Gauging the Market and Non-Market Forces in Indian Aquaculture Industry for a Strategic Position in Fish Vaccines Market

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Abstract

Indian aquaculture segment has become a growth engine for the agriculture sector and is postulated to be one of the key sources of food-protein supporting the growing Indian population. Significant potential for new fish vaccine business was demonstrated previously using market and sales potential assessments; however, in addition to the overall market attractiveness, estimating the market and non-market forces in an industry is vital to ensure profitability in a new business. Therefore, this research directed attention to gauging the forces using Porter's five market forces (2008) and Prasad's (2011) non-market forces (national culture and history) framework together with measuring the benefits of complementors. Each of the forces was measured and key drivers within each force were identified. A base case revenue scenario was built on forecasts and the impact of the major forces was tied to the income statement to determine sensitivity of the revenue forecasts. The results suggest that the buyer power and the substitute power are the major competitive forces. The power of complementor products was also found significant and an entrant could counter the predicted losses in profitability due to influences of these market and non-market forces by providing product-product bundles thus reaping considerable improvements in net present value (NPV) and internal rate of returns (IRR) on investments. The NPV from this analysis thus yielded a range between $0.97 and $7.5 million with an IRR ranging between 29.9% and 35.8% depending on the variables considered in the sensitivity analysis. Therefore, to realize profit potential and many other advantages, the entrant may choose a strategy of reaching the customer with a solution package either by producing complementors internally or by joining hands with strategic partners in the industry.

Keywords: Market forces, Non-market forces, Strategic position, Aquaculture, Fish vaccines, Carp vaccines, India

1. Introduction

Indian aquaculture segment has become a growth engine for the agriculture sector and is postulated to be one of the key sources of food-protein supporting the growing Indian population in coming years. Elsewhere, scholars have demonstrated India's overall macro-environmental factors being congenial (Pallapothu & Krause, 2013) and the overall market and sales potential as attractive (Pallapothu, 2013). However, in addition to the overall market attractiveness, estimating the competitive forces in an industry is vital to ensure profitability in a new business. As a continuum of previous work (Pallapothu, 2013), this research addresses the market and non-market forces that are currently shaping the Indian aquaculture segment.

Before entering any market, the investor group or the participating organization has to understand the competitive forces that exist within the industry of choice (aquaculture in this case) to gauge the profitability potential of a new business and to strategize its approach on the market positioning to protect its profit share. Michael Porter (1980) defined the industry structure and the competitive forces in interpreting the microeconomics of an industry for the

benefit of management strategy development to position itself either by coping or influencing these competitive forces which has gained popularity and some criticism (Prasad, 2011). The framework demonstrated strengths of unraveling each of the market forces and their impact on capturing the company's share of profit from the pool of industry stakeholders namely, buyers, sellers, new entrants, competitors, and substitute manufacturers (Porter, 2008).

This study not only contributes to the understanding of the Indian aquaculture market but also quantifies each of the competitive forces with consideration of influences from non-market forces such as culture and history of India to further the profit potential of a new fish vaccines business in India. The article is organized as follows. The second section provides an overview of the literature review on market and non-market forces, and the strategic positioning. In section three, a suitable methodology, study framework, and the data sources used in the study will be outlined. The analyses of the key forces and their impact on the profit potential of the entrant in Indian aquaculture industry will be executed, and described in section four. Comparisons are made to similar industries in Chile and Norway, as these two countries are the leaders in Salmonid aquaculture production. Suggestions on how to position the entrant in this industry will be offered taking into consideration the findings from this research and drawing from the ideas available in the extant literature in section five. Finally, conclusions of the research and the direction for future exploration are summarized in section six.

2. Literature Review

Michael Porter (1980) first described the 'five competitive forces' as threats posed by the competitors, the buyers, the suppliers, the new entrants, and the substitute makers that not only shape the industry structure and establish rules of competition but enable a company to realize the profit potential in a given industry. Later, Brandenburger and Nalebuff (1995) introduced the 'complementors' as the sixth force by using game theory on how interfirm dependencies among counterparts of substitutors could change the game of business by forming strategic alliances. This dependency was further exemplified by Intel's former Chairman, Andrew Grove (1996) who defined complementors as the ones who share similar business interests and their products offer synergistic properties.

Hax and Wilde (2001) proposed the Delta Model using network theory on profitability and suggested that the firm in question has to focus on its customers', suppliers', and complementors' industry rather than its own to pursue strategy. They argued that complementors are the key players in competitor lock-out and system lock-in based on the resource-based view of the firm, and postulated that a firm's profits rely on the resources and capabilities that a company is able to appropriate. An understanding of the industry structure and the underlying major forces that limit the firm's profitability is therefore vital in forecasting a firm's earning capability and to derive a strategy to defend or influence its position (Porter, 1980).

According to Porter (1996) and Cook (1995), a firm can retain profits only if it can differentiate itself from its competition (through the choice of activities or products or customers) that it can preserve, either by offering greater value to its customers or create comparable value at a lower cost, or do both. Hence, competitive strategy is about deploying unique set of activities (customized to your customer's needs) that are different from your rivals (Porter, 1996) and forging strong links (fit) among these activities. This exercise will not only lock out the competitors and imitators but also lead to sustainability (Hax & Wilde, 2001). The competitive advantage and superior value will result from the execution of the entire set of activities in a systematic manner (Cook, 1995; Hax & Wilde, 2001; Porter, 1996). Hax and Wilde (2001) and Reiss's (2010) proposal of creating long-term economic value by attracting, satisfying and retaining customers, and superior employees coincide with Porter's view. They suggested focusing on the customer relationship and building barriers around them so as to establish a high switching cost, and a customer lock-in. In order to achieve this, one has to target specific customer segment(s) and their needs similar to what Porter has described as competitive positioning and tradeoffs. Hax and Wilde (2001) argue that suppliers and customers are critical to achieving customer lock-in while using complementors for seeking competitor lock-out and system lock-in, by which unique and exciting value propositions for all the key players (customers, consumers, suppliers, and complementors) could be realized. Due to market changes within and from outside, termed as dynamic capability, firms evolve in their capabilities over time thereby influencing the competitive positions. The firm's competitive advantage is accomplished depending on the combination of ability to sense changes in a given market, identify the opportunities, formulate the approach, and deploy the resources in a changing market while protecting the key resources (Athreye, Kale, & Ramani, 2009).

Prasad (2011) noted a gap in the Porter's model in determining the force intensity and advised the need for understanding the social context, the role of national history and its culture, in which a given firm envisions to establish before even attempting to delineate Porter's five forces for competitive positioning. He illustrated the impact of non-market forces on the Porter's (2008) five market forces with historical validation. For example, he

accentuated the influence of the Gandhian Economics on Indian's preference of 'core' (generic) products and how these core products have altered the demand for 'differentiated' (branded) products. Similarly, he also signified the impact of culture on the market forces using Hofstede's five cultural dimensions. For instance, he claims that the 'power distance' has a strong influence on decision-making and relationship management between seller and customer. Similarly, the uncertainty avoidance has a direct influence on regional entrepreneurship and the propensity to take risk for a higher return (Prasad, 2011). Therefore, the significance of understanding the non-market forces (history and culture) of an entry country is equally important while analyzing the market forces using Porter's five forces model in realizing the full advantage of the country's competitiveness (Kopalle, Lehmann, & Farley, 2010; Prasad, 2011). Since this research is focused on India, which has a strong history and culture, the findings of this research may help a foreign entrant or investor group to concentrate its attention on the strongest forces in designing a sound approach to position its products and services, and effectively retain profits in the Indian aquaculture market.

