discuss how it might close the gap.

6.1 Summary of WJC's Situation

WJC has recovered from the serious strategic and financial difficulties of a few years ago. It is pre-dominant in its marketplace, profitable, and successfully pursuing a differentiation strategy.

Internally, WJC has important strategic assets. It is also facing some significant, though not overwhelming challenges with product quality, overly complex and manual business processes and issues related to leadership and communication. These are all pushing costs higher than they should be and will constrain growth.

Externally, WJC is leading an attractive and rapidly growing global market. It has the best brand, products and consistent victories in head-to-head competition. However, there are some clouds on the horizon.

Firstly, competition is becoming more intense on pump technology. WJC is clearly in the lead with ultra-high pressure pumps reliable enough for water-jet systems. Competitors are not sitting by idly however. Were WJC's technology not to keep progressing, its executives feel competitors could match its technology in as little as 18-

24 months. A key decision for WJC is how much resource to commit to research and development in order to maintain its lead.

Another concern is the diminishing returns on pump pressure. This could result in commoditization of pumps in five to ten years, which would undermine one of WJC's most important strategic assets. Once returns on pressure have diminished too much, WJC will have to shift its focus away from ongoing efforts to increase them. WJC may be able to prevent commoditization if it can develop other pump technology to enhance water-jet performance.

Thirdly, WJC must respond to the challenge of meeting customer demand as the market develops. We expect that the market will go through a rapid growth spurt and then mature. Once it does, consolidation of the industry is likely. If WJC cannot meet demand, a competitor undoubtedly will. In that case, WJC's fate would probably be consolidation. WJC needs to resolve the internal organizational challenges described earlier. These are the primary constraint to growth rapid enough for it to maintain its market position.

In addition, price competition is intensifying on lower-end pumps and systems, and on after-market parts. WJC needs to find ways to protect its aftermarket. If it does not, and has to compete on price routinely, the margins in this lucrative segment of its business will erode to the extent that WJC cannot lower its costs. As noted earlier, WJC does have some opportunities to do so, by taking advantage of its global supply chain and off shore manufacturing, for example.

WJC must decide how much resource it will commit to the low-end pumps and systems market. It must be careful not to become "stuck" between differentiation and cost-leadership competitive stances. This balance will become increasingly important if

the high end of the market starts to erode over time, due to lower-performance systems becoming adequate for a larger proportion of applications.

Finally, WJC will need to find ways to mitigate pricing pressures through continued cultivation of its other strategic assets. WJC must not lose sight of the value of its brand, its service capability, its systems integration capability and its geographical reach.

6.2 In The Crystal Ball

We can summarize WJC's expected performance, given its current strategy, using a GE/McKinsey Performance Matrix[65]. We will predict and value WJC's future performance with the status-quo as a strategic alternative later in this document. Meanwhile the performance matrix will provide a useful initial impression.

In a GE/McKinsey matrix, we plot a firm's current competitive position against the attractiveness of its industry. Industry attractiveness depends on the various factors we explored in the external analysis section of this paper. A firm's competitive position depends on its resources, capabilities, strategy and execution thereof. These two factors predominate in determining a firm's financial performance.

Therefore, by predicting changes in industry attractiveness as competitive forces evolve, and assessing WJC's changing relative competitiveness given its current strategy, we can plot its current and expected performance. It is also helpful to plot a firm's desired position on the matrix.

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[65] Robert M. Grant, *Contemporary Strategy Analysis*, Third Edition (Malden: Blackwell Publishers Inc., 1998), 394.

WJC currently enjoys a leading competitive position in an industry of medium-to-high attractiveness. However, for the reasons outlined in the summary above, the industry is likely to become of only medium attractiveness in a five to ten year timeframe. In a similar timeframe, some of WJC's competitive advantage may erode. Pumps may become more of a commodity. Finally, if WJC continues to pursue its strategy without alteration, competitors are likely to imitate some of its other resources and capabilities.

Given the above, we expect WJC's competitive position to deteriorate to a little better than medium with its current strategy. Clearly, WJC would prefer to remain highly competitive in the industry. We show WJC's current position on a GE/McKinsey matrix (Figure 11) as "t". We also show its expected position in a little more than five years as "t_{+1E}" and its desired position at that time as "t_{+1D}".

