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The Complexities of Honda's Supply Chain & Associated Risks: Understanding Suppliers & Customers, Industry Differentiators, and Market Locations

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ABSTRACT

This paper investigates Honda Motor Co of Japan and over 50+ supply chain network relationships between suppliers and customers. These companies represent the industry through trading, specialty retail, road & rail, professional services, machinery, food products, electronic equipment, diversified financial, automobiles, and auto components. Using data from Bloomberg terminals, Mergent Online, Hoover Academics, and IBIS World, our goal was to understand Honda's supply chain risks and the capabilities needed to overcome them, in conjunction with their suppliers, customers' locations, and industry differentiators. We aimed to understand how they performed through the many disruptions of the Covid-19 pandemic. Results showed that the main risks to Honda Motor Co are in three categories: Organizational (credit, agency), Industry (product market, input market), and Environmental (macroeconomic). The core capabilities that Honda Motor Co used to overcome these risks are Flexibility (financial strength), Velocity (efficiency, anticipation, security), and Collaboration (market position). As a market leader, Honda has demonstrated resilience and readiness to recover from these disruptions.

Keywords: automotive industry, capabilities, disruptions, risks, supply chain resiliency

1. INTRODUCTION

In a world where unexpected events can cause mass disruption to industries worldwide, companies have been embracing supply chain lessons aiming at a more resilient supply chain (Young, 2022). It is in the hands of worldwide leaders to work towards resilience to proactively prepare against such events or recover quickly from them. To be resilient, companies must establish processes, risk management, and business continuity and identify their supply chain vulnerabilities. We must also understand that our world is dominated by the extreme, the unknown, and the improbable (Fiksel *et al.*, 2015). As the spread of Covid-19 took over the world, delays, shortages, and productivity impacted many industries. These challenges were no different for the automotive industry.

In 2020, the Global Automotive Market consisted of 85.32 million units and was expected to reach 122.83 units by 2030 (Carlier, 2021.). Within this market, the five top players and their market share came to be General Motors 17.3%, Toyota 14.41%, Ford 13.87%, FCA/Chrysler 12.41%, and Honda 9.12%. However, this growth was thwarted by the supply chain risks introduced by the Covid-19 pandemic.

This paper focuses exclusively on Honda Motor Company, a Japanese multinational manufacturer of automobiles, motorcycles, and different power equipment tools, with their headquarters residing in Minato, Tokyo, Japan. In recent years, Honda has reported over $15T in Japanese Yen (JPY – about US$ 128B). Regarding its supply chain design, we identified 597 tier-1 suppliers and 73 tier-1 customers (Manufacturing Honda, 2021; Bloomberg Terminal, 2021). With the hit of COVID-19, Honda forecasted a 68% decrease in annual operating profit, with expected profits sinking to 200B Japanese Yen by the end of

2021, being its weakest profit since 2010 (Honda Revenue, 2021). This decrease in revenue comes with Honda bracing for a 6% decrease in annual vehicle sales after a 40% plunge in the June quarter (2021), which resulted in a 100B+ JPY operating loss. COVID-19 and the 2021 semiconductor chip shortage hurt Honda immensely, but the manufacturer was already seeing a 10-year global low in customer demand (Reuters, 2020). Knowing this information, this paper's research aims to discover possible insights toward recovery.

Within this paper, the research aims to answer three questions, of which one is primary, and the other two are secondary support. The primary research question is: *what are Honda's supply chain risks and the associated capabilities needed to overcome them with resilience?* The secondary research questions are: *where are their suppliers and customers located, and does their location correlate to their markets? What industry are their suppliers and customers a part of, and do they differentiate?* The three questions were created to uncover contributing factors that may disrupt Honda's supply chain and discover what is necessary for the organization to overcome them. Specifically, our secondary questions were designed to offer further explanations of the disruptions and capabilities present to overcome them. To answer these questions, we utilized several academic reports on their supply chain risks and capabilities, including 10K filings, cluster mapping, and multiple databases, such as IBISWorld, Mergent Online, Bloomberg, and Hoover Academics to analyze Honda's resilience amid the Covid-19 pandemic.

2. THEORETICAL BACKGROUND

In the modern global economy, the interconnectedness of supply chains has allowed suppliers in economies of all sizes to participate and thrive. The importance of buyer and supplier partnerships in supply chain resiliency has been reinforced by different authors (Ponomarov and Holcomb, 2009; Wieteska, 2020). However, these complex supplier relationships have introduced a huge amount of risk and vulnerability. Even minor disruptions can cause companies significant financial losses, while globalization has made risk management of these disruptions increasingly challenging (Christopher and Lee, 2004). This paper will utilize multiple theories to analyze Honda's supply chain, including supply chain risk management, supply chain risks, vulnerabilities and capabilities, and industry clusters. This paper will show how these theories are interrelated and help to answer our research questions.

