RESEARCH PROJECT REPORT

Strategic Cognition of Supply Chain Managers about Post-COVID-19 Strategies

by

Thais de Salgado Rêgo Mendes

MSc in Medical Science, Federal University Fluminense (UFF), Rio de Janeiro, Brazil
B.S. in Nutrition, Federal University of Ouro Preto (UFOP), Minas Gerais, Brazil

Submitted to the MIT Malaysia Supply Chain Management Program in Partial Fulfillment of the Requirements for the Degree of

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ABSTRACT

The Covid-19 pandemic caused an unprecedented disruption in global supply chains, forcing companies to adapt to a "new normal" approach to work. Although this "new normal" is not defined, it presents an opportunity to rethink the strategies for designing and operating supply chains. Indeed, the ability to think outside the box, plan for the future and address the unknown is necessary for defining the "new normal". To this end, the present research set out to obtain views from inside the supply chain, of those professionals who are facing day-to-day challenges, on their outlook for the post-pandemic world and ideas for the strategies their company should adopt. The findings, based on the data collected from a survey of over 100 supply chain managers and business leaders, show little compliance of strategic action from the executive's perceptions compared to theoretical predictions (Study I). I believe that this is due to the enormity of uncertainty unleashed by the pandemic. To help industry practitioners grapple with this uncertainty, Scenario planning to offer four scenarios to help them identify potential future states and appropriate strategic actions, including those not considered before (Study II). This study gives supply chain professionals an opportunity to reflect this change under a future-forward mindset.

Research Report Supervisor: Shardul Phadnis
Title: Associate Professor and Director of Research

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1 Introduction

Although the need to adapt constantly to new realities in business is not a new concept, the coronavirus pandemic has had an unprecedented impact on supply chains worldwide. It has exposed fragilities and vulnerabilities in businesses' ongoing strategies and put decision-making into an uncertain future.

Our current pandemic has created a major uncertainty and given businesses the hard task of adapting their supply chains from initial chaos to a meaningful change. This way, the strategic thinking ability of managers becomes an essential tool within all levels in an organization, as they attempt to navigate through this turbulence. This context urges the executives to have a better understanding of the future business environment to determine the direction to be taken to achieve their vision.

1.1 COVID-19 impact on supply chain

The novel coronavirus was first detected in the People's Republic of China in late 2019 as a "viral pneumonia" sickening a cluster of people linked to a Seafood Market in the city of Wuhan. Even with aggressive containment measures, by mid-January, the first case outside China was detected.

On March 11th, 2020, the disease was marked with 118,319 confirmed cases, a death toll of 4292 people, and a presence in over 110 countries and territories (World Health Organization, 2020b). As a result, the World Health Organization (WHO) declared it a global pandemic (World Health Organization, 2020a). Nearly nine months into the coronavirus pandemic, when the first person received a vaccine outside a clinical trial, there were 68.5 million cumulative reported cases and a death toll of 1.5 million (World Health Organization, 2020c).

Given the lack of specific treatment, guidelines for the initial response to the pandemic were basically for prevention measures. The new recommendations were mainly based on physical distancing and personal protection has hit many aspects of social life. It turned what once was normal – going to school/work, being with family/friends, or sitting at a restaurant – into a health risk. In a matter of time, feelings such as anxiety, fear and insecurity emerged for both health and financial terms.

What started as a health crisis soon enough spilled over into economic problems. Many employees did not communicate with management about mental issues; indeed, according to Businessolver's fifth annual State of Workplace Empathy Study, 68% of employees worry that those issues could negatively impact their job security (Horch, 2020). A study published in the Journal of the American Medical Association (JAMA), conducted after the coronavirus outbreak – from March to April 2020 – showed that the number of adults experiencing depression tripled in the US after the coronavirus outbreak (Ettman et al., 2020). Since mental health is vital for employees to be engaged and productive, the huge rise of mental health issues can carry a direct cost to employers and have an economic impact.

As the virus swept across the world, the network of global supply chains started to feel the damage. According to Harvard Business Review Analytics Services, 95% of business leaders said their companies worldwide had experienced disruption to strategic sourcing and supplier management processes during the pandemic (Nagem, 2021). In the third quarter of 2020, S&P Global published that the top five industries most affected the most were airlines, oil & gas drilling, leisure facilities, restaurants, and auto parts & equipment. The least impacted were Specialized Real Estate Investment Trusts (REIT), property insurance, multi-line insurance, life & health insurance, and industrial REITs (Haydon & Kumar, 2020).