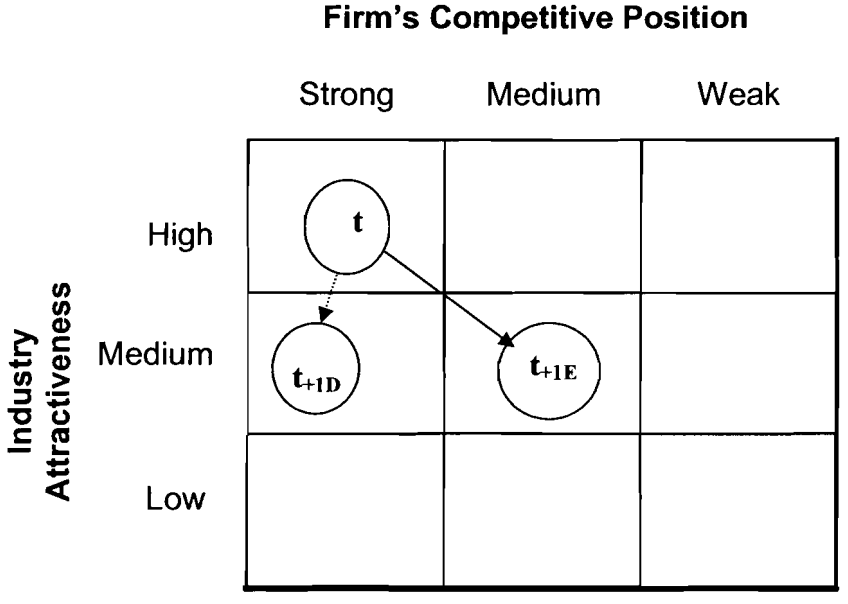

Figure 11: McKinsey Performance Matrix for WJC

6.3 What Should WJC Do Next?

WJC is currently very successful. If it fixes the organizational issues that will otherwise constrain its growth with some urgency, there is little wrong with its present strategy in the short term.

It is in a timeframe of the next two to five years that some serious threats will develop. This suggests that WJC can afford to implement a new strategy incrementally – it has the luxury of some time. It also means that generating momentum for strategic change will be more difficult. There is not an immediate crisis to spur the firm into action. If WJC fails to act for too long, however, a crisis could develop in due course.

So what changes to its strategy might WJC make to avert such a situation? We narrow the range of possible answers to this question by considering the top two levels of an appropriate strategy in the remainder of this chapter.

6.3.1 No Change in Corporate Level Strategy

WJC's corporate level strategy seems sensibly consistent with its external environment, global reach and strategic assets. This paper will suggest no changes to the plan for organic growth and eventually some acquisitions of businesses in WJC's UHP water-jet "core".

6.3.2 Competitive Stance: Differentiation and Cost-leadership Are Both Possible

In this section, we explore which of the three generic competitive stances could be appropriate for WJC.

6.3.2.1 The Case for Differentiation

Given the industry environment and WJC's strategic assets described above, it seems at a glance that differentiation continues to be its most appropriate competitive stance[66]: WJC's PCM, in Table 1, shows that its differentiated, high margin cutting systems, specialty applications and parts account for more than 85% of its market. The dominant needs in these segments for customer service and performance are inconsistent with competing on cost. Clearly, these will drive expenditures on research, development and customer service capabilities.

Similarly, the ongoing need to raise customer awareness, given the early adopter phase of the market, requires spending on marketing and a sales force. Finally, the custom-designed machinery developed in WJC's advanced systems and applications groups does not lend itself well to processes aimed at achieving efficient scale manufacturing, although this is not the case for the pumps.

Also supporting a differentiation stance is the fact that WJC does not compete on cost for high-end integrated systems. Customers remain willing to pay for high-end, integrated products.

6.3.2.2 There is No Case for Focus

There are some smaller players in the industry with a focus strategy. They compete based on very high quality of service in a particular application or geographical niche. Others do not deliver integrated systems, but compete for replacement part

[66] Michael E. Porter, *Competitive Strategy – Techniques for Analyzing Industries and Competitors* (Free Press, 1980), 34-46.

business based on low cost. Given WJC's market position, a "focus" competitive stance is not currently relevant and we will not explore this option further.

6.3.2.3 The Case for Cost-Leadership

As we discussed earlier, there is significant price competition at the low end of the market. This is possible because performance is not as critical and maturing technology has resulted in availability of similar features from a wide range of suppliers. This market segment is still very small at WJC. The PCM in Table 1 shows that this segment, which for WJC consists primarily of OEM pumps, makes up only 5 percent of revenue.

WJC competes successfully in this market with PowerJet, a system powered by WJC pumps, for under US$60,000[67]. It does so in two senses: As discussed earlier, PowerJet rounds out WJC's product line and provides opportunities to "up-sell" more sophisticated models to customers. Indeed this seems to happen more often than not. Secondly, WJC has sold several dozen of them for low-performance applications, in job-shops that did not value highly the greater capabilities of more expensive models.