2.1 Supply Chain Risk Management

Supply chain risk management (SCRM) has become ever more important and popular amongst academics and practitioners. According to Jutner *et al*. (2011), SCRM is defined as "the management of external risks through a coordinated approach among the supply chain members to reduce supply chain vulnerabilities" (Christopher 2002). SCRM consists of four key management aspects: 1. Assessing risk sources for the supply chain; 2. Defying the supply chain's adverse consequences; 3. Identifying the risk drivers; 4. Mitigating risks for the supply chain (Rao and Goldsby, 2009; Jutner *et al*. 2011). Overall, SCRM must be focused on reducing vulnerabilities to the supply chain rather than looking at a firm level. To manage supply chain risks and vulnerabilities, we must first define those risks or vulnerabilities. We will use the concept of supply chain risk management as an underlying framework by Fiksel *et al*. (2015) and Petit *et al.* (2010, 2013, 2019) and the typology of supply chain risks by Rao and Goldsby (2009). We will combine these frameworks to accurately define supply chain vulnerabilities and coordinating capabilities.

2.2 Supply Chain Vulnerability Factors and Capabilities

Fiksel *et al*. (2015) recognize that companies have long employed traditional risk management methods that assume a certain level of stability. However, with the introduction of increased risks through globalization, which has never been more poignant than within the Covid-19 pandemic, there is a need to define vulnerabilities related to those risks. Petit et al. (2010, 2013, 2019) propose a supply chain resilience assessment and management (SCRAM) framework to allow businesses to properly identify and prioritize vulnerabilities and corresponding capabilities to build resilience. Throughout their research, Fiksel *et al.* (2015) identified six types of vulnerabilities that firms face in this ever-growing global economy. These supply chain vulnerabilities are defined as "factors that make an enterprise susceptible to disruptions" (Fiksel *et al*., 2015). These vulnerabilities are 1. Turbulence; 2. Deliberate threats; 3. External pressures; 4. Resource limits; 5. Sensitivity; and 6. Connectivity (2015). Within this framework, the vulnerability of *turbulence* is defined as "changes in the business environment that are beyond a company's control." These may include shifts in customer demand, geopolitical disruptions, natural disasters, and pandemics. The next vulnerability within this framework is *deliberate threats* that would include sabotage, terrorism, or disputes with labor groups. The category of *external pressures* creates barriers or other constraints like regulatory shifts or shifts in cultural attitudes but are not specifically targeted at the company. *Resource limits* like the availability of raw materials or labor have the potential to put constraints on a company's production capacity. *Sensitivity* refers to the complexity of the firm's production process and the importance of controlled conditions within the production process, while *connectivity* refers to how interrelated the firm is with others in the supply chain or outside entities. These are the principal factors in the SCRAM framework (Fiksel *et al*., 2015; Petit *et al*. 2010, 2013), but they also define several related subfactors. For example, *turbulence* subfactors include unpredictability in demand, technological failures, or fluctuations in currency. Another example would be the *external pressures* subfactors which include competitive innovation, government regulations, price pressures, health and safety concerns, etc. While we will not list the full scale of subfactors identified by Fiskel *et al*. (2010) within this paper, we mention them to recognize the depth and complexity of each principal vulnerability factor.

Next, Fiksel *et al.* (2015) define ways that a firm can build supply chain resilience. Supply chain capabilities are "attributes that enable an enterprise to anticipate and overcome disruptions" (Fiksel *et al*., 2015). These capabilities are 1. *Flexibility in sourcing* - the ability to rapidly change the input or mode of receiving the inputs; 2. *Flexibility in manufacturing* - ability to quickly and

efficiently change outputs; 3. *Flexibility in order fulfillment* - ability to quickly change the way of delivering outputs; 4. *Capacity* - availability of assets to enable sustained levels of production; 5. *Efficiency* - the capability to produce outputs with minimum resource requirement; 6. *Visibility* - knowledge of operating asset status; 7. *Adaptability* - ability to modify operations when faced with challenges; 8. *Anticipation* - ability to discern potential future situations; 9. *Recovery* - ability to return to normal operation after challenge; 10. *Dispersion* - wide distribution/decentralization of assets; 11. *Collaboration* - the ability to work well with others of mutual benefit; 12. *Organization* - infrastructure like human resources, policies, culture, etc; 13. *Market position* - status of the company within specific markets; 14. Security - ability to defend against deliberate attack or theft; 15. *Financial strength* - ability to absorb financial fluctuations; 16. *Product stewardship* - sustainable business practices (Fiksel *et al.*, 2015). Like the principal vulnerability factors, these capability factors also have subfactors for each category. While listing them all is out of scope for this particular analysis, they could be used in the future analysis of firms' resilience through SCRAM framework capabilities.