During the first quarter of 2020, 94% of Fortune 1000 companies saw supply chain disruptions, with 75% having negative or strongly negative impacts, and 55% planning to downgrade their companies' outlook (Sherman, 2020; Timmermans et al., 2020). According to the World Trade Organization (WTO), normal economic activities plunged 15% in the second quarter of 2020 as countries imposed measures to contain the spread of Covid-19 (World Trade Organization, 2020). The average growth rate of ASEAN-10 (Association of Southeast Asian Nations) economies reduced by 7.8% in October 2020 when comparing to the previous year. Malaysia, with 10.4% reduction, ranked the second worst affected among them (Suvannaphakdy, 2021).

For low-probability, high-impact events – such as our current pandemic – standard models of forecasting and planning fall short. 71% of companies do not have a business operations contingency plan, as a result leaving supply chain executives to respond (George et al., 2020). To navigate this crisis, and win a viable path to the next normal, companies must have a quick response to balance operational challenges, while also responding to their customers' and suppliers' changing habits.

With so much uncertainty and few straightforward answers, the pandemic came as a wake-up call for many companies to review policies and strategies, as this proved to be a crucial moment for short- and long-term decisions.

1.2 Strategic thinking

Uncertainty is a complex issue faced by every supply chain manager, especially as the global network is becoming more and more diverse. The ability to deal with the possibility of disruption is a common challenge, supply chain disruptions lasting a month or longer, averaging across industries is estimated by McKinsey Global Institute to occur on average every 3.7 years (Lund et al., 2020).

Under a disruptive scenario, the executive's ability to anticipate the result is reduced, and decisions tend to follow insights and interpretations of the surroundings. Knowing that the connection between an organization's competitive position and the supply chain processes is governed by decision-making processes (Perez, 2013), when facing such abnormal disruptions as Covid-19, this decision-making process is more than ever driven by the managers' experience and subjective understanding of the disruptive context.

However, the quality of those decisions depends on how well they are aligned to the strategies. McKinsey's survey showed that companies, where organizations' decisions are aligned with the corporate strategy, are 2.9 times likely to see higher growth rates returns from those decisions (Aminov et al., 2019). This brings us to the importance of managers having strategic thinking i.e., orienting decisions and ensuring alignment of action to the projected goal.

The imposed "new normal" and the long-lasting consequences of the pandemic, can affect how one thinks about the working environment and the appropriate strategy. Our first research case looked at those perceptions from the perspective of supply chain professionals. Having in mind the strategic thinking, this study will evaluate the cognition profile revealing how decisions are likely to be oriented and what actions can be recommended for a post covid environment. This will show us if such an alignment is found.

About one year into the pandemic, we are long past the responsive action period and into a recovery period. Even if the future is still not clear, a well-established strategic plan is required to implement the path to the goal desired for the post-pandemic times. Uncertainty

and unpredictability are part of all strategic planning processes, but depending on its level, different approaches can appear helpful or dangerous.

The traditional approach to supply chain planning requires precise predictions. When the future cannot be seen clearly enough, analysis cannot identify which outcome will actually come to pass (Courtney et al., 2020). Questions like -- what change is likely to become permanent? What will come back? What will fade away? What will be to some extent? -- bring us to many different possibilities, that may interfere internally and externally with the company.

To plan under such extreme uncertainty, scenario planning has been used as a tool to leverage the unknown by bringing up plausible hypothetical scenarios that will guide and accelerate decision-making. Different from other techniques, scenario planning is not about predictions, forecasts, speculations, or applying a formula, but rather a new way of thinking about directing organizational attention to a broad range of relevant elements.

Our second study case, still with the next five years in mind, will look to general scenarios that could envision opportunities and help in the decision-making process of what design the supply chain should aim for.

1.3 Thesis scope and research question

Our research looks to the planning level in supply chains. The art of strategic planning in a company requires considerable thoughts of goals and the implementation path. Our research took advantage of the present disruption to make a prospective analysis. In our first study, we will look at the aftermath of the pandemic from the view of supply chain professionals, during the disruption. We attempt to answer how the strategies supply chain managers favor under Covid-19 uncertainty are related to their perception of the business environment. Our results provide a glance at the quality of possible decisions from those professionals in multiple industries.