While this segment of the market is small for WJC, it is expanding, and it is even possible that it will constitute most of the market once the industry has matured. So, if WJC can be a cost-leader with PowerJet, could it not be with other products as well? WJC's strengths in manufacturing process suggest that perhaps it could be. In addition, WJC has not yet taken advantage of significant opportunities to lower manufacturing costs outside of the USA.

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[67] WJC Corp., "WJC Corporation 2007 February Update" (2007): 19. http://www.wjccorp.com/uploadedFiles/Resources/Brochures/Waterjet_Brochures/Waterjet_Brochures/Investor%20Presentation.pdf (accessed March 15, 2007).

Finally, thoroughness demands that we consider whether a cost-leadership strategy could be a viable response by WJC to the possible commoditization of UHP pumps, and even more of the systems integration technology than is already standardized.

6.3.3 Positioning Alternatives

In this chapter, we have summarized WJC's current situation. We have predicted that WJC's performance will remain good in the short term, but will begin to deteriorate as the industry matures and rivalry intensifies. Finally, we narrowed the range of WJC's possible strategic responses to the danger of poorer performance in future.

In the next chapter, we will focus primarily on WJC's positioning alternatives, i.e. we will explore in which product-customer segments WJC should compete, within the context of the two possible competitive stances we have already identified.

7: WJC'S STRATEGIC OPTIONS AND EVALUATION CRITERIA

As we discussed in the previous chapter, it would be appropriate for WJC to continue with its differentiation competitive stance. It is also plausible that WJC might follow a cost leadership strategy. We will therefore describe strategic (positioning) alternatives in each of these categories in more detail. We base the first two alternatives on WJC's current stance. The third changes WJC's competitive stance to one of cost-leadership. We will finish the chapter with a discussion of how WJC can choose between the strategic alternatives.

7.1 Differentiation Strategy – Expand Market for Pumps and Existing Applications

In this alternative WJC would ignore new applications of UHP water-jets. It would concentrate on increased sales of UHP pumps and systems for existing applications. It would target increased penetration of existing customers, try to win business from competitors, sell to new customers for existing applications and aggressively sell pumps to other system integrators. In positioning terms, WJC would focus on market development and penetration. Over time, a greater proportion of pumps would be sold to integrators as WJC's own system designs aged and were surpassed in the marketplace.

WJC would continue to emphasise the features of its products and the excellence of WJC's execution in delivering and servicing them. In other words, WJC would

emphasise customer value, rather than the price paid. WJC would focus on the performance, quality, pre-sales and customer service KSFs. WJC would maximize customer value because they would be using the fastest, most accurate, most reliable and most versatile machines in the industry, backed up by all the support they needed to get the most out of their machines.

An implication of this strategy is that WJC would need to maintain high gross margins. It would be prepared to lose business that would require it to sell below a threshold price. Secondly, WJC would try to capture a high share of the business value derived by each purchaser from a machine. This would include any downstream integrators' machines incorporating WJC pumps. WJC would try to develop strong partnerships with firms possessing outstanding systems integration capabilities, but no competitive pump technology of their own.

WJC would continue to develop its own core UHP pump and water delivery technologies (e.g. developing higher-pressure pumps), in order to maintain its technological lead. It would avoid the uncertainties associated with developing new applications by leaving that to system integrators.

7.2 Differentiation Strategy – Develop New Applications

In this alternative, WJC would try to increase its sales by aggressively developing new applications for UHP water-jets. Ideally, no competitor would have yet developed a solution. Failing that, WJC's solution would be certain to deliver at least significantly higher value to customers than any competing implementation.

WJC's emphasis would be more on selling systems priced on the value derived by a customer than on the cost of building the system. It would not be prepared to compromise its gross margins to win low-cost business.

WJC would focus on the performance, quality, service and systems integration KSFs. An additional KSF to make this strategy viable is the ability to identify plausible new applications. Such applications would include those where a water-jet system could outperform potential substitutes by a sufficient margin that customers would perceive this value and be willing to pay for it. Alternatively, the application would solve a manufacturing problem that had previously seemed insoluble by any other means.

WJC got into trouble in the past by failing to drop unfruitful exploration into applications that turned out to be economically unviable. To make this alternative successful WJC would conduct market-driven development. It would create joint marketing-engineering teams. It would determine quickly whether a proposed application had a viable market and drop ones that did not.