The SCRAM framework is only one system for identifying vulnerabilities and corresponding capabilities. In this paper, we will combine the SCRAM framework with the typology of supply chain risks proposed by Rao and Goldsby (2009) presented below in **Table 1**. Rao and Goldsby (2009) have defined three categories of "framework factors": environmental risk, industry risk, and organizational risk. They also define categories of "problem-specific risk" and "decision maker risk ."These categories have multiple subfactors within each category. The components - specifically the vulnerability factors - of Fiksel *et al.*'s SCRAM framework fit well within each category, further organizing the factors for use in the analysis. By combining the SCRAM framework and typology of supply chain risks, we can analyze the fullness of supply chain risk and management of Honda in a more comprehensive manner.

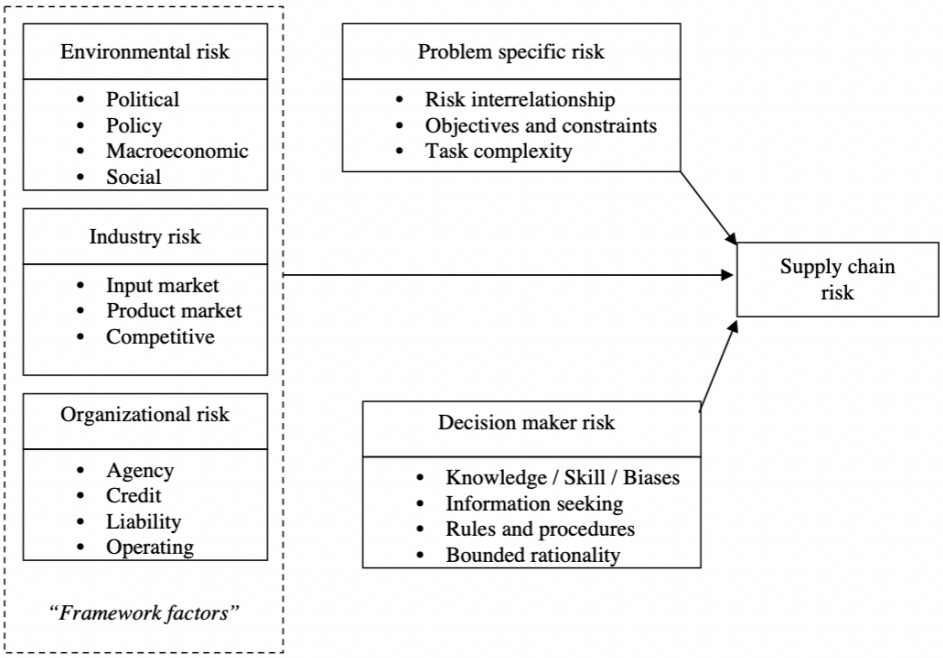

Figure 1. Supply Chain Risk Framework
Source: Rao and Godsby (2009)

2.3 Industry Clusters

In addition to analyzing risks through the SCRAM framework and typology of supply chain risks, we will look at industry data through the lens of industry clusters. Delgado *et al*. (2016) define clusters as "geographic concentrations of industries related by knowledge, skills, inputs, demand and/or other linkages" that are regionally comparable. Recognizing the way that clusters behave, we can make inferences about the industry as a whole. In cluster analysis, it is important to note that "economies of agglomeration manifest themselves in geographic concentrations of related economic activity …. (where) the firms may operate more efficiently and innovate faster due to sharing common technologies, infrastructure, pools of knowledge and skills, inputs and responding to demanding local customers (Delgado *et al.*, 2016)."

For this paper, we will utilize basic cluster analysis and what is known about region-specific clusters. By " identifying locations with a high density of economic activity in a particular field…" we can begin to analyze certain externalities about that region and the industry (Delgado *et al.*, 2016). We will combine these understandings of clusters with the frameworks mentioned above to analyze Honda's risks under section 4. Data Presentation.

3. METHODS

To answer our research questions, we utilized several reports on Honda to identify their supply chain risks and capabilities, such as 10K filings, Cluster Mapping, and multiple databases, including IBISWorld, Mergent Online, Bloomberg Terminal, and Hoovers Academics. We used the

Bloomberg terminal to find specific supply chain data about Honda. This would allow us to see the correlations between suppliers and consumers and lead us to see the risks that may occur from these relationships. Through the Supply Chain Analysis (SPLC) function, we gathered detailed information about the company's supply chain. We also reviewed Tier 1 through Tier 6 data and viewed the relationship between suppliers and consumers. We used Honda 10-K filings to find different risk factors and how Honda mitigates risk. Through this, we could see how Honda uses their financial strength to reduce credit risk. Another method we took advantage of was the U.S. Cluster Mapping tool to determine the top employment in different states and what industries were the most employed. Through this, we could see where Honda had the most risk. We also used it to view Honda's plants throughout the United States. Mergent online was used to accurately view Honda's financial information. Other specific databases that were used were Hoovers Academic and IBISWorld. Throughout this research paper, you will notice that there are a variety of tables and graphs. The authors created some of these visualizations due to Bloomberg license download restrictions, but the majority came from QDA Miner and Tableau software. Both QDA Miner and Tableau were great resources to sort the data and analyze the facts at hand, but also to visualize what was occurring. We invested approximately 150 hours in research and analysis.