In our second study, we use a scenario planning analysis, with the pandemic as a common context to all supply chains, to provide four plausible scenarios for supply chains to prepare for. Our result unfolds plausible and consistent possibilities that expand people’s thinking, and also improve understanding and judgment.

2 Literature Review

Our research looks to the planning level during the most uncertain event in the past years: the coronavirus pandemic. The executive's thinking, or "strategic cognition," of the strategic goal should anticipate the future plan of action chosen. The cognitive perspective behind managerial decisions has been a point of interest for researchers. In this chapter, we will take a closer look into the literature of strategic cognition of executives, the strategic thinking, and the typology we used in our study. Next, we will review a scenario planning analysis, since in our second case study, we use this method as guidance for executives to plan their supply chain design in a future where a range of outcomes is possible.

2.1 Executive's strategic cognition

According to the Oxford dictionary, *cognition* means "The mental action or process of acquiring knowledge and understanding through thought, experience, and senses". By studying cognitions, the relationship between an individual's mindset and the surrounding environment to anticipate elements that will guide actions is understood (Uotila, 2015). In the business environment it is no different, a professional's perception of the work environment should antecede their actions.

As logic-based as the work environment can be, it is not freed from individual cognition to affect decisions. The managerial cognition research shows that managers with different cognition profiles present, direct the attention, and affect the interpretation they make (Uotila, 2015). When the decision is at a strategic level, the term *Strategic Cognition* captures the cognitive perspective in strategic management (Narayanan et al., 2011). It focuses on the link between cognition and decisions during the process of formulating and implementing strategic actions (Porac & Thomas, 2002, as cited in Narayanan et al., 2011).

Strategic cognition has been researched in different levels of analysis in the business environment. At the individual level, the literature has focused on top-level management focusing on the cognitive characteristics of the Chief Executive Officer (CEO) (Narayanan et al., 2011). Our study involves supply chain executives, who are carrying out strategic decisions through operational reality. By facing day-to-day short-term decisions, they are

adjusting the organization's strategies towards their own perception of what is the best implementation process (Cantor et al., 2014; Eggers & Kaplan, 2013).

2.2 Strategic thinking during disruptions

Turbulence has been more and more part of supply chain management, and the relative stability assumption from when our current supply chain model was invented, no longer holds (Christopher & Holweg, 2011). According to Abbott (2021), understanding the dimensions of uncertainty can guide planning practice. In that sense, uncertainty is likely to remain and should be part of the decision-making process. Thus, for strategic thinking, before any planning, managers must perceive the future environment with turbulence as a given.

When disruption hits a supply chain, a manager's strategic thinking can influence how the company's future will evolve. The outcome is mediated by the relationship between the interpretations made on that environment and the actions taken by managers (Kaplan, 2011; Uotila, 2015). Because the implementation of those strategic decisions takes place in the medium to long term future, it calls for a forward-looking perspective from the manager. An individual's past history can play an important role at this point; however, aspects of the past or present may also need to be "forgotten" or relearned before individuals can think about the future (Baum, 1999, as cited in: Abbott, 2021).

The pandemic left supply chain professionals struggling for an initial response without references or past experiences. However, the prospective strategic thinking of managers is of paramount importance, as well as its alignment to his strategic cognition of the future environment; particularly if the company wants to use this disruption as an opportunity to strategically redesign the future of work.

2.3 Typology of strategic cognition

To understand more about the manager's perspective, we based our theoretical framework in a typology using two psychological constructs as axes: levels of optimism and goal-oriented behavior.

Optimism is the first axis, and it centers on manager's expectancies about the future environment, 5 years after the outbreak of the pandemic. The optimism assessment model roots in expectancy-value theories in psychology. In those Expectancy-value models of

motivation, “value” means the importance is given to the goal to be reached and “expectancy” means the confidence to reach that goal (Robinson & Eid, 2011). Applying this viewpoint on behavior in individual’s differences, it is believed that optimists hold positive expectancies about the future, and that this view leads to different responses to adversities from pessimists who tend to hold negatives expectancies (Scheier et al., 1994). Under this thread, professionals with high levels of optimism are associated with more confidence that the company will adapt to the business environment in the aftermath of the pandemic, and will respond to this disruption differently than pessimists.