The emphasis here is on new products sold to new or existing customers. This strategy would encompass some level of continuing effort to maintain a lead in pump technology as well. WJC would avoid supplying systems integration competitors with its best UHP technology. However, it would supply other integrators with lower performance pumps, as it currently does.

The main difference between this strategy and the status quo is the considerably increased focus on new applications that WJC can exploit quickly, before competitors begin to follow suit. This strategy also implies progressively less focus on higher pump performance, as returns on pump pressure diminish in future.

7.3 Become the Cost Leader in Existing Pumps and Applications

This strategy would represent a complete shift in competitive stance. However, in terms of functional activities it would be consistent with where WJC has focused much of its energy since the start of its turnaround in 2002 – reducing both production and overhead costs. This strategy would further emphasise these goals, would de-emphasise WJC's focus on product quality and would greatly reduce the amount of R&D (Research and Development) activity.

In other words, WJC would stop developing ever better performing pumps and new applications. It would try to leverage its scale advantages and production management practices to drive its cost below that of its competitors. It would then use its cost advantage to undercut them on price. Executed well, this strategy could be particularly effective in the lower end of the UHP market, where WJC is experiencing the most intense price competition. An almost certain consequence would be the steady erosion of WJC's high-end business. This would happen because WJC would not be investing in R&D. As a result, competitors' products would soon surpass WJC's in performance. WJC would have to be prepared to let that go, along with its market position as the world's leading developer of new UHP water-jet systems.

However, this strategy could be "game changing". As low prices pushed demand up, the market would grow more quickly. WJC's low prices would result in much greater market share for it in all segments but the ones requiring the highest performance.

WJC could perhaps best execute this strategy by quickly lowering its costs below those of its competitors (and possibly its own in the short term). This way it could "sew up" market share before its current technological edge had disappeared. Clearly, WJC

could not sustain this for long if COGS (Cost of Goods Sold) did not quickly drop as well, through economies of scale, optimization of the supply chain, and the use of low-cost manufacturing locations, for example.

This strategy would align well with the external environment of a mature market in which pumps had become a commodity, and the high end of the market had largely eroded. This would be particularly true if WJC could still maintain an acceptable level of quality and after-sales service. These are likely to remain KSFs after all.

7.4 Maintain the Status Quo

Often, an implicit strategic alternative is to maintain the status quo. This is certainly the case for WJC, at least for a while, given its current solid performance. In this case, WJC would continue unchanged all elements of its current strategy, as described in chapter 4 of this paper.

7.5 WJC's Evaluation Criteria

In this chapter, we have proposed in some detail three new strategies for WJC. We should now consider them as possible alternatives to its current one. We can choose between the four strategies by predicting and comparing their impact on WJC's future performance. We will do so in the next chapter.

Before moving on to prediction, we need to define our evaluation criteria more specifically. In chapter 5, we used financial and non-financial metrics to evaluate WJC's performance to date. We chose these metrics because they are a clear indication of how well WJC is executing its current strategy, which we described in chapter 4. Similarly, we can use the most relevant of these metrics as criteria to evaluate WJC's expected

performance under each of its strategic alternatives. We will now discuss the criteria in more depth, describe their relative importance to WJC, and explain how we can use them in an evaluation.

Since we cannot measure all of WJC's criteria in monetary terms, we select a strategy by using the multi-goal analysis method[68]: In this method, we rate the relative importance of each criterion by assigning each a weight between zero and one. The sum of the weights must total to one. After we predict the impact on each criterion of each alternative, we can assign a value to it. Finally, we multiply these values by their corresponding weights and sum them for each alternative. This yields a numerical score. The alternative with the highest score is the most attractive for the given combination of performance criteria and predicted outcomes.

Based on discussions with WJC executives, we will use the following performance criteria (goals).

7.5.1 Goal 1 – Maximize Discounted Cash WJC (DCF) Valuation

The first goal reflects WJC's long-term profitability. It is to maximize the value of the firm's equity five years from now. We calculate it by summing the free cash flows generated by the firm over the forecast period, discounted by the firm's Weighted Average Cost of Capital – WACC. We then add the discounted value of the terminal free cash flow thereafter.

The terminal free cash flow is an expression of what flows of cash we can expect to continue indefinitely after the forecast period. Since every market matures eventually,

[68] Aidan R. Vining and Lindsay Meredith, "Metachoice for Strategic Analysis," *European Management Journal* 18 no. 6 (2000): 605-618.

we should only assume continuing cash flow growth at close to a risk-free rate (i.e. reflecting little or no economic profits). We can adjust the rate somewhat to reflect conditions where we expect greater market growth to continue for a while after the forecast period. Even then, we cannot assume such growth will continue indefinitely, so the terminal growth must still be close to the risk-free rate.