4. DATA PRESENTATION

The automotive industry is constantly changing, more so now, with the supply chain impacts of the recent COVID-19 pandemic. To understand the automotive industry challenges and make inferences about how these industry challenges apply to Honda, we began a study into the industry clusters of employment, industry subclusters, and region-specific clusters. In this section of the paper, we will present the data of our industry-related findings with minimal analysis in conjunction with specific data about Honda and inferences related to their supply chain design.

The first level of data that we considered was the top employment locations for the automotive industry. **Table 2** shows the top 5 locations of employment for the automotive industry cluster, verifying the strength the industry plays in America's Midwest (**Table 1**).

Table 1. Automotive Cluster Employment by State 2018 (Top 5)

Ranking	*State*	*Employment*
#1	Michigan	180,283
#2	Ohio	114,737
#3	Indiana	93,817
#4	Kentucky	64,753
#5	Tennessee	57,602

Source: Based on US Custer Mapping, 2021

This industry-wide data also presents direct comparisons to Honda USA. Honda USA manufacturing plants are primarily located in Ohio, Indiana, Alabama, South Carolina, and North Carolina. Honda's manufacturing began in America over 40 years ago after its first plant opened in Marysville, Ohio. Honda boasts that they have cars on the "Most American Made Vehicles' list. To make this list, autos must be assembled in the U.S. and have parts produced in the U.S. They have plants that make genuine Honda parts in Ohio, Georgia, and North Carolina. This information tells us that upon risk, there are high employment numbers surrounding specific areas that can be supported internally as a corporation. As we will discuss in more detail in the next section of the paper, the location of manufacturing plants is vital to Honda's supply chain design and resiliency.

From there, we looked at employment by Industry Subcluster (**Table 2**), where we found Automotive Parts, Motor Vehicles, and Metal Mills to provide the highest employment. From the highest industry subcluster to the lowest industry subcluster, there was a vast difference of 445,000+ employed versus 13,000+ employed. This shows us the prioritized areas of the business that are backed for risk.

Table 2. Employment by Industry Subcluster 2018

Subcluster Type	*Employment*
Automotive Parts	445,647
Motor Vehicles	370,277
Metal Mills and Foundries	119,053
Gasoline Engines and Engine Parts	63,312
Small Vehicles	13,889
Military Vehicles and Tanks	9,744

Source: Based on US Custer Mapping, 2021

We then observed the region-specific cluster, with Automotives being at the center, fueling Plastics, Metalworking, and Production Technology (**Figure 2**).

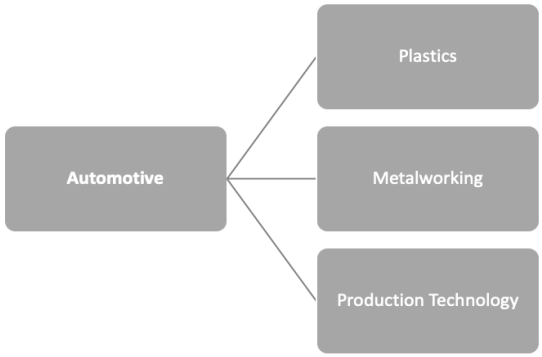

Figure 2. Regional Clusters, Automotive Industry's Main Connections
Source: Based on US Custer Mapping, 2021

While exploring the data about industry clusters' location and employment, we sought to understand how Honda's suppliers and customers differentiate between industries. There were slight differences between the top 40 suppliers (per revenue) and the top 20 customers (per revenue). Honda's leading 40 suppliers were generally classified under the industry of "Auto Components," with a few classified under "Electronic Equipment, Instruments & Components" and a sparse amount (2-3) categorized under "Machinery and Professional Services." From the customer's perspective, it was different. There were hardly any "Auto Component" classifications of industry, and instead, the most common was "Specialty Retail." Other customers' industries are considered "Road & Rail, Machinery, and Food Products." It did not surprise us that Honda's suppliers and customers would be in different industries, as they have other objectives and goals contributing to Honda Motor Co. They were also located in different parts of the world. While customers are located in the Americas, Asia, and Europe; suppliers are mostly in India, Japan, and the U.S. (**Figure 3**).

Figure 3. Supplier Locations vs. Customer Locations

After analyzing industry clusters, we wanted to explore the various tiers of Honda's supply chain design. When we look at Honda's first tier of suppliers, we identified 597 suppliers in Tier 1. As we look further down in Tier 2, 3, 4, 5, and 6, the number of suppliers and customers for each varies but generally reduces. T.S. Tech Co. Ltd, a Tier 2 company, has 28 suppliers. Not only are they a supplier of Honda, but also a customer. This dual relationship in the supply chain continues to the next tier with Imassen Electric. Imassen Electric has 14 suppliers and is a supplier and customer of T.S. Tech Co. Ltd. These relationships are also notable when looking at Honda's supply chain design, which will be discussed later in the paper. A few illustrations of these relationships are represented in **Figure 4**.