3. Methodology

Understanding the industry structure, defending the strongest competitive forces (Porter, 2008) and non-market forces (Kopalle et al., 2010; Prasad, 2011) in that industry are essential for an effective strategic positioning, and formulating a sound strategy. Specifically linking these competitive forces to opportunities and risks can help management deploy appropriate responses to manage the identified industry pressures, and improve competitiveness to increase profits (Dobbs, 2012). Oraman, Azbagaoglu, and Inan (2011) first defined a template for quantifying the Porter's five forces and the drivers within each force using a scale of 1 (highly unfavorable) to 5 (highly favorable). Subsequently, Dobbs (2012) expanded the template by offering the selection of key drivers within each force in a given industry and associated the key drivers to a firm's internal resources, opportunities, and external threats, thus enabling the management to gain insights into formulating a strategy for business success. Prasad (2011) offered insights on the need to include the history and culture (Kopalle et al., 2010; Prasad, 2011) of an entry country in the analysis. In this study, a modified template was built by hybridizing the templates developed by Oraman, Azbagaoglu and Inan (2011), and Dobbs (2012). Additionally, a template for the benefits of complementors was described and utilized using the propositions from Hax and Wilde's (2001) Delta model and Reiss's (2010) complementor relationship management. The influence of India's culture and history was also taken into consideration wherever relevant within each of the previously stated templates as per Hofstede, Hofstede and Minkov (2010), Kopalle et al, (2010) and Prasad (2011). Secondary data sources such as industry reports, government documents, financial reports of the companies, and anecdotal and peer-reviewed literature were researched to gather information for these analyses. The knowledge and the authors' expertise in the aquaculture industry, specifically in the Indian and Western markets were also utilized in describing the forces. Relevant qualitative and quantitative data trends were documented in respective templates and analyzed. Once the market forces are measured and the key drivers in each force are identified, they are tied to the opportunities and threats of the firm's business, and the scenario proforma income statements (PIS) to visualize the impact of each force.

Earlier, Pallapothu (2013) forecasted the sales through a combination of assumptions on price per dose, fish population available for vaccination (FAO-Statistics, 2010), potential market share appropriated by the JV firm, and then built a proforma income statement (PIS) with required investments and estimated cost of capital for a 32 year horizon. This PIS was adapted to analyze the sensitivity of forecasted revenues [net present value (NPV) and internal rate of return (IRR)] to the identified forces in the Indian aquaculture industry.

4. Analyses

In this section, the threats from each of the five forces, the benefits from complementors, the influence of India's history and culture are analyzed, and the research results are summarized in Appendices 1 to 6.

4.1 Threat of Buyers/Buying Groups

The overall buyers' threat level is 2.56 (low). Since the buyers' profitability is moderate to high due to higher costs of carp production and low efficiencies (depending on the type of production practices) coupled with high switching costs, and the substitutes being generic and comparably cheap, the buyers may demonstrate price sensitivity. Since switching to vaccines incurs higher costs to the buyer, the buyer may bargain to bring the price of vaccines down. As a result, the entrant should target a specific segment where they can demonstrate a higher cost-to-benefit ratio to the buyer to reap higher profits. Buyer numbers in the Indian aquaculture industry are many which mean that their collective influence on the vaccine prices should be expected based on their collectivist mindset (G. Hofstede, 2009). Since each farm has unique issues with diseases, the vaccine firm should offer customized products/services to increase their product adoption and mitigate the risk of threat from the buyer groups. In India, aquaculture is being practiced as privately owned family businesses (Abraham, Sil, & Vineetha, 2010) unlike in Norway and Chile, where the majority of the

farms are owned by few corporate companies. Therefore, the pressure to bring the prices down is not as high in India as in the above two countries. Given the buyers' products are of high value to the community and India's agriculture economy, and Indians in general are more socially focused, one can argue that switching to vaccines is only going to increase the profitability of the buyer through increasing the productivity and the quality of the fish as seen in Norway with the advent of vaccines in 1987 (Kibenge, Godoy, Fast, Workenhe, & Kibenge, 2012; Nomura, 2006; Plant & LaPatra, 2011; Subasinghe, 2009). An estimation of the productivity improvements between 25% and 35% (by the use of vaccines) from the current scenario provided by CIFA (June 29, 2012a; June 29, 2012b) showed that the buyer may increase the net income by INR 19 010 and INR 26 708, respectively in carp production. Similarly, the net income improvements ranged between INR 26 832 and INR 36 367 for fry rearing, and INR 19 046 and INR 26 277 for fingerling rearing (Refer to Table 1 for further details of the scenario analysis on buyer profitability). Additionally, the entrant could influence the government in revising policies and regulations on the use of chemothrapeutants, and encourage farmers to adopt vaccines. Potential exists for the firm to lobby the government to offer subsidies for the use of vaccines based on the facts that the price-to-performance ratio will be much higher for vaccines as seen in Norway and Chile, and the environmental impact is significantly lower thus positively adding to the national agricultural GDP.

4.2 Threat of Suppliers/Supplier Groups

The number of suppliers is many for general ingredients that are used in the production of vaccines while only few suppliers exist for specialized equipment such as vaccination machines and production equipment. Since the entrant is envisioned to set up as a joint venture with an established Indian partner, the required infrastructure except the vaccination machinery is assumed available. Industry switching costs are low for both industry participants and suppliers as the number of supplier substitutes are moderate. Based on the analysis of annual reports of some of the major suppliers (Caltex, SEPPIC, Chevron, EMD, Becton Dickinson, etc.), the supply of material to biologics companies is only an insignificant fraction of their entire portfolio and a review of the reports suggest that their primary markets are different from the biopharmaceutical industry such as food, pharmaceuticals and human biologics, bioenergy, etc. Since the revenue stream contribution from the biopharmaceutical industry to the overall revenues of these suppliers is negligible, it is unlikely that they would put pressure on the entrant or forward integrate the entrant. On the contrary, specialized equipment suppliers may force the industry participants to pay more for their products due to the sophistication of their equipment and the low number of equipment buyers. Similarly, the National Research Institutes (who are the technology and vaccine candidate vendors to the entrant) may force the entrant to pay a premium for licensing their intellectual property and technology based on the rationale that the vaccine candidates have already been standardized to local geographic needs, and to meet the government's mandate of recovering between 30-50% of their R&D costs through public-private partnerships (Fan, 2011). However, to minimize the pressure from the suppliers (at least for general reagents and ingredients), the entrant may tap into the vertically integrated suppliers and established long-term price contracts of the Indian partner based on volume discounts thus exercising buyer power. By and large, the threat level from suppliers/supplier groups is low (2.00).

4.3 Threat of New Entrants

High switching costs for the buyer may likely play a key role in realizing the projected sales potential of the segment. These costs coupled with high fixed and storage costs of vaccines may demand the initial entrant to better its efficiencies in product creation with value-based pricing, and strong efforts in marketing. Benefits exist for the initial entrant in exploiting the current infrastructure and distribution channels of the Indian partner to minimize wastage of time reaching the market, and minimize investment risk. If future entrants' ingress is likely, the entry barriers for them to establish (other than JV mode) include: huge upfront capital commitments, long lead time in regulatory approvals, and distribution channel creation. Although the Multi National Companies (MNCs) that are in fish vaccines business today may want to step into the Indian aquaculture segment to gain access to profits from this market, the constraints such as the diversity of fish species to be served, lack of knowledge of the fish biology of various species, and diverse sizes of fish farms (Walker, Lester, & Bondad-Reantaso, 2005) have been identified as the limiting factors to invest in the fish vaccines business in India. Additionally, Indian Major Carp is considered a low value fish and hence value-based pricing is appropriate in order for the vaccines to be successfully adopted, but this pricing structure will impose constraints on the MNC's coverage of large overheads to remain profitable. In one of the authors interactions with the Chiefs of international animal health firms, the author gathered information that the firms are not interested in the South East Asian market due to its low value proposition which speaks to the lack of interest for at least two international animal health firms. If an Indian firm's desire is to diversify its portfolio on its own, it requires the help from the government funding agencies to fulfill its financial investment requirements and the current position on funding from the government in India is low for the animal health segment (Ahn, Hajela, & Akbar, 2012). However, the incumbents (potential Indian animal health partnering firms) are willing to reduce their

investment risks by JV with foreign investors who are willing to absorb higher risk (Ahn et al., 2012; Chakraborty & Agoramoorthy, 2010). The JV with a smaller firm like the candidate firm in the state of AP (Chakraborty & Agoramoorthy, 2010) previously identified by Pallapothu (2013), could therefore enable both the partners share the risk in venturing into a new segment by leveraging the existing capabilities of the Indian partner and the financial strength of the foreign entrant (Ahn et al., 2012; Johnson & Tellis, 2008). The incumbents' response although welcoming at the moment, may become retaliatory when the success of the JV partners and their profits are significant, and government funding position changes in the future or when the required investments for an existing incumbent become accessible either from internal sources or through initial public offerings. In conclusion, the overall threat level from the new entrants as it stands today is 1.88, which is low.