The orientation on the other axis is an individual motivational system from Higgins’ Regulatory Focus Theory. Higgins (2001) proposes that individuals energize and direct task engagement differently according to their orientations: promotion focus or prevention focus. Those anticipatory goals reactions are according to the subjective history of success. Promotion-focused individuals attempt to reach a goal by approaching a match, whereas those who are Prevention-focused have a history of success by avoiding mismatch.

According to Uotila (2015), the individual approach stems from the perspective that managers have certain cognitive schemas, or mental models, which guide their actions. Since regulatory focus shapes how people perceive their environment and their emotional responses to it, the same is likely to apply to employees’ perceptions of their job and company, as well as how they direct their decisions (Lanaj et al., 2012). With that in mind, a manager’s regulatory focus should be inclined toward being successful in the aftermath of the disruption. Promotion-focused executives would be more inclined to exploit opportunities generated by the pandemic; and prevention-focused by avoiding threats that emerged.

The combination of those cognitive attributions as axes to form a typology has already been extrapolated to a business environment and used to anticipate the executive’s strategic inclination by Phadnis et al. (2017). This typology allows different characteristics for 4 different types of conduct designated as Pioneering, Pushing, Protective and Provocative:

Pioneering cognition is optimistic and promotion-focused.

Pushing cognition is optimistic and prevention-focused.

Provocative cognition is pessimistic and promotion-focused.

Protective cognition is pessimistic and prevention-focused.

We contextualized this typology to the pandemic disruption and listed one different type of strategic action for each of those types of conduct that would fit with its particularities (figure 1).

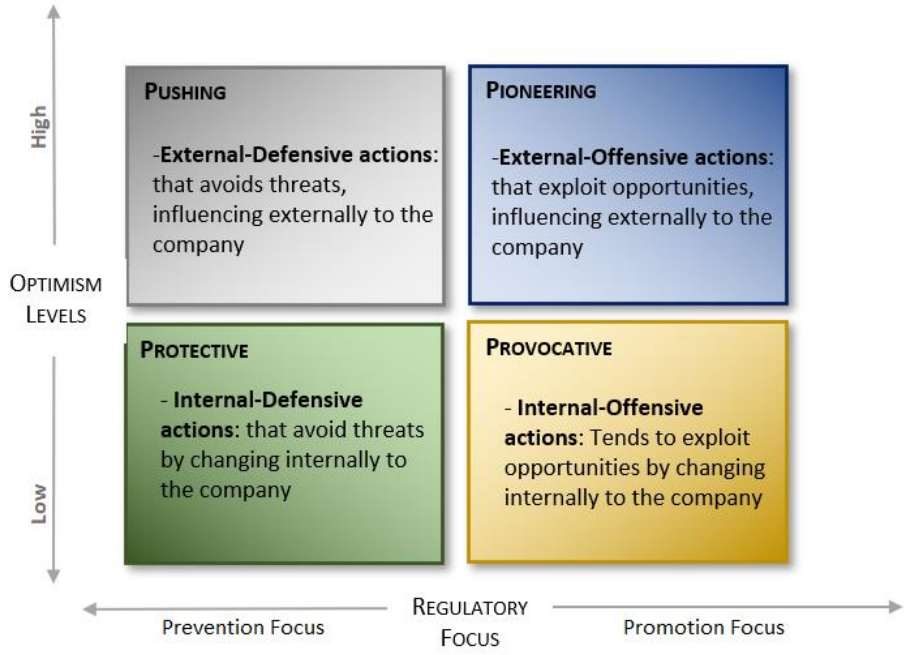

Figure 1: Types of strategic actions expected from each strategic cognitive type.

Based on the assumption that cognitive particularities of each type would reflect the executive's actions likely to be chosen, we used the same typology to evaluate if the same applies to our current pandemic disruption. We developed four hypotheses:

Hypothesis 1: Pioneering types of executives are likely to choose external-offensive actions. Pioneering executives will look to exploit the new revenue sources opportunities brought by the pandemic by changing or influencing the environment external to the company.

Hypothesis 2: Pushing type of executives are likely to choose external-defensive actions. Pushing executives will tend to protect the current business from any threat posed by the pandemic by changing or influencing the external environment.

Hypothesis 3: Protective type of executives are likely to choose internal-defensive actions. Protective executives will identify the company's structure and possible losses and threats that might incur from the pandemic and prefer strategic actions that mitigate them.