7.5.2 Goal 2 – Maximize Return on Net Assets (RONA) at the End of FY09

This goal provides a measure of WJC's short-term profitability. WJC's long-term profitability is more important, but we need to give some weight to short-term profit as well. Shareholder activism could derail a strategy that reduces short-term profit too much.

7.5.3 Goal 3 – Maximize Customer Satisfaction

It is difficult to express the value of customer satisfaction in monetary terms. Nevertheless, it is a critical success factor in the UHP water-jet industry. As such, WJC's management feels that it will be an extremely important determinant of both short and long-term success.

7.5.4 Goal 4 – Maximize Employee Satisfaction

Employee satisfaction is similarly difficult to monetize. WJC's management believes it is an important goal for a number of reasons. Firstly, higher employee satisfaction will result in better service to customers. This will in turn have positive effects on profitability. Secondly, the tightening labour market predicted by many will make attraction and retention of qualified employees increasingly difficult. Perhaps even more for a differentiation stance, this will affect WJC's ability to execute its strategy. A reputation as a good place to work can only help WJC in this regard. Finally,

management feels employee satisfaction to be a worthy goal for its own sake. They are employees themselves after all and value a good work environment.

7.5.5 The Relative Importance of WJC's Goals

We have selected four goals that define WJC's performance. To complete our strategy selection criteria, we describe their relative importance by assigning weights to them. Again, we determined these weights through discussion with WJC's executives. We summarize the goals and their weightings in Table 8.

Table 8: Summary of WJC's Goals and Weighting for Evaluating Strategic Alternatives

Goal	Weighting
DCF Valuation	0.35
RONA at the end of FY09	0.30
Customer Satisfaction	0.20
Employee Satisfaction	0.15
Total	**1.00**

In this chapter, we detailed WJC's strategic alternatives. We went on to describe how WJC could choose amongst them using weighted evaluation criteria, otherwise known as goals. In the next chapter, we will use the criteria to compare the proposed strategies.

8: EVALUATING WJC'S STRATEGIC ALTERNATIVES

The purpose of this chapter is to use the evaluation criteria defined in chapter 7 to identify which of WJC's strategic alternatives is best. We do this by predicting the outcome of each strategy, and ranking them in order of performance with respect to the weighted criteria.

8.1 Predicted Outcomes of Each Alternative

In order to predict the overall outcomes, we need to forecast the impact, on every goal, of each of the strategic alternatives under consideration. We assess the expected impacts on the non-monetized goals in qualitative terms. We calculate the impacts on the monetized goals by considering the implications of each alternative for the firm's financial performance drivers. These are revenue growth, gross margin, the ratio of sales spent on each of the R&D, SG&A (Special, General and Administrative), and marketing categories, and expected terminal growth of the market. We forecast pro-forma financial statements using a spreadsheet model driven by these parameters. Finally, we use the statements to calculate future values for WJC's RONA and its DCF equity valuation.

8.1.1 Status Quo

We consider the status quo first in order to provide an impact prediction baseline for the other alternatives. If WJC continues to execute its existing strategy, the expected effects on the non-monetized goals, financial forecast inputs and forecasted values for the monetized goals are as summarized in table 9.

With a status quo strategy, we expect revenue to continue growing at approximately 15 percent per year, but then slow down as competition becomes more intense and the market matures. For the same reason, we expect gross margin to gradually decline. Expenditures will remain more or less constant as a percentage of revenues. Given these parameters, WJC's financial forecast model yields the DCF valuation and FY09 RONA figures shown in the table.

Table 9: Predicted outcomes of "status quo" strategy

Forecast input / non-monetized goal	Expected effect of strategy
Revenue	Initially grows at 15% p.a. but deteriorates as competition intensifies and market matures
Gross margin	Initially constant, but deteriorates as competition becomes more intense
R&D expenditure	Remains at current levels
Marketing expenditure	Remains at current levels
SG&A expenditure	Improves steadily as WJC improves business process consistency, automation and internal communication
Terminal Market Growth	Mature market yields 3.25% p.a. free cash flow growth at end of forecast period
DCF Valuation	$357M
FY09 RONA	19%
Customer satisfaction	Improves somewhat as operations, procurement and logistics improvements resolve start-up quality issues
Employee satisfaction	Improves somewhat as leadership and communication improvements are made

8.1.2 Expand Market for Pumps and Existing Applications

Table 10 summarizes the expected outcomes if WJC pursues a strategy of continuing to develop pump technology, but leaves development of new applications to downstream system integrators.