4.4 Threat of Substitutes

Buyers' price sensitivity to vaccines and indirect costs associated with administering vaccines, and switching costs as well as substitute price-to-performance trends (tradeoffs) make the substitutes more powerful than the entrant's products. This sensitivity to price thus demands the entrant and the incumbent partner to demonstrate high cost-to-benefit ratio to the buyer in order to attract and retain customers. Similarly, they may have to influence by lobbying the government in tightening the regulations on the use of substitutes (antibiotics and other drugs). Opportunity is immense if the price-to-performance can be justified to expand into secondary and international markets. Intense marketing efforts and price wars from substitute providers may be expected as retaliatory steps in keeping the entrant out of the industry. Currently, primary research data on the buyers' risk tolerance profile is not available to ascertain the willingness of the buyer switching to new products such as vaccines, but the negative impacts of low performing products on the social costs (human health and environment), which are of high value to Indians in general, may change the landscape as reported in consumer product segments (Tiwari & Herstatt, 2012). The uncertainty avoidance dimension when assessed indicates that the Indian managers in general have demonstrated comfort in dealing with the ambiguity compared to their Chinese counterparts (Pallapothu, 2012) and the farmers in the aquaculture industry primarily relied on the sales representatives' advice on different solutions to dealing with disease management (Abraham et al., 2010) which indicates the willingness to try new/diverse products. However, historical experience in the Western markets like Norway and Chile suggest that the aquaculturists would embrace vaccines if appropriate products are developed that would address their production needs. The overall threat level of the substitutes is 3.00, which is much higher than all other threats in the Indian aquaculture industry structure. Hence, the entrant must take this force into consideration, especially, the key drivers, namely, buyers' price sensitivity, switching costs, and price-performance trends of substitute products in drafting suitable strategy.

4.5 Threat of Competitive Rivalry

The level of rivalry in the aquaculture industry is low (average threat level = 2.12) due to no competition (other than the competition between substitute manufacturers), high industry growth, high fixed costs, high product differentiation, high switching costs, moderate strategic stakes, low capacity expansion, and nominal exit barriers. The threats to a new entrant from the key drivers are low market adoption of vaccines due to high switching costs to the buyers, and also high fixed and storage costs for the vaccines, which demand careful capacity calculations that meet the sales projections and room to expand in the future date. On the contrary, the industry growth rate and the lack of meeting the latent demand by the existing substitute competition invites novel technologies, and products that meet the needs of buyers and the ecological safety as well as offer first mover benefits such as appropriating better market share by the entrant if the pricing structure is attractive. Therefore, focusing on the key drivers such as enhancing the product differentiation, and reducing the fixed/storage costs and switching costs, may reduce the threat levels from the rivalry and increase the competitive advantage. In a study, scholars have noted that in lead markets like India the move towards 'value proposition' is increasing from the traditional frugal innovations that have focused on affordability and economies of scale in the past (Tiwari & Herstatt, 2012). In the present case, the innovations in fish vaccines are relatively novel relying on differentiated product profiles from that of the substitute products while consciously preserving the affordability, which is key in attracting and retaining customers.

4.6 Benefits of Complementors

The benefits from including complementors to an entrant were determined as 4.29. Aquaculture is complex and influenced by the local environmental factors in the outcome of a production batch. Vaccines or immunostimulants alone cannot offer good protection from disease outbreaks without concomitant employment of good husbandry practices. For that reason, bundling the products and services to the buyer is essential for an entrant to offer a complete solution, which will not only reduce the transaction costs to both the buyer and the seller but also may increase the economies of scope. Since the complementary products such as probiotics require the same upstream and downstream

infrastructure, the entrant could leverage the facilities and resources of its Indian partner in bundling the products. Some technologies like oral delivery mechanisms require partnership with feed manufacturers to incorporate the active ingredients into the feed for delivery. Benefits of partnering with complementary product suppliers include access to new buyers who are in the purview of feed manufacturers and exercise collective influence on the government in revising the policy on the use of chemotherapeutants thus leading to the realization of better market share. In order to flourish in this industry, building trust and long-term relationships are the keys to locking-out the competition and system locking-in. An entrant may engage the farm owners in the dialogue to build trust by exploiting the long-term orientation and high power distance of Indians (G. Hofstede, 2009) to achieve the previously stated goals. Kopalle, Lehmann, and Farley (2010) have shown that Indians' long-term orientation induced by '*karma*' is less prone to decreasing their expectations on product performance, which warrants a careful articulation of advertisement claims during the product introductions.

4.7 Financial Analysis

Previous work by Pallapothu (2013) was adopted in the financial analysis. The assumptions used in the financial analysis are provided in the end note[1]. Based on these assumptions, the base case financial scenario yielded an NPV of $4.45M at an IRR of 37.5%. Refer to Table 2 for the base scenario of revenue analysis.

4.8 Sensitivity Analysis

The base case scenario of financial forecast (built on several assumptions described in the endnote) was found to be attractive with an NPV and IRR reported previously. Considering the credible threats from the buyer (2.56) and the substitute manufacturers (3.00), variables such as 20% less dose price, 20% less market share, and 20% higher operating costs are probable. Since India's market potential is moderately attractive (Pallapothu, 2013), the COC between 25% and 30% is likely. Nonetheless, the benefits of complementors in this industry are determined very high (4.29), and such benefits are expected to translate into revenues which may offset the losses by about 10% influenced by the buyer and the substitutes forces. Refer to Table 3 for the impacts of the competitive forces (buyer and substitute power), and the benefits of complementors on the forecasted NPV and IRR.

From the results of the sensitivity analysis (Table 3), it is evident that all the variables chosen (except the COC of -5% and its combination with other variables), have a negative impact on the NPV and IRR either individually or in combination with other variables. The highest impact was observed with the COC of +5% in combination with 20% higher operating costs, where the NPV decreased substantially from $4.45M to $0.07M, a 98% decrease in NPV from the base scenario. Considering the optimistic scenario where the COC is -5% (NPV=$8.90M, IRR=38%), even if the dose price and the market share are reduced by 20%, and the operating costs increased by 20% from the base case, the IRR resulted in a range between 31% and 33%, which is considered 'attractive.' When other variables (+5% COC, -20% each of MS and DP, and +20% OC) were analyzed individually, the IRR ranged between 31% and 37%, and a NPV between $1.90M and $2.60M. The interactions among the variables (variables that are noted in the parenthesis previously) yielded a range of IRR between 27% and 32%, and NPVs between $0.07M and $1.1M. Given the inherent buyer and substitute power on the variables considered, the IRR demonstrates that the fish vaccines business in India is still attractive and a strong opportunity for a small to medium sized enterprise.

Contemplating the benefits of complementors and the choice of variables defined previously, there is a significant improvement in the NPV and the IRR, when compared to the respective values obtained in the case of buyer and substitute power. The NPV ranged between $7.00M and $7.50M at the rate of 20% COC, which is about 40% and 23% improvement compared to the variables of MS and OC, under the influence of buyer and substitute power, respectively. Similarly, greater than 100% increase in NPV was envisioned when the complementors are included into the equation of revenue forecasts in comparison to respective cases of MS and OC under the influence of competitive forces (buyer and substitute forces). The reason for such an increase can be attributed to increase in market share and reduction in operating costs by spreading the fixed costs across product bundles, and also reduction in transaction costs to the firm in supplying product bundles to the buyer. Since the entrant may partner with other complementary product suppliers such as fish feed suppliers, the potential for increasing the market share appropriation is high where the entrant may tap into the customer segments that the feed supplier may have already established. The impact of the lower dose price when coupled with complementor products in a bundle has changed the NPV range from $0.59 and $6.10 (competitive forces alone or in combination) to $1.90 and $8.90. The dose price of the vaccine in the product bundle was assumed at 20% less than the base scenario to make it affordable to the buyer and that gap in revenues due to 20% losses in value-based pricing was assumed to be reclaimed from the sales of the complementor product in the bundle [average dose price of INR 1.00 ($0.01818/dose)]. As a result of the advantages highlighted previously due to complementary product offers, the firm can capitalize on the benefits such

as realizing better NPV of up to $8.90M. Even in the worst case scenario when two variables interplay such as +5% COC and +20% OC, under the forces of buyers and substitutes leading to the lowest NPV of $0.07M, the authors assume that by exploiting the benefits of complementors, the entrant may turn the worst case scenario into a reasonable outcome of up to a NPV of $0.97M.