Hypothesis 4: Provocative vs Internal-Offensive. Provocative executives will pursue new revenue sources opportunities revealed by the pandemic and focus on adjusting the company's internal structure or practices to reach them.

2.4 Scenario planning

The popular dictum "The only constant in life is change" also fits into the supply chain environment that is dominated by constant decision-making activities. Management in any kind of organization means working those changes in the business world to your advantage. However, when disruption hits and offers changes that managers cannot control or understand, even the most skilled become unstuck.

When the decision-making process is boundedly rational, it usually involves techniques such as forecasting in which the future is expected to follow the same lines as the past/present, leading the forecast to a single most likely future alternative (Patvardhan, 2013). When caught by a situation where there is no solution, framework or forecasts to be applied, critical turning points in the business environment are often missed (Wack, 1985).

That is when scenario planning comes as a convenient and practical tool: it is not an application of a new formula, rather a new way of thinking. It demands the manager to understand the forces driving their business environment so that they can interpret the key data behind the outcome; distinguishing signal from noise, and what is significant from what is ephemeral (Schoemaker, 1993; Wack, 1985). Furthermore, it structures the future from the exploration and expansion of predetermined and uncertain elements whose consequences are unknown, but which characterizes the range within which the future is likely to evolve (Schoemaker, 1993; Wack, 1985). As those predetermined elements are being acknowledged, risks are exposed, and the uncertainty of the alternative scenarios opens space for strategic choices not previously considered (Schoemaker, 1993; Wack, 1985). In this way, this

technique does not aim to predict the future, but rather bring up scenarios and bound the zone of possibilities (Schoemaker, 1993).

The final outcome of this analysis are scenarios with ‘coherence’, ‘plausibility’, ‘internal consistency’, and ‘logical underpinning’; however, different methods guide their creation (Bradfield et al., 2005). Scenarios began for practical reasons and from different applications rather than theories; therefore, understandably, the technique has evolved with different definitions, characteristics, principles, and methodologies (Schoemaker, 1993). In our study, we will limit to the Intuitive Logics School (ILS), which is the one used in our research and the most widely used method.

According to Bradfield et al. (2005), as a strategic planning tool, the modern-day scenario analysis has its roots after World War II, when military strategies were needed in the development of new weapons systems. The ranking authority and strategic planner, Herman Kahn, used the simulations to develop scenarios based on his “think about the unthinkable” mindset. The objective was to look for reasonable expectations rather than wishful thinking. Later on, the scenario methodology was applied as a tool for social forecasting and public policy, and then migrated to the business community.

Following the scenario approach developed by Kahn, Pierre Wack, a planner at Shell, decided to experiment with this technique in a project to study the future business environment in 1969. That is the first widely documented use of scenarios in the context of business (Bradfield et al., 2005). Even though the company had experienced decades of growth and expansion, contradicting the forecast analysis, Wack developed scenarios highlighting causes of stagnation and overcapacity (Wack, 1985). The strategic vision changed by being exposed to this possibility and was proven extraordinarily successful when oil became scarce and consequently increased in price in 1973-74 (Wack, 1985). The scenario planning technique adopted by Shell has become the “gold standard of corporate scenario generation”, and along with other works, gave rise to the Intuitive Logics School (ILS), or methodology for scenario planning. (Bradfield et al., 2005).

The practical use of scenarios faces many challenges, from methodological to observational aspects. Private topics to be considered, biases from behavioral theory, learnings, and mental models from organizational theories are some examples of issues that collaborate to the non-standard nature of scenario practices, and which thus prevents comparison of methods (Phadnis, 2021). An experimental academic design was conducted

simulating a joint scenario creation by a supplier-buyer dyad facing the uncertainty of Brexit (Phadnis & Joglekar, 2020). This study intended to elucidate the supply chain for an anticipated preparation for this disruption.

The new pros and cons views exposed by multiple scenarios can support and guide decision-making in long-term strategies. After evaluating the projections, a company can actively update or develop new strategies, or passively test the robustness of existing those already in place (Von Der Gracht & Darkow, 2010). In a study with supply chain practitioners, Phadnis et al. (2015) found that the majority of judgments changed after multiple-scenario evaluation, with the same high level of confidence as before.