In this strategy, we expect revenue and gross margin to dip as WJC's existing integrated systems become less competitive. Sales later recover as WJC's focus on pumps yield an increasing share of that segment, and finally flatten as the market matures. Gross margin also declines as more sales come from OEM pumps: WJC has fewer direct relationships with the end-users of water-jet systems. The downstream integrators are able to appropriate some of WJC's profit margin on pumps as its brand becomes less relevant. R&D and marketing expenditures get smaller as remaining R&D focuses on pumps, and marketing targets integrators.

Given these input parameters, WJC's financial forecast model yields the DCF valuation and FY09 RONA shown in the table. In qualitative terms, WJC expects employee satisfaction to drop somewhat as its shift in focus results in some staff "churn", and as short-term financial results suffer.

Table 10: Predicted outcomes of "expand market for pumps and existing applications" strategy

Forecast input / non-monetized goal	Expected effect of strategy
Revenue	Substantial dip over 2 years as systems sales decrease, then rapid growth from that base as WJC pumps dominate, then flattening as market matures
Gross margin	Decreasing slowly as existing systems age, then decreasing more as margin on pumps is appropriated by integrators
R&D expenditure	Reduced substantially and decreasing due to no focus on systems and less on pumps as returns on pressure diminish
Marketing expenditure	Decreases after 2 years as existing systems age and focus shifts to OEM pump sales to integrators.
SG&A expenditure	Improves steadily as WJC improves business process consistency, automation and internal communication
Terminal Market Growth	Mature market yields 3.25% p.a. free cash flow growth at end of forecast period
DCF Valuation	$785M
FY09 RONA	14.8%
Customer satisfaction	Expected to improve somewhat as operations, procurement and logistics improvements resolve start-up quality issues. End-user satisfaction becomes less relevant, and integrator satisfaction more relevant.
Employee satisfaction	Drops somewhat with staff churn and as financial results suffer in the short term

8.1.3 Develop New Applications

Table 11 summarizes the expected outcomes if WJC pursues a strategy of maintaining competitive pump technology and aggressively developing new applications. In this case, we expect market growth to continue at current rates, primarily because the regular introduction of new applications will delay maturity of the market, perhaps indefinitely. WJC maintains its gross margins through these new, differentiated products, but developing and marketing them result in substantial increases in expenditure in the

R&D and marketing categories. Given these inputs, the financial forecast model produces the DCF and RONA values shown in table 11. WJC expects employee satisfaction to increase due to a more dynamic and exciting environment, growth opportunities, etc.

Table 11: Predicted outcomes of "develop new applications" strategy

Forecast input / non-monetized goal	Expected effect of strategy
Revenue	Increases at 15% p.a. as new applications prolong market adoption phase of growth
Gross margin	Value-added new products, avoidance of price competition will maintain margin. Cannot be appropriated by integrators
R&D expenditure	Increasing significantly year over year to develop new applications
Marketing expenditure	Increased significantly as more research and more marketing to new segments is needed, but stays steady at new level
SG&A expenditure	Improves steadily as WJC improves business process consistency, automation and internal communication
Terminal Market Growth	Prolonged growth of market yields 4.25% p.a. free cash flow growth at end of forecast period
DCF Valuation	$1,807M
FY09 RONA	12.5%
Customer satisfaction	Improves somewhat as operations, procurement and logistics improvements resolve start-up quality issues
Employee satisfaction	Increased significantly, partly due to leadership and communications improvement, partly due to good results

8.1.4 Become the Cost Leader in Existing Pumps and Applications

Table 12 summarizes the expected outcomes if WJC pursues a cost-leadership strategy, no longer developing pump technology or applications. Instead, WJC uses the

window of opportunity provided by its current lead in pumps to focus all its efforts on capturing market share and driving down costs.

In this instance, revenue grows quickly as WJC gains market share, but gross margins suffer in the short-term until WJC's efforts to lower COGS pay off. After that, margins improve, but revenues eventually flatten as the market matures. WJC reduces R&D and marketing expenses greatly. WJC expects employee satisfaction to get significantly worse due to the disruptive changes required to implement the strategy.