5. Discussion

In order to position a potential entrant in the Indian fish vaccines market, the market and non-market forces that are currently structuring the Indian aquaculture industry have been evaluated, and the key forces were identified, namely, buyer price sensitivity, substitute power, and the benefits of complementors with the view of influences from the history and culture of India. Buyer price sensitivity has been found to be the key driver in this market similar to many other Indian industries due to the role of history and culture of the Indian social fabric, and their influence on the buyers' behavior (Kopalle et al., 2010; Prasad, 2011). Specifically, the Gandhian philosophy ingrained in the Indian mindset has led to the preference of generic products (Prasad, 2011). An understanding of Hofstede's cultural dimensions (G. Hofstede, 2009) may also help an entrant to draft a strategy that meets the needs of its customers and segments. For example, high power distance in India warrants an entrant to tailor an approach to satisfy the decision makers (farm owners). Therefore, the development of effective strategic plans is required with a thorough consideration of the national and local organizational cultures (G. H. Hofstede, Hofstede, & Minkov, 2010) without which the fruits of competitive advantages cannot be realized. Also, the same influences trust building and long-term relationship development as Indian managers expect to maintain such long-term relationships with their suppliers.

To address the price sensitivity issue, other scholars have suggested various approaches to diminish the prominence of price. For example, partitioning a price into components to highlight the benefits to buyers (Bertini & Wathieu, 2010; Brown, 2007) or offering options leading buyers to weigh their preferences (Bertini & Wathieu, 2010; Estelami, 1997); multi-dimensional pricing utilizing the buyers' price perceptions and inability to accurately determine the price as the number of price dimensions increase (Estelami, 1997); stimulate curiosity by intentionally overpricing (Bertini & Wathieu, 2010); or offering quantity discounts (Weng, 1995). These suggestions were aimed at creating a win-win transaction between the supplier and the buyer by reducing the operating and transactions costs for both, and increasing the buyers' demand.

Although there is no direct competition for fish vaccines in India, due to substitute power, one can expect aggressive price wars from substitute suppliers to keep the potential entrant in fish vaccines away from the industry. Buyers who compete as a differentiator in their industries are less price sensitive, especially when the supplier product/service adds to their differentiation and leads to greater profitability in their market. Chen (2008) argues that the intensity of competition among suppliers determine the selling price, for example, high competition leading to *monopsony* power (large buyer controls the market and drives the prices down) and lower competition leading to *countervailing* power of the buyer. Mills (2010) noted that if the supplier is a monopolist with strongly differentiated products [which in this case, vaccines are differentiated from conventional chemotherapeutants (substitutes) and the entrant may be considered monopolist], then the selling firm must maintain a dominant position and prohibit the formation of buyer groups to mitigate the possibility of buyer groups bringing the prices down. He argues that 'Nash bargaining' creates a "waterbed effect" on prices where the dominant buyer pays a lower price using bargaining power and small buyers pay a higher price. This leads to a vicious cycle of creating the downstream cost advantage due to upstream market power thus strengthening the downstream market power, and the downstream competition between buyers transferring the power to the sellers as upstream market power. In the case of an entrant, the target buyers are large aquaculture farms who operate as a family owned business (Abraham et al., 2010) unlike the industries in Norway or Chile where the majority of the farms are owned by corporations. In this scenario, it is unlikely that the purchasing groups are formed, and if they do so may put downward pressure on the price in which case, the seller may not be able to recoup the losses from the small buyers as the primary market for the seller (entrant) is only large fish farms. In a survey, Brochers et al., (2012) reported that even the performance buyers demonstrated price sensitivity to an extent by expending efforts in shopping for a least cost supplier when buying more expensive animal health products which the authors assume vaccines as one of the animal health products.

In Indian societal structure, trust is the key in building long-term relationships. Leonidou, Talias, and Leonidou (2008) found that the use of the coercive power by the supplier in influencing the buyer to purchase a product could increase conflict and reduce satisfaction leading to erosion of the trust, which in turn negatively affects the buyers' commitment to the relationship. Therefore, compelling approach in selling the product may hinder an entrant in building strong relationships with its customers. Alternatively, to realize the first-mover advantage, an entrant may use his/her soft power while setting up prices with a strong complementarity between product offerings (Krasteva & Yildirim, 2012).

Therefore, complementor relationship management becomes critical as suggested by Hamilton and Srivastava (2008), and Reiss (2010) not only to build trust but also to create a healthy relationship, and selling is a relationship management (Reilly, 2010). Due to power distance being high in small family owned Indian businesses (Raghavan, 2008), aquaculture farms being small family-owned businesses in India (Abraham et al., 2010), and the power of decision making vested with the farm owner, an approach of reaching and convincing the farm owner is vital in successful competitor lock-out, and system lock-in. Not doing so would lead to shifting the power to the buyer and his/her reliance on substitute products.

According to the Lancaster's theory of buyer response to product attributes, the key driver of their purchase decision and product choice is driven by functional benefits, and this assumption forms the foundation of many economic utility theories. Hence, in order to make a shift in buyers' willingness to pay, highlighting the higher perceived benefits of a product or component becomes central in lowering the buyers price sensitivity (Hamilton & Srivastava, 2008; Simmons, 2007) which has been shown in the US animal health segment where a performance-oriented buyer is likely to buy high performing animal health products to further improve performance (Borchers et al., 2012). Since the vaccines and the complementary products in a bundle differ in perceived benefits, partitioning the total price according to their functional performance is anticipated to increase the buyers' willingness to pay for the offer. Accordingly, our projections as stated in Table 1 were built on these assumptions where the bundle price is split into 80% and 20% for vaccine and complementary product, respectively.

To deliver customer value in the area of aquaculture health management, two offerings emerge: product-service bundle and product-product bundle as a result of complementarities between offerings. Since partnering companies bring unique strengths and competencies to the customer, this strategic option of complementing each other's products/services becomes more mutual and enhancing when presented together (Reiss, 2010). For example, customer value can be enhanced by complementing vaccines with probiotics; vaccines with efficient delivery systems; co-administering vaccines with immune enhancers, etc. Therefore, an entrant has to plan for an aggressive marketing campaign to inculcate knowledge in the buyer on the benefits of the vaccines over the conventional chemotherapeutants and the inherent opportunity costs (Simmons, 2007) s/he may risk by choosing the later which have a poor track record in performance. In the case of fish vaccines which are much more differentiated than the current drugs, it may be envisioned that the introduction of these products may enhance the perception of the buyer for potential positive impacts on his/her vertical expansion capability which is shown in section 4.1 and Table 1. The buyer could also negotiate for volume discounts on the feed and manure prices as the volumes required to support increased productivity increases, thus reducing the costs further and increasing net profits.

Grouping of products on similarities and differences among product alternatives simplifies buyers' processing of information in decision making, and it facilitates interpersonal communication (Reilly, 2010; Shocker, Bayus, & Kim, 2004). In 1980s, the Norwegian salmon industry extensively relied on antibiotics which reached almost 50 tons in 1987 due to the absence of commercial vaccines. Subsequently, vaccines were introduced against the bacterial diseases (Vibriosis, Cold Water Vibriosis, and Furunculosis). Despite higher prices of these vaccines [NOK 1.20 (~$0.183 in 1990)], due to the pressures such as increased outbreaks of bacterial diseases and pressures from insurance agencies, the adoption rate of vaccines increased. As a consequence the use of antibiotics and other drugs in the industry declined significantly to less than 1.4 tons by 1994 (Burridge, Weis, Cabello, Pizarro, & Bostick, 2010; Kibenge et al., 2012; Marine, 2012). The reasons for such an increased adoption of the vaccines were due to the fact that the aquaculturists could sort the products (drugs and vaccines) into categories based on the superiority and performance. Treatment of fish with antibiotics were also found to be more expensive than vaccines as antibiotics have to be administered more than once during the life cycle of salmon for the reasons of emergence of antibiotic-resistant bacterial strains (Personal Communication). These developments, along with the introduction of tight biosecurity and mitigation measures allowed the Norwegian aquaculture industry further its expansion, and production volumes. Similar superior results were recorded in Chile (average 15% reduction in antibiotic use between 2007 and 2008) (SalmonChile, 2010), Scotland, and Canada with the use of vaccines (Burridge et al., 2010; Kibenge et al., 2012; Marine, 2012). Well-publicized uses for the newer product increase the likelihood that many buyers will insist on such higher benefit levels in existing and future products. This enhancement also occurs as a result of training or learning. Marketers can influence sales of older products by augmenting with complements and re-positioning the newer product bundle which can help the buyers better understand the combined benefits of both products (Shocker et al., 2004). Hamilton and Srivastava (2008) described this phenomenon in complementary product bundles where the buyers react differently for partitioned and non-partitioned products in a bundle, especially, to the price change of a less expensive component in a bundle. On the contrary, Kopalle, Lehman, and

Farley (2010) offered caution on Indians' high expectations on product performance, induced by '*Karma*,' and suggested lowering the advertised performance claims to meet customer expectations.