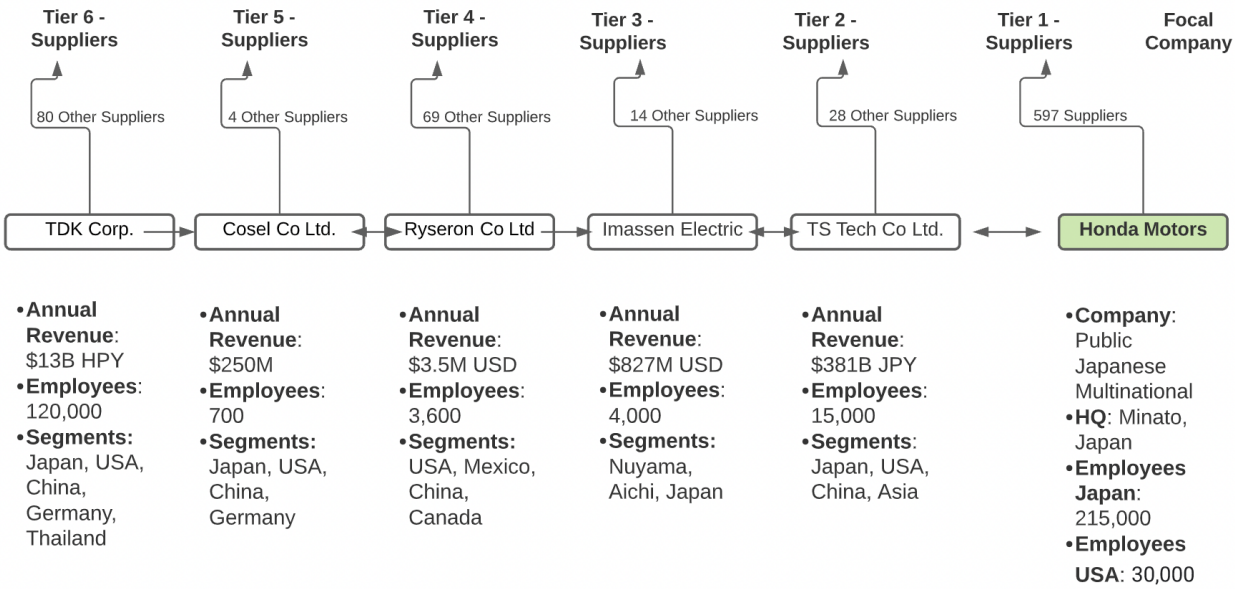

Figure 4. Honda Example of Supply Chain Relationships

As we moved down the tiers in the supply chain, the smallest number of suppliers, 4, was found in our tier 5. This may be because Honda has many different parts to produce its product and will need many suppliers to achieve this. Some of the companies on the lower tiers may not need as many suppliers because they do not have as many components that go into the production of the part they need.

It is intriguing to see how many suppliers excessively rely on Honda (**Table 3**). T.S. Tech Co Ltd, a supplier of Honda, has 90.85% of its revenue relied on Honda. Not far behind them is H-One Co Ltd with 88.45% and F-Tech Inc at 71.91%. When looking at the amount of revenue each tier receives, it tends to have a gradual decrease. While T.S. Tech Co LTD is Tier 2 and has revenue from Honda at 90.8%, Tier 6, which is TDK Corporation, has .04% of revenue from Cosel Co LTD, Tier 5. The decrease in revenue may be due to the number of suppliers each company has or how much the product is needed.

Table 3. Revenue Reliance on Honda

Supplier or Customer	*Company*	*Industry*	*Revenue %*
Supplier	T.S. Tech Co Ltd	Auto Components	90.8%
Supplier	H-One Co Ltd	Auto Components	88.45%
Supplier	F-Tech Inc	Auto Components	71.91%

5. DATA ANALYSIS

Using the data presented above, secondary research and frameworks proposed by Rao and Goldsby (2009), Fiksel *et al*. (2015), Caniels (2005), and Delgado *et al*, (2015) we can answer our research questions: What are Honda's risks and associated capabilities to overcome them? Where are their suppliers and customers located, and does their location correlate with their markets? What industry are their suppliers and customers a part of, and do they differentiate? And finally, we will use our research and research questions to tell us about Honda's resilience and ability to overcome industry risks related to the Covid-19 pandemic.

First, by using the frameworks presented by Rao and Goldsby (2009) and Fiksel *et. al* (2015), we can identify Honda's risks/vulnerabilities and capabilities as discussed in Honda's annual reports. Below, in **Figure 5**, are the vulnerabilities identified in Honda's reports and data.