Table 12: Predicted outcomes of "cost leadership in existing products" strategy

Forecast input / non-monetized goal	Expected effect of strategy
Revenue	Grows rapidly as cost leadership gains share, then flattens as market matures
Gross margin	Reduced short-term due to aggressive pursuit of share, then improving as economies are realized and some competitors fail
R&D expenditure	Almost eliminated
Marketing expenditure	Dropped significantly to control costs but still needed to maintain market awareness.
SG&A expenditure	Improves steadily as WJC improves business process consistency, automation and internal communication
Terminal Market Growth	Mature market yields 3.25% p.a. free cash flow growth at end of forecast period
DCF Valuation	$1,358M
FY09 RONA	-9.4%
Customer satisfaction	Improves somewhat as operations, procurement and logistics improvements resolve start-up quality issues
Employee satisfaction	Reduced significantly as cost cutting and elimination of R&D causes layoffs, etc.

8.1.5 Summary - Predicted Impacts of WJC's Strategic Alternatives

We have explored the expected outcomes of each of WJC's strategic alternatives and predicted their effects on WJC's goals. We summarize the predicted monetary and non-monetary impacts in table 13 below.

Table 13: Summary of predicted impacts of WJC's Strategic Alternatives

Goal	Expand market for pumps and existing applications	Develop new applications	Become the cost leader in existing pumps and applications	Status quo
DCF Valuation	$785M	$1,807M	$1,358M	$357M
RONA at the end of FY09	14.8%	12.5%	-9.4%	19%
Customer Satisfaction	Somewhat better	Somewhat better	Somewhat better	Somewhat better
Employee Satisfaction	Somewhat worse	Significantly better	Significantly worse	Somewhat better

8.2 Valuing and Ranking the Alternatives

In the final step of strategy selection, we assign a value between one and five for each impact on every goal. For the non-monetary goals, the value is a whole number on a scale with one representing significantly worse employee or customer satisfaction and five being significantly better employee or customer satisfaction.

For the monetary goals, we assign the least profitable impact a value of one, the most a value of five, and the others proportional values between. We show the results in table 14. We also include the weighted total scores and rank the alternatives by score.

Table 14: Valuation Matrix for WJC's Strategic Alternatives

Goal	Weight	Expand market for pumps and existing applications	Develop new applications	Become the cost leader in existing pumps and applications	Status quo
DCF Valuation	0.35	2.18	5.00	3.76	1.00
RONA at the end of FY09	0.30	4.41	4.08	1.00	5.00
Customer Satisfaction	0.20	4.00	4.00	4.00	4.00
Employee Satisfaction	0.15	2.00	5.00	1.00	4.00
Total Weighted Score		**3.19**	**4.53**	**2.57**	**3.25**
Rank		**3**	**1**	**4**	**2**

As we can see, the "develop new applications" strategic alternative ranks first by a good margin, followed by "status quo", "expanding the market for pumps and existing applications" and lastly "cost leadership in existing pumps and applications".

In the final chapter of this paper, we discuss the results above, recommend a strategy for WJC, and explain why WJC should change direction to follow the new strategy.

9: RECOMMENDATION – KEEP WJC GROWING

Given its enviable market position, WJC could pursue any of the strategies described, at least in the short term. However, there are some clouds on the horizon. Competition is becoming more intense, both in UHP pumps and in integrated systems. Despite WJC's best efforts, there is a chance pump technology will become a commodity, or nearly so, in the next decade. This could result in a maturing market, ending WJC's days of rapid growth and above normal economic profits.

The temptation for WJC will be to maintain the status quo. Indeed, this is the second best of its strategic alternatives. However, this paper has revealed that there is a better answer. UHP pump expertise is not WJC's only strategic asset. WJC has its brand, geographical reach, systems integration and customer-service capabilities. By using their full potential, WJC can still thrive in a marketplace where pumps have become a commodity, but new applications have not.

WJC's greatest opportunities lie in providing differentiated products to a growing market. WJC can foster market growth, both by maximizing penetration of each application segment and by developing new applications. This is not to say that WJC should return to its former days of unfocused product research. WJC is capable of practicing innovative and market-driven development of appropriately qualified new water-jet applications. Succeeding will prolong the growth phase of the water-jet industry's life cycle well into the next decade. WJC can be there to reap the rewards!

REFERENCE LIST

Andrade, Gregor, Mitchell, Mark and Stafford, Erik, "New Evidence and Perspectives on Mergers," *Journal of Economic Perspectives* 15, no. 2 (2001): 103-120.

Boardman, A.E. and Vining, A.R., "Defining Your Business Using Product-Customer Matrices," *Long Range Planning*, Vol. 29, No.1 (1996): 38-48

Boardman, Anthony E., Shapiro, Daniel M. and Vining, Aidan R., "A Framework for Comprehensive Strategic Analysis," *Journal of Strategic Management Education* (2004).