Regulatory reforms in further restricting the use of antibiotics and other drugs are the key drivers for the success of a new entrant, and also for the sustainability of the Indian aquaculture industry. Best practices and lessons can be learned from the previously stated nations who are reaping better productivities, and enjoying significant growth by employing vaccines and good husbandry practices.

6. Conclusion

Gauging the market and non-market forces that structure an industry is vital in determining strategic position for any firm in the market. In this research, the market forces, namely, buyer price sensitivity, substitute power, and the benefits of complementors, were found to be dominant in the Indian aquaculture industry. Although the buyers are sensitive towards the price of vaccines, it has been suggested that there are various approaches to sway away the buyers from this perception. Since the vaccines are highly differentiated from substitute products, it is important that an entrant highlight the benefits of vaccines (with careful articulation of advertisement claims) and educate the buyer in reaping the full potential of these products using softer marketing skills, and building trust and long-term relationships. The Indian aquaculture industry may learn the lessons from successful countries like Norway, Chile, Scotland, and others who have gained significant productivity improvements. The benefits for the Indian buyers have also been shown in the analysis where improvements between 25% and 35% in productivities from the current scenario by using the vaccines would allow them to realize an increase in net profits between INR 19 010 and INR 36 367. Additionally, due to complementary product-product or product-service bundles, the potential entrant may realize higher NPV for the business and IRR. By offering the bundles of complementary products/services, the entrant may mitigate the risk of losing the market share and increasing the operating costs as seen in the buyer and substitute power scenario. The complementary product-bundle scenario yielded a range of NPV between \$0.97M and \$8.9M and IRR between 30% and 38% which are significantly higher than the scenario influenced by buyer and substitute power (NPV range: \$0.07M to \$6.1M; IRR range: 27% to 33%).

In this research, the authors have demonstrated the utility of the market forces template (Dobbs, 2012; Oraman et al., 2011) and the importance of combining Porter's five forces model (Porter, 2008) with non-market forces framework (G. H. Hofstede et al., 2010; Prasad, 2011) to position an entry firm in the Indian aquaculture industry. Additionally, the authors provide a preliminary template for the benefits of complementors using the frameworks of Hax and Wilde (2001) and Reiss (2010), and recognize that there is room for improvements to this template which could be a theme for additional research. Since the primary objective of this research was to analyze, and evaluate the market and non-market forces, the authors suggest the following areas for future investigation: identifying potential complementary partners in the Indian aquaculture industry, developing a partnering model with strategic partners, and conceptualizing an overall business strategy for the entrant.

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Note

Note 1. Briefly, the assumptions in building the financial scenarios are as follows. AAGR of 7.0% was determined as required growth rate to reach 2020 target of 8-10 million tons (Paroda & Praduman, 2000) from 2010 production rate (FAO-Statistics, 2010) and subsequent production rates after 2021 were assumed to decline and reach 2.5% by 2045. The After Tax Cash Operating Earnings (ATCOE) were calculated using a progressive increase of market share of the entry firm from 5% in year three (2016) of JV to peak share of 42% in year 11 (2024) over a 32 year horizon

while the first two years were dedicated for R&D and registration. The corporate tax rate was assumed at 30% using the Direct Tax Code (DTC). Revenues for the first five year period (2016-2020) were projected and the terminal value was calculated from the present values of ATCOE from 2021 to 2045. The NPV was derived from the present values of ATCOE and the initial investments and ATCOE for the entire 32 year horizon (data not shown) was used in the calculation of IRR. The COC was assumed at 25% with the reasons that the opportunity cost of investing in India is slightly higher due to moderately attractiveness of the market potential (Pallapothu & Krause, 2013), high inflation rate and required informal payments to authorities. Subsequent investments required for the firm's growth was assumed at $8.5 million between 2021 and 2045. For the sake of simplicity, the IRR was calculated by netting out the incremental investments (2021-2045) in the respective year's ATCOE (Pallapothu, 2013)

Table 1. Scenarios of buyer profitability with the use of vaccines and complementary products [Adapted from CIFA (June 29, 2012a; June 29, 2012b)]

	Fry Rearing			Fingerling Rearing			Carp Polyculture		
Proposed Percent Improvement	**Current**	**25%**	**35%**	**Current**	**25%**	**35%**	**Current**	**25%**	**35%**
Pond lease value	5000	5000	5000	10 000	10 000	10 000	10 000	10 000	10 000
Bleaching powder (10 ppm chlorine)/other toxicants	2500	2500	2500	2500	2500	2500	2500	2500	2500
Fingerlings Cost (INR/8,000 Fingerlings)							4000	4200	4200
Spawn Cost (5 million @ INR 5 000/million Spawn)	25 000	25 000	25 000						
Fry Cost (3 00 000 fry @ INR 7 000/100 000 Fry)				21 000	22 050	22 050			
Manure & Fertilizer Costs (5% volume discount for proposed)	8000	9500	10 260	3500	4156	4489	6000	7125	7695
Supplementary Feed Costs: (750kg@INR 10/kg) / (5 tons @ INR 7000/ton) / (6 tons @ INR 7 000/ton) (5% volume discount for proposed)	7500	8906	9619	35 000	41 563	44 888	42 000	49 875	53 865
Wages for Management & Harvesting: 100 man-days or 100 man days or 150 man-days (@ INR 50/man-day)	5000	5000	5000	5000	5000	5000	7500	7500	7500
Miscellaneous Expenditure	5000	5000	5000	3000	3000	3000	2000	2000	2000
Vaccine + Complementary Product Costs	0	3000	3000	0	5000	5000	0	8000	8000
Total Variable Cost (VC) (INR)	**58 000**	**63 906**	**65 379**	**80 000**	**93 269**	**96 926**	**74 000**	**91 200**	**95 760**
Interest on VC (15% per annum): for 1 month for fry, 3 months for fingerlings, 6 months for Carp	725	799	817	3000	3498	3635	5550	6840	7182
Total Costs (TC) (INR)	**58 725**	**64 705**	**66 196**	**83 000**	**96 766**	**10 0561**	**79 550**	**98 040**	**102 942**
Gross Income (GI) (INR)									
Total Fish at Harvest: (# of Fry) or (# of Fingerlings) or (kg Carp)	1 500 000	1 875 000	2 025 000	210 000	262 500	283 500	4000	5000	5400
Sale Price: (INR/1 00 000 Fry) or (INR/1000 Fingerlings) or (INR per kg Carp)	7000	7350	7350	500	525	525	30	31.5	31.5
Total Revenues (TR) (INR)	**105 000**	**137 813**	**148 838**	**105 000**	**137 813**	**148 838**	**120 000**	**157 500**	**170 100**
Net Income (NI = TR - TC) (INR)	**46 275**	**73 107**	**82 642**	**22 000**	**41 046**	**48 277**	**40 450**	**59 460**	**67 158**
TC to GI	56%	47%	44%	79%	70%	68%	66%	62%	61%
NI to GI	44%	53%	56%	21%	30%	32%	34%	38%	39%
Production Efficiency	30%	37.5%	40.5%	7.00%	8.75%	9.45%	50%	62.5%	67.5%
NI change from Current (INR)		26 832	36 367		19 046	26 277		19 010	26 708
NI change from Current (US$) (US$ 1 = INR 55)		488	661		346	478		346	486

Notes and Assumptions: The sale prices for the harvests resulting from the use of vaccines were assigned a small premium of 5.00% due to improvement in the quality of harvest. As a result, the purchase price of fingerlings and fry were forecasted at higher price than current. The real variable costs that increase with the increase of survival rates of fish, fry, and fingerlings, respectively were proportionately projected to increase based on the percentage of improvements. Import tariffs on fish feeds (GOI-MoF, 2011) and the 20% duty on oil-meal, a component in fish feed (Thukral & Dutta, 2012), were abolished to facilitate production and exports. Based on the latest tariff changes, it was assumed that the feed manufacturers transfer the savings to Indian aquaculture farmers by at least 5%. At the same time, since the order quantity of fish feed increases due to improved survival because of vaccination, the aquaculture farmers may negotiate for quantity discounts. Product valency and other product mix are not considered.