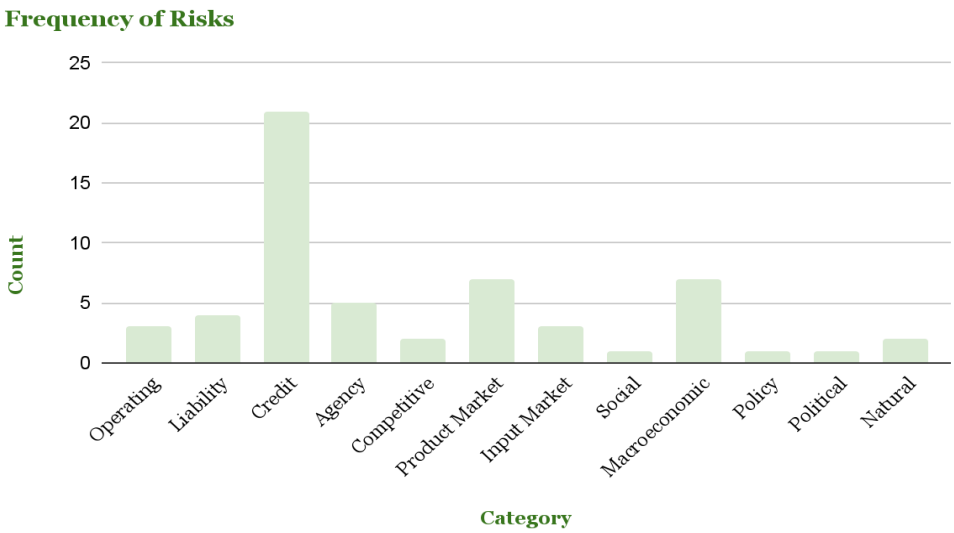

***Figure 5**. Frequency of Risks*

We also can further understand these vulnerabilities by placing them in the categories of risk or "framework factors" by Rao and Goldsby of Organizational, Industry, and Environmental Risk. The top five risks within these framework factors that we identified were 1. *Credit*, organizational risk; 2. *Product market*, industry risk; 3. *Macroeconomic*, environmental risk; 4. Agency, organizational risk; 5. *Liability*, organizational risk. As can be seen in **Figure 5**, Honda presents multiple risks within the three categories as defined by Roa and Goldsby (2009). Combining Rao and Goldsby (2009) and Fiksel *et al.'s* framework

The organizational risk of *credit refers* to the loss that arises from the failure of a consumer or dealer to meet the terms of a contract with Honda or failure to perform what was agreed upon. The majority of the credit risk is from consumer financing and partially dealer financing. The credit risk for consumers is made up of the total number of

contracts that default and the amount of loss per occurrence net of recoveries. The level of credit risk with dealers is influenced by the financial strength of the dealers in the portfolio.

The industry risk of the *product market* refers to the changes that occur unexpectedly in the demand for a company's output. This can be due to changes in what the consumer now wants or if there are more product substitutions. Hondas is in a competitive market with new cars being introduced. Honda has to be prepared for unexpected substitutions that may occur.

The environmental risk of *macroeconomics* refers to price fluctuation. This is due to exchange rates, interest rates, and raw materials or labor. Honda has risks from interest rates and liquidity and uses funding sources such as commercial paper, medium-term notes, bank loans, and asset-backed securities to minimize these risks. Honda also looks at the interest rate environment, capital market conditions, and economic conditions to reduce macroeconomic risk. They also use derivative instruments to reduce the exposure to fluctuations in interest rates and exchange rates.

The organizational risk of *agency* refers to the uncertainty that is associated with other agency relationships. When there is a contract with more than one person engaging the other person to perform a specific service and involves some decision making this can lead to agency risk. Honda has noted issues with an agency agreement that requires the other party to agree to specific terms such as negative pledge provisions, and also includes customary events as default.

The organizational risk of *liability* refers to the prospect of legal or market actions against Honda. Honda determines accruals from legal claims when the costs can be reasonably determined and when the claims are probable. There is a lot of uncertainty with legal matters; the costs that are associated with resolving legal disputes may be substantially higher or lower than originally estimated. Honda is involved with different legal proceedings from individual customers and class action lawsuits.

Another critical aspect to note, not found within Honda-specific reports, is the novel industry risks brought forth by the Covid-19 pandemic and associated supply chain crisis. As mentioned earlier in the report, Honda forecasts a 68% decrease in annual operating profit due to the disruptions of the Covid-19 pandemic. The obvious reason for the decrease in operating profit is a decrease in sales. This decrease in sales came from the low demand from customers and the semiconductor chip shortage, which has made it very difficult to get a new car. However, Honda is seen overcoming the pandemic better than some of its rivals such as Mazda, Nissan, and Mitsubishi, who forecasted record operating losses for last year (Reuters, 2020). There are many aspects of risk associated with the Covid-19 pandemic, but for this paper, we think it's appropriate to categorize the pandemic as an environmental risk as well as an industry risk.

Next, we will discuss some of Honda's main supply chain capabilities (**Figure 6**).