Duncan, W. Jack, Ginter, Peter M., and Swayne, Linda E., "Competitive advantage and internal organizational assessment", *Academy of Management Executive*, Vol. 12, No. 3 (1998): 6-16

The Economist Newspaper Ltd., "Economic and Financial Indicators," *The Economist* 383, no. 8534 (June 2007): 105.

Erb, G. (ed.). "WJC cold to suitor's demand." *Puget Sound Business Journal*, May 2, 2007. http:// www.bizjournals.com/seattle/stories/2007/04/30/daily18.html (accessed June 23, 2007).

First Research Inc. "Machine Tool Manufacture Industry Profile Excerpt." http://www.firstresearch.com/Industry-Research/Machine-Tool-Manufacture.html (accessed June 25, 2007).

First Research Inc. "Machine Shops Industry Profile Excerpt." http://www.firstresearch.com/Industry-Research/Machine-Shops.html (accessed June 25, 2007).

The Gale Group, Inc. "WJC Corporation." *International Directory of Company Histories* (2006), http://www.answers.com/topic/wjc-corporation (accessed March 14, 2007).

Gardner Denver, Inc. "2005 Annual Report." http://library.corporate-ir.net/library/64/649/64980/items/216914/2005%20Annual%20report.pdf (accessed March 16, 2007).

Grant, Robert M., *Contemporary Strategy Analysis*, Third Edition. Malden: Blackwell Publishers Inc., 1998.

Hoovers, a D&B Company, "Hoover's Custom Report Builder - WJC Corporation" (March 2007).

Kaplan, Robert S. and Norton, David P., "Using the Balanced Scorecard as a Strategic Management System," *Harvard Business Review* 74, no. 1 (1996):75-86.

Karolin Machine Tool AB. "KMT Year-End Report 2006." http://www.kmtgroup.com/opencms/en_ZZ/investor/reports/index.html?releaseid=262832 (accessed March 16, 2007).

Kay, John A., *The Foundation of Corporate Success: How Business Strategies Add Value*. Oxford and New York: Oxford University Press, 1995.

Klier, Thomas, "Structural change and cyclicality of the auto industry," *Chicago Fed Letter* Issue 159 (November 2000): 1.

Krehmeyer, Dean, Orsagh, Mathew and Schacht, Kurt N., "Breaking the Short-Term Cycle," *CFA Centre for Financial Market Integrity* (2006): 2.

MSN. "WJC Ownership." http://moneycentral.msn.com/ownership?Symbol=WJC (accessed June 23, 2007).

Porter, Michael E., "How Competitive Forces Shape Strategy," *Harvard Business Review* 57, no. 2 (March-April 1979): 137-145

Porter, Michael E., *Competitive Strategy – Techniques for Analyzing Industries and Competitors*. Free Press, 1980.

Porter, Michael E., *Competitive Advantage: Creating and Sustaining Superior Performance*. New York: Free Press, 1985.

Sodick Co., Ltd. "Hybrid Wire EDM." http://www.sodick.jp/product/hybrid/index.html (accessed June 30, 2007).

Stepankowsky, Paula L. "WJC's Strategy Puts a Premium on Custom Orders." *Wall Street Journal*, Jul 26, 2006, Eastern edition, B.2B.

United States v. WJC Corp. and Ingersoll-Rand Co., Civ. No. 94-71320 (E.D. Mich., filed April 14, 1994).

Vining, Aidan R. and Meredith, Lindsay, "Metachoice for Strategic Analysis," *European Management Journal* 18 no. 6 (2000): 605-618.

WikiMedia Foundation, s.v. "Oligopoly." http://en.wikipedia.org/wiki/Oligopoly (Accessed July 4, 2007).

WikiMedia Foundation, s.v. "Cournot Competition." http://en.wikipedia.org/wiki/Cournot_competition (accessed July 2, 2007).

WJC Corp. "87,000 psi HyperPressure Technology." http://wjccorp.com/waterjet-products.cfm?id=565 (accessed Mar 14, 2007).

WJC Corp, "Velocity: Global Transformation Project - Business Strategy Workshop Output" (January 13, 2007).

WJC Corp. "WJC Corporation 2007 February Update." http://www.wjccorp.com/uploadedFiles/Resources/Brochures/Waterjet_Brochures/Waterjet_Brochures/Investor%20Presentation.pdf (accessed March 15, 2007).

WJC Corp., "WJC employee engagement survey" (April 2007).

WJC Corp. "WJC Receives 2005 Frost & Sullivan Customer Value Enhancement Award." http://www.wjccorp.com/about-wjc.cfm?id=412 (Accessed June 30, 2007).