Table 2. Revenue forecast and pro-forma income statement for fish vaccines business in India (Pallapothu, 2013)

Worksheet									
Production Year	2013	2014	2015	2016	2017	2018	2019	2020	2021-2045
Market annual growth rate	7%	7%	7%	7%	7%	7%	7%	7%	
Total fish production (tons)	5 327 326	5 700 238	6 099 255	6 526 203	6 983 037	7 471 850	7 994 879	8 554 520	
Total fish production (kg) ('000)	5 327 326	5 700 238	6 099 255	6 526 203	6 983 037	7 471 850	7 994 879	8 554 520	
Total carp production (1kg at harvest) (87% of total fish production) ('000)	4 634 773	4 959 207	5 306 351	5 677 796	6 075 242	6 500 509	6 955 544	7 442 433	
Proportion of fish available for vaccination from big fish farms (40%) ('000)	1 853 909	1 983 682	2 122 540	2 271 118	2 430 096	2 600 203	2 782 217	2 976 973	
Dose Price[a] (USD)	0.01818	0.01818	0.01818	0.01818	0.01818	0.01818	0.02273	0.02273	
Market Potential (USD) ('000)	$33 707	$36 066	$38 591	$41 293	$44 183	$47 276	$63 232	$67 658	
Market Share				5%	8%	15%	25%	35%	
Direct Costs as % of sales				10%	10%	10%	12%	12%	
Operating Costs as % of sales [b]				50%	50%	50%	50%	50%	
Tax rate				30%	30%	30%	30%	28%	
Cost of Capital				25%					
Investment USD ('000)		-$3750	-$2000						
Pro-Forma Income Statement	**(USD)**								**Project's Terminal Value**
Sales				$2 064 653	$3 534 686	$7 091 465	$15 808 057	$23 680 469	
Direct Costs				-$206 465	-$353 469	-$709 146	-$1 896 967	-$2 841 656	
Gross Margin				**$1 858 188**	**$3 181 218**	**$6 382 318**	**$13 911 090**	**$20 838 813**	
Operating Costs				-$1 032 327	-$1 767 343	-$3 545 732	-$7 904 028	-$11 840 234	
Cash Operating Earnings				**$825 861**	**$1 413 875**	**$2 836 586**	**$6 007 062**	**$8 998 578**	
Taxes				-$247 758	-$424 162	-$850 976	-$1 802 118	-$2 519 602	
After Tax Cash Operating Earnings (ATCOE) ('000)		-$3750	-$2000	**$578**	**$989**	**$1 985**	**$4 204**	**$6 478**	**$23 450**
Present Value of ATCOE ('000)				*$295*	*$405*	*$650*	*$1 102*	*$1 358*	*$4 917*
Present Value of Investments ('000)		*-$3000*	*-$1280*						
	NPV	**$4 450 968**							
	IRR	**37.5%**							

Notes & Assumptions: [a] Average weight of fish at harvest = 1kg; Price per vaccine dose = INR 1.0 ($ 0.01818); Wholesale price of 1kg fish INR 40-50 ($ 0.73-0.91); and Cost of production INR 15-25 per kg fish ($ 0.27-0.45) (Jha, 2009). Initial investment is estimated based on the need to pay a licensing fee to secure existing vaccine technologies from research institutes in India, where as the expenses included variable costs and operating costs (cost of sales, salaries, taxes, interest expenses etc). [b] Excluding amortization. Product mix is not included in the study which may further add to upside potential

Table 3. Sensitivity analysis of the revenue forecasts for fish vaccines business in India (Impact of competitive forces and benefits of complementors). Adapted from Pallapothu (2013).

(Pallapothu, 2013)						This Research				
	Buyer & Substitute Power (B)					**Benefits of Complementors (C)**				
Percent change from (A)										
Sensitivity Analysis NPV ($); IRR (%)	**Base Scenario (A)**	**COC (+5%)**	**-20% MS**	**-20% DP**	**+20% OC**	**COC (-5%)**	Percent change from (A)	**-10% MS**	**-20% DP +20% C**	**+10% OC**	**Constant**
COC (-5%)			**$6.1**	**$6.1**	**$5.0**	$8.9		**$7.5**	**$8.9**	**$7.0**	
			33.4%	**33.4%**	**31.3%**	38.1%		**35.8%**	**38.1%**	**34.8%**	
COC (+5%)		$1.9	**$0.59**	**$0.59**	**$0.07**			**$1.2**	**$1.9**	**$0.97**	
		36.9%	**32.3%**	**32.3%**	**30.3%**			**34.7%**	**36.9%**	**33.8%**	
-20% MS			**$2.6**	**$1.1**	**$0.53**		**-10% MS**	**$3.5**	**$3.5**	**$2.4**	COC 25%
			32.8%	**28.6%**	**26.8%**			**35.2%**	**35.2%**	**32.3%**	
-20% DP				**$2.6**	**$0.53**		**-20% DP +20% C**		**$4.5**	**$3.2**	COC 25%
				32.8%	**26.8%**				**37.5%**	**34.3%**	
+20% OC					**$1.9**		**+10% OC**			**$3.2**	COC 25%
					30.8%					**34.3%**	
Base Scenario	**$4.5**										COC-25%
	37.5%										

COC = Cost of Capital; NPV = Net Present Value; IRR = Internal Rate of Return; MS = Market Share; DP = Dose Price; OC = Operating Costs; C = Complementor Product.

Appendix 1: Threat of Buyers/Buying Groups

LOW		THREAT LEVELS		HIGH	
1	2	3	4	5	
Many		Buyer Number		Few	

Buyers are many and may exhibit collective influence on the product pricing of the fish vaccines due to collectivistic behavior of Indians (score 48) (Hofstede, 2009)*, but the differing issues faced by each farm may prohibit them from doing so. A minimum of 153 customers are reported in AP and WB states* (Abraham, Sil, & Vineetha, 2010)*, and at least 1000 farmers are practicing aquaculture in Kolleru Lake area in the state of AP* (Katiha, Jena, Pillai, Chakraborty, & and Dey, 2005).

1	2	3	**4**	5	
Single/Few		**Buyer Orders**		Large Volumes	√

Aiming for the larger customer firms, the buyer orders are expected to be larger in quantity or small volumes of high value (Pallapothu, 2012).

1	**2**	3	4	5	
Low		Buyer Information		High	

Currently the buyer information is fragmented but the need for understanding the geographic locations of the buyers and epidemiology (disease occurrence) is important to gain market share.

1	**2**	3	4	5	
Not Feasible		Buyer Backward Integration		Credible Threat	

Buyer backward integration is low as the markups on the fish vaccines is moderate (Pallapothu, 2012) *and the integration requires setting up specialized facilities, appropriate knowledge and resources which are unique and different from aquaculture industry. As* Abraham, Sil, and Vineetha (2010) *reported, aquaculture farmers in leading states such as WB (15%) and AP (2.7%) had fewer graduate degrees indicating the need for higher literacy in order to operate knowledge-based business like fish vaccines.*

1	2	3	4	**5**	
Highly Differentiated		**Industry Products**		Standardized/Generic	√

Although the aquaculture industry products are moderately differentiated with different types of species and fry/fingerlings produced, the industry products (drugs) are standardized and generic (Pathak, Ghosh, & Palanisamy, 2000)*. The buyer may compare the price-to-performance of the new products (vaccines) to industry products in bargaining for a lower price influenced by Gandhian economics* (Prasad, 2011).