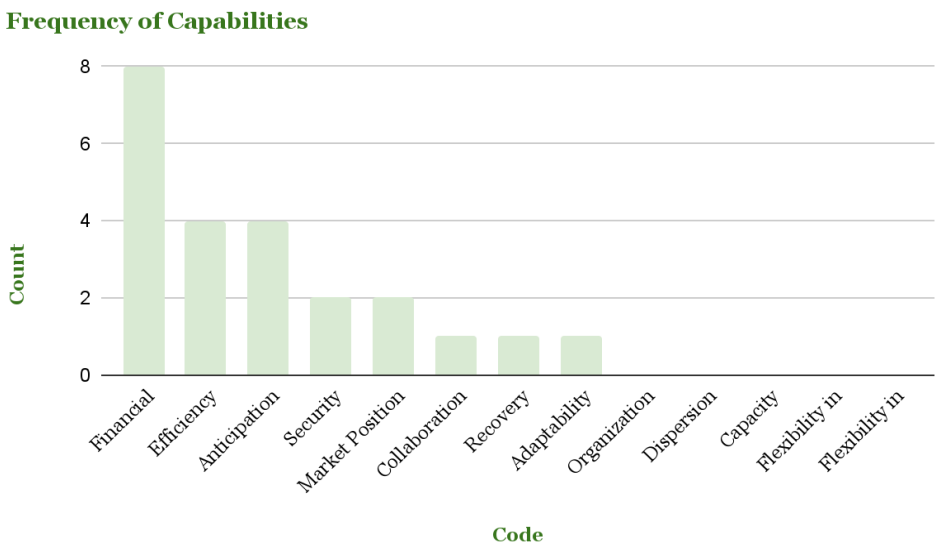

Figure 6. Frequency of Capabilities

Based on our research, Honda already demonstrates several of the defined capabilities. The capabilities that Honda currently has are 1. Flexibility through financial strength; 2. Velocity through efficiency, anticipation, recovery, and adaptability; and 3. Collaboration through market position. The SCRAM framework suggests that by utilizing capabilities, a firm can reduce and address vulnerabilities in its supply chain (Fiksel *et al*. 2015). Through these capabilities, Honda can reduce its vulnerability and reduce the frequency of disruptions to its operations.

The greatest capability that Honda has is Flexibility through financial strength. Honda faces majority credit risk and uses financial strength to help lower this risk. Making sure that they have collateral securing the financing in their portfolio and the economic factors can ensure that there is less collateral. The financial strength then reduces the credit losses and premature termination of operating lease assets

which would negatively impact the cash flow, financial conditions, and operations. This specific capability would be helpful, for example, during the crisis of the Covid-19 pandemic where there was a severe fluctuation in cash flow. Financial strength allows a company to weather these types of fluctuations and result in quicker recovery from loss.

Honda strived to have efficiency through waste elimination, labor productivity, and asset utilization. Honda works to make sure that its employees are in a safe working environment which can help increase labor productivity. Furthermore, Honda tries to make sure that the actual number of assets being used is comparable to the number of assets available for use. Also, reducing the amount of waste from producing products allows for them to be more efficient.

Through anticipation, Honda forecasts current and future economic conditions to help mitigate the risks. These forecasts are put in a model to project the monthly gross loss rates, and to see the dollars that are lost. Honda continues to develop this model to predict events or losses that may occur in the future. Honda also uses a re-evaluation of the model to estimate termination losses from operating lease assets. This capability can reduce liability risk.

Through layered defenses, personnel security, and cyber security Honda has reduced the risk of competitors or consumers gathering information about Honda that should not be released. Cybersecurity breaches, internal controls, theft, and fraud are all risks that Honda eliminates by having increased security.

Honda has a strong market position by keeping up with its competitors and continuing to have product differentiation. By providing customers with a loyal product, they can build customer retention along with building up a reputable brand name. These strengths allow Honda to reduce industry risk.

Finally, by understanding supply chain clusters, we can make inferences about Honda's supply chain design in its efforts to build resiliency. Honda's supply chain design by location is not by coincidence. Region-specific clusters show dependence on the geographic location and existing firms. As we observed with Honda's suppliers and customers, we know that there are linkages that likely make doing business easier by being geographically close. By participating in the Midwest automotive industry cluster, Honda participates as a "driver" industry (automotive) where other industries cluster around as can be seen in **Figure 2** (plastics, metalworking, etc). Participating in a region-specific cluster, it has allowed Honda to build resiliency and develop cluster-specific capabilities like economies of scale, sharing of industry-specific knowledge/skills, sharing of resources, etc. By having manufacturing plants in the U.S. that assemble their vehicles and plants that produce parts, Honda has taken control of its supply chain in the U.S. Honda produces parts and creates vehicles in the markets they sell (Manufacturing, 2021). This speaks to Honda's view of supply chain design and intentional risk mitigation in the supply chain by participating in industry region-specific clusters. Placing themselves within the region-specific midwest automotive industry cluster gives Honda capabilities to mitigate supply chain risk.