1	2	3	4	5	
High		Buyer Switching Costs		Low	

Buyer switching costs are high to switch from conventional therapeutics (INR 68-120/kg) (Pathak et al., 2000) *to other means of disease management, for example vaccines.*

1	2	3	4	**5**	
Low %		**Overall Buyer Costs**		High %	√

Overall buyer's COGS are high rising from 47% in 1992 (Jayaraman, 1997) *to 66% in 2012* (CIFA, June 29, 2012b)*, while improved strains of Carp reduced the costs to 52% compared to traditional strains (68% in 2008). Similarly, the fry/fingerling rearing costs reduced from 82% in 2008* (P. Kumar, Dey, & Barik, 2008) *to 56% in 2012* (CIFA, June 29, 2012a)*. Therefore, the buyer is expected to demonstrate price sensitivity to vaccines due to higher switching costs from the conventional substitutes.*

1	2	**3**	4	5	
High Profits		**Buyer Profitability**		Operating Losses	√

Buyer profitability is moderate to high and depends on the type of the aquaculture system being practiced and the type of Carp strain used. The gross margins decreased from 53% in 1992 (Jayaraman, 1997) *to 34% in 2012* (CIFA, June 29, 2012b)*. Improved Carp strains yielded greater margins of 48% compared to traditional strains (32% in 2008). The fry/fingerlings rearing yielded between 18%* (P. Kumar et al., 2008) *to 44%* (CIFA, June 29, 2012a).

1	2	3	4	5	
High Impact		Buyer Product/Service		Low Impact	

Buyer product is of high socioeconomic value as it offers employment to over 1.2 million inland fishers (GOI-PC, 2012) *and serves as the cheap protein source for the poor* (Kawarazuka, 2010)*. The fisheries sector including aquaculture segment, has gained recognition for its rising contribution from 0.75% to 1.04% to India's gross GDP and 2.17% to 5.93% to the agriculture GDP between 1980 and 2005* (B. G. Kumar & Datta, 2008a; B. G. Kumar & Datta, 2008b)*. Agriculture and food sectors are therefore considered as the priority sectors in India* (Ahn, Hajela, & Akbar, 2012).

Appendix 2: Threat of Suppliers/Supplier Groups

LOW		THREAT LEVELS		HIGH	
1	**2**	3	4	5	
Many Organizations		Supplier Concentration		Few Organizations	
Many firms and National Research Institutes supply raw materials, services and technology candidates to the industry participants.					
1	**2**	3	4	5	
High %		**Supplier Volume/Profit**		Low %	√
Most of the raw materials used in the vaccine manufacture are required in higher volumes than are needed for other industry participants like human biologics manufacturers. Also, the profits for the suppliers are moderate to high. Point to note is that most of the raw materials used in vaccines form an insignificant fraction of the supplier portfolio as the primary market for these suppliers are other industries and segments other than biologics for example, food, petroleum etc. (example adjuvant oils provided by Caltex, SEPPIC, Chevron etc and growth medium ingredients). Therefore, the price negotiations may not yield significantly changes in the profit margins of vaccine manufacturers.					
1	2	3	4	5	
Not Feasible		Supplier Forward Integration		Credible Threat	
Forward integration is unlikely as the suppliers reap moderate to high profits similar to the new entrant of fish vaccines manufacturer and their supply to this industry is insignificant volume. Also, the equipment profits are very high that may not lead to forward integration by the equipment suppliers.					
1	**2**	3	4	5	
Standardized/Generic		**Supplier Products**		Highly Differentiated	√
Most of the supplier products are standardized and only few products are of specialized nature that may influence the power of suppliers. For example, the vaccine delivery machines. Similarly, the research institutes (suppliers of novel products and technologies) may demand higher pay for in-licensing their technologies due to GOI mandated recovery of 30-50% of R&D expenses (Fan, 2011) .					
1	**2**	3	4	5	
Low		Industry Switching Costs		High	
Industry switching costs are low for both the industry participants and the suppliers in general except for some specialized equipment and services. Therefore, the overall industry switching costs are low.					
1	2	**3**	4	5	
Many Viable Options		Supplier Substitutes		No Viable Options	
Supplier substitutes are moderate if not numerous for general ingredients with the exception for specialized equipment.					

Appendix 3: Threat of New Entrants

LOW		THREAT LEVELS		HIGH	
1	**2**	3	4	5	
High		Supply-Side Economies of Scale		Low	
Partnership with an established firm mitigates the need of large investments and high fixed costs associated with economies of scale in fish vaccines business. For a new entrant/investor this means either s/he has to find a partner who has established resources or start the firm ground up risking the investment in start up costs.					
1	**2**	3	4	5	
High Network Effects		Demand-Side Benefits of Scale		Low Network Effects	
Word of mouth is very powerful both in Western and Indian aquaculture industries. In the Indian context, the word of mouth (good or bad) from the owner of the aquaculture farm is being taken seriously as the recipient farmer highly respects the experience and knowledge of his/her peer (Hofstede, 2009) *which was also reported by Abraham et al.,* (2010). *Indian partner could add value in this factor where the partner with wide brand recognition in other animal health segments could offer the networks and channel power to realize the demand-side benefits of scale in the new venture.*					
1	2	3	4	5	
High		Switching Costs		Low	
Buyer switching costs are high to switch from conventional therapeutics (INR 68-120/kg) (Pathak et al., 2000) *to other means of disease management, for example vaccines. An entrant may have to develop better efficiencies in managing the business and products in order to meet the incumbent pricing to be able to attract and retain customers.*					
1	2	3	4	5	
High		**Capital Requirements**		Low	√
Biotechnology-derived products are regulated in India similar to developed countries. It requires containment facilities that needs significant up front capital investments, long lead times to make a facility operational and obtain approval from regulators (Pallapothu, 2012). *Indian biotechnology industry is facing constrains in harnessing government funds* (Ahn et al., 2012; Chakraborty & Agoramoorthy, 2010) *and animal health segment is secondary to human health segments. Therefore, it is a tight sport for a new firm to expect financial support from the government. Established firms in this segment are capable of such investments.*					
1	2	3	4	5	
First Mover Benefits		Incumbency		Late Mover Benefits	
First mover benefits are likely since the market is open for an entrant to capitalize on the latent demand. The animal health sector in India is growing at a rate of 7% (worth INR 2,000 crore) (Datta, 2010) *which is on par with aquaculture segment* (Pallapothu, 2012). *Similarly, the incumbent firms may leverage their brand strengths in other animal health segments, geographic location advantages and business efficiencies in reaping the benefits.*					
1	**2**	3	4	5	
Limited Access		**Distribution Channels**		Easy Access	√
Distribution channels of the incumbents are well established while the new entrant may have to either partner with the incumbent in accessing channels or establish new channels for survival. To gain access to these, many MNCs chose JVs or local alliances or acquisition of local firms in Indian market (Datta, 2010). *Therefore, this is a barrier for entry.*					
1	**2**	3	4	5	
Regulations		Government Policy		Subsidies	
Indian government has created FDI policy and SEBI (Venture Capital Funds) Regulations, 1996 (Warne & Insan, 2011) *to attract foreign investment and encourage new venture creation. Although this policy is not a barrier, it requires the foreign investor to seek permission if chosen to enter into specific sectors through approval from Government Route (Foreign Investment Promotion Board) on the investments exceeding INR 1 200 crore ($218 M) which is a tedious task* (GOI-FDI Policy, 2012). *Tightening of regulations on the use of drugs in aquaculture and introduction of subsidies for vaccines may open up doors for potential future entrants.*					
1	2	3	**4**	5	
Retaliatory		**Anticipated Incumbent Response**		Welcoming	√
Industry participants (incumbents) are engaged in segments other than aquaculture segment. The aquaculture segment is a volume-based business where the current incumbents are likely to tap into this segment for portfolio expansion. But the inflexibility in allocating funds to the new venture might lure the incumbent in joint venture creation with the entrant (Ahn et al., 2012; Chakraborty & Agoramoorthy, 2010) .					

Appendix 4: Threat of Substitutes

LOW		THREAT LEVELS		HIGH	
1	2	3	4	**5**	
More Expensive		**Price/Indirect Costs**		Less Expensive	√

At a first instance, price and indirect costs for using the substitutes is low while the same turns out to be more expensive and laborious for vaccines. However, in the long run during the entire life cycle of production, the farmer may incur more expenses due to recurrence of the disease and repeated use of substitutes.

1	2	3	4	**5**	
Low		**Buyer Price Sensitivity**		High	√

The buyer is extremely price sensitive as they are used to the low prices offered by the substitutes (Pathak et al., 2000)*. They may use this as a bargaining tactic to lower the prices for vaccines products.*

1	2	3	4	5	
Lower		Performance		Higher	

Poor performance and recurrence of the disease which necessitates the use of higher substitute concentration or a combination of other substitute products or both. High residues of substitutes disqualify the buyer's product for human consumption. To increase the buyer's productivity, substitutes are not the solution. Indian customers have been accustomed to low value propositions historically, influenced by the Gandhian economics where generics took the front seat. But the negative impact of low performing products on the social costs (Prasad, 2011) *(human health and environment) mean a shift to high performing products is likely as seen in consumer product innovations* (Tiwari & Herstatt, 2012).

1	2	3	4	5	
High		**Buyer Switching Costs**		Low	√

Buyer switching costs are high to switch from conventional therapeutics (INR 68-120/kg) ($1.24-2.18/kg) (Pathak et al., 2000) *to other means of disease management, for example vaccines. An entrant may have to develop better efficiencies in managing the business and products in order to meet the incumbent pricing to be able to attract customers.*

1	**2**	3	4	5	
Risk Avoidance		Buyer Profile		Risk Seeking	

Currently, primary market research data is unavailable to determine the willingness of the buyer to take the risk of using new products. Considering the uncertainty avoidance, Indian managers in other industries have demonstrated comfort in dealing with the ambiguity compared to their Chinese counterparts (Pallapothu, 2012) *which means potential exists with aquaculture farmers in taking risk on trying new products. Experience in the Western markets like Norway indicates that if vaccines are made available and the regulations are tightened for the use of substitutes, there is high potential for market adoption of vaccines* (Nomura, 2006)*.*

1	2	3	**4**	5	
High Cost/Low Performance		**Substitute Industry Price/Performance Trends**		Low Cost/High Performance	√

Substitute products are low in price and low in performance. The price/performance tradeoff is attractive to the aquaculture segment but the issues of recurrence of disease, and the impact on the environment and human health outweighs the price/performance tradeoff. Due to latent demand for fish vaccines, the customer is relying on the substitutes, and it is hoped that new product adoption is likely if it is made available at an affordable price with high performance as seen in consumer product categories (Tiwari & Herstatt, 2012)*. Benefits lie for the potential entrant to demonstrate significant improvements in the customers' productivity by using the vaccines.*

Appendix 5: Threat of Competitive Rivalry

LOW		THREAT LEVELS		HIGH	
1	2	3	4	5	
Few/Leader		Existing Competitors		Numerous / Balanced	
Rivalry is low as there is no direct competition in the fish vaccines business. The likely competition may arise from multinational animal health companies such as Novartis, Pfizer or Pharmaq. Merck has already set up an R&D facility in Singapore (Komar, Sheehan, Tan, & Enright, 2006). *Local animal health companies like Indian Immunologicals Ltd or Ventri Biologicals may pose a threat of competition in the future.*					
1	2	3	4	5	
High		Industry Growth		Slow / Negative	
Aquaculture industry is growing at an average annual growth rate of 7% in India (Pallapothu, 2012).					
1	2	3	**4**	5	
Low		**Fixed and /or Storage Costs**		High	√
Fixes costs and the storage costs are high as this business is in a technology intensive biotechnology industry that uses specialized assets and provides perishable goods. Long lead times required for testing the products before release increases the storage costs.					
1	2	3	4	5	
High		**Product Differentiation**		Low	√
Product differentiation will be high similar to the companies in the Western markets that operate with novel products that are protected with intellectual property (IP) (patents). It is expected to have similar protection of IP in Indian market. Also, emphasis on value proposition is increasing in India and products with innovation are being adopted (Tiwari & Herstatt, 2012).					
1	**2**	3	4	5	
High		**Switching Costs**		Low	√
Switching costs are high for the companies to change the industry due to the differences in marketing efforts, supply chain and regulations to venture into other animal health products.					
1	2	**3**	4	5	
Low		Strategic Stakes		High	
Strategic stakes are moderate when the market share is eroded by the entry of a new company or when the market adoption of the products is low due to high switching costs. In this industry, the firms continue their businesses to offer products to its customers to demonstrate its commitment even though the returns may suffer in the short term. Gandhian philosophy applies to this market as it pertains to 'value for many' at an affordable price. Indian entrepreneurs' value of long-term orientation (Hofstede, 2009) *also speaks to this fact who take pride and give priority to serving societal interests over the organizational interests and with a sense to accept the loses in the short-term.*					
1	**2**	3	4	5	
Small Increments		Capacity Expansion		Large Increments	
The capacity expansion can be made in small increments as per the increase in market share appropriation by the firm. Since fish vaccines can be scalable without the expansion of facilities but by the expansion of the equipment or improving process efficiency, the overcapacity issue can be mitigated. Similarly, the vaccine delivery machinery can be expanded as per the market share appropriation.					
1	2	**3**	4	5	
Low		Exit Barriers		High	
Exit barriers for the firm include repayment of loans, accrued interests and lease payments, as well as liquidation of specialized assets. Since the fish vaccines business is in the biotechnology industry, the exit barriers are moderate. Conversely, opportunities in selling the firm to potential animal health companies are high as the industry is growing rapidly and attractive which could ease the exit barriers.					

Appendix 6: Benefits of Complementors

LOW		BENEFIT LEVELS		HIGH	
1	2	3	**4**	5	
Not Likely		Cross Selling		Highly Likely	
Complementors such as probiotics, feed supplements and immune enhancers work in conjunction with vaccines. Cross selling vaccines with these products will not only enhance buyers' product value but also increase the profitability to the vaccine firm and productivity of the buyer. Customer relationship management may be of importance in Indian context where long-term and positive relationship with the customer enhances the trust leading to commitment to new product offerings.					
1	2	3	4	**5**	
High		Bundle Pricing		Low	
Bundle pricing is essential to provide the customer a superior value which will enable both the buyer and seller to minimize their transaction costs.					
1	2	3	**4**	5	
Lower		**Economies of Scope**		Higher	√
The total cost of production could be spread out if complementary products are produced by the vaccine firm. Since vaccines and probiotics require the same type of upstream infrastructure and human resources, it is expected to increase the economies of scope for an entrant and spreading the fixed costs.					
1	2	3	**4**	5	
Low		Reduction of Transaction Costs with Customers		High	
The entrant would minimize the transaction costs in terms of marketing, customer visits, and accounting systems if offered as a bundle of products and services. Similarly, the buyer would also experience a reduction in transaction costs.					
1	2	3	4	**5**	
Low		Economies of Integration (increasing value)		High	
Use of entrant's product (vaccine) alone may not offer complete protection to the buyers' products. It requires complementary products and good husbandry practices in order to reap the full potential of vaccines (Kibenge, Godoy, Fast, Workenhe, & Kibenge, 2012).					
1	2	3	**4**	5	
Low		**Speed to market through Alliances**		High	√
Alliances by the entrant with National Research Institutes or the feed manufacturers could accelerate the speed to market. Leveraging the customer information and distribution channels through feed manufacturers could be one alternative. If the entrant is able to produce the complementary products by itself then the speed to market could be realized through its brand image and strength, and customer relationship management capability in the industry.					
1	2	3	**4**	5	
Low		**Competitor Lock-Out and System Lock-In**		High	√
Understanding the customer needs, tailoring the products to meet their farm requirements and integrating customers into the value chain not only helps the entrant to build trust and good relationship but also allows it to succeed in system lock-in and competitor lock-out. In author's experience, at least in developed markets like Norway and Chile, customer-vaccine supplier bonding plays a key role on business success and taking the Indian social structure, relationship building with the customer goes far beyond just selling a product (Pallapothu, 2012). *Due to power distance being high in small family owned Indian businesses* (Raghavan, 2008)*, aquaculture farms being small family-owned businesses in India* (Abraham et al., 2010)*, and the power of decision making vested at the peak of the organizational structure, an approach of reaching and convincing the owner of the customer organization is vital in successful competitor lock-out and system lock-in.*					