Also, the interrelatedness of supplier and customer is notable within our data and when looking at Honda's supply chain design within the automotive industry cluster. Honda has a very diverse supply chain but chooses to localize its suppliers and manufacturing plants to its customer segments. We have discussed the midwest automotive industry cluster, but the other largest customer segment is in Japan. For example, their largest supplier, T.S. Tech Co Ltd, is also headquartered in Japan. As discussed above, Honda has manufacturing facilities not only in the U.S. but also in Japan. Therefore, it would make sense to have an extensive parts supplier local to their Japanese manufacturing plants and local to a large customer base. In a world where the Covid-19 pandemic has revealed the risks and vulnerabilities of globalization, participating in region-specific clusters and sourcing suppliers local to their manufacturing plants and their customers is a major capability. The specific capability could be defined as an "organizational capability." By diving deep into an understanding of Honda's supply chain clusters, we have a better understanding of Honda's capabilities and supply chain resilience.

6. FINAL CONSIDERATIONS

Honda Motor Co has made a big impact on the automotive industry over the years, shown through the depth of their tier supply chain and ability to overcome supply chain risk. To conclude our research, we will now summarize our research questions and conclusions.

Primary Research Question: What are Honda's risks and associated capabilities to overcome them with resilience?

Through frameworks presented by Rao and Goldsby (2009) and Fiksel *et al.* (2015), followed by 10K filings and Bloomberg Terminal, we were able to identify Honda's risks and associated capabilities to overcome them with resilience. Our risk and capability data analysis revealed that Honda Motor Co.'s most prominent capabilities are financial strength, efficiency, anticipation, security, and market position. These five capabilities help mitigate Honda's most prominent risks - credit risk, macroeconomic risk, product market risk, agency risk, and liability risk. Within our research, the largest risk that they faced was credit risk due to the failure of a consumer or dealer not being able to meet the terms of a contract. The product market risk that Honda faces is unexpected changes in what the consumer demands or if more substitutions become available. The macroeconomic risk they face is changes in interest rates and currency exchange rates. The agency risk is Honda's uncertainty when having relationships with other agencies. Lastly, the liability risk is from the legal claims that Honda faces. Ultimately, the greatest risk that Honda currently faces is the environmental risk of the Covid-19 pandemic.

Additionally, through Honda's capabilities, they can work to reduce their risks and vulnerabilities. Honda has financial strength from realizing the risk associated with price fluctuations, diversifying its portfolio, having financial reserves and liquidity, and understanding the price margin. Honda uses efficiency by being able to produce outputs with decreased resource requirements. By anticipating future events through monitoring, forecasting, and risk management, Honda can diminish certain risks. Honda uses cybersecurity, employee involvement, and restricted access to have security in its organization. Lastly, Honda's product

market has diversified products, market share, customer communications and relationships, and brand equity.

Secondary Research Question 1: Where are their suppliers and customers located, and does their location have a correlation to their markets?

Furthermore, we were able to answer our first secondary research question through cluster mapping. We saw the majority of their manufacturing taking place in Japan, China, and within America's Midwest, close to the largest markets for their vehicles. Part plants and manufacturing plants located in the U.S. and Mexico were supplied to the North American automotive market, similarly to China's supply chain infrastructure. It was apparent that Honda meant to bring their suppliers close to their manufacturing plants in each of their customer markets around the world. By localizing their supply chains relative to their largest customer markets and participating in region-specific clusters, Honda likely can mitigate supply chain risk and realize the benefits of being a "driver" in the automotive industry cluster.

Secondary Research Question 2: What industry are their suppliers and customers a part of, and do they differentiate?

We supported our second research question through cluster mapping, which allowed us to conclude how their suppliers and customer industries differentiate, with Honda's suppliers being mainly auto components and Honda's customers mainly retailers. However, this is interesting to note that Honda also builds auto parts for their vehicles. While we know that there is a dual customer/buyer relationship between some of the companies within Honda's supply chain, it seems as though these relationships are not the norm. This means that Honda does not manufacture parts or auto components for other companies on a large scale.

In conclusion, we believe that Honda Motor Co. demonstrates excellence in supply chain management and in building supply chain resilience. While the Covid-19 pandemic and related supply-chain crises have had major impacts on the automotive industry (Eckert, 2022), we believe that Honda's development of supply chain capabilities and participation as a driver in region-specific automotive clusters will be able to overcome pandemic losses. As proposed by the research within this paper, we have confidence that Honda will continue to overcome not only pandemic-related to risk, but also any additional risk to their business with resilience.

Implications

The research suggests that Honda has the power to overcome associated supply chain risks through its strongest capabilities while also acknowledging that its location and industry crossover is a significant impact on the success of the company. Between COVID-19 and semiconductor shortages, Honda has ample time to identify risks before their building, with a plan to overcome them with resilience. As many organizations learned in the last few years, it is critical to be proactive rather than reactive when it comes to supply chain management.

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