Moreover, important matters were put aside when disruption was caused by the pandemic, which in turn gave new urgency to scenario planning (Von Der Gracht & Darkow, 2010). An axiomatic framework presented by Phadnis et al. (2014) offers a structured process for scenario development; and although it does not give a ready-to-use formula, by contextualizing this theoretical foundation to the pandemic disruption, our work is a further attempt to create scenario planning for general industries facing Covid-19.

3 Research Method for Case 1: Tests of strategic cognition

In this study, we test our hypothesis using quantitative methods similar to Phadnis et al. (2017). We investigated whether a company's strategic actions advocated by the supply chain executives for the aftermath of the pandemic are associated with their own strategic cognition. This measurement approach is based on the perception of the professionals and was done by adapting existing questionnaires to our context. This chapter starts by outlining the participants and design, and is followed by the description of the independent variable and its analysis.

3.1 Participants and study design

Three sets of questions to evaluate Optimism levels, Regulatory focus, and Strategic inclinations respectively were administered online using Qualtrics. The survey was then sent to a supply chain executives' database from the Malaysia Institute for Supply Chain Innovation (Phadnis, 2020). This dataset is composed of 866 unique emails from supply chain professionals of the most diverse areas in Malaysia, and who had completed or partially complete courses focused on supply chain management and leadership. The time course for the survey application was between April 22 and May 16 of 2020, about one and a half months after the pandemic had been declared by the WHO. By that time, companies had already been somehow hit by disruption effects, had taken all immediate response acts, and should have been moving towards a strategic analysis of actions.

3.2 Questionnaires

The first and second sets of questions (Appendix A) evaluated levels of optimism and regulatory focus respectively. The answers were rated, yielding scores for the three psychological dimensions as first-order constructs: Optimism, Prevention Focus and Promotion Focus. The combination of those individual attributes in a typology represented the individual cognition conduct profile.

The third set of questions (Appendix B) provided 12 generic strategic actions satisfying the 4 types of executive profile.

3.2.1 Optimism

Optimism levels were measured through a 5-point Likert scale with 6 questions adapted from a Life Oriented Test-Revised (LOT-R) questionnaire (Scheier et al., 1994). While the original version of the test assesses dispositional optimism in self-analysis, adjustments from Phadnis et al. (2017) were needed to relate it to the work environment.

An even number of positive and negatively worded sentences were maintained, filler items were removed, and sentences reworded to focus on the respondents' outlook about the company. Prior to each set of questions, a brief statement was needed to situate the respondent to the study context: "In the aftermath of Covid-19 pandemic…"

For scoring optimism, the responses were evaluated in a 5-point Likert scale, (0 – strongly disagree, 1 – disagree, 2 – neutral, 3 – agree, 4 – strongly agree) where each point indicates a score.

For the positively worded sentences, the scores were directly indicated: responding '0' would denote a rating of '0' and responding '4' would add a score of '4'. Similarly, for the negatively worded sentences, the score was reversed: a score of '0' would add a rating of '4', a response in '1' would add a score of '3,' and it continues likewise.

The summation of the question's direct and reverse scores was standardized to 0-1, giving the respondent a final optimism score.

3.2.2 Regulatory focus

The regulatory focus was measured by adapting Higgins' (2001) questionnaire from the original personal life to a work-related environment. The present study context is an outlook in the aftermath of the Covid-19 pandemic, a disruption of unique magnitude for most of the companies. Therefore, the history of past success on the original questionnaire – from "how often" the individual experience to "how important" the individual assigns each statement under the context in the study – needed to be adjusted.

For scoring prevention- and promotion-focus, all questions were positively worded; thus, scores were directly indicated (responding '0' would denote a rating of '0' and responding '4' would add a score of '4'). Six questions quantified promotion, and five questions quantified prevention, therefore the promotion sums were divided by 6 and then standardized to 0-1 score for the final promotion score. Prevention sums were divided by 5 and then standardized to 0-1 score for the final prevention score.

3.2.3 Strategic choices

Strategic choices were formulated to encompass the three sides of a supply chain: demand, operations, and consumer. For each area, we suggested 4 organizational actions – yielding a set of 12 generic strategies – for the company satisfying 4 types of strategic choices. These types were designated according to the focus of action (External vs Internal) and purpose (Defensive vs Offensive). This was designated as:

- External-Defensive: Initiatives that would protect the current business by influencing some entity outside the company (Customer, Government, or Supplier).
- External-Offensive: Initiatives that would explore new opportunities by influencing some entity outside the company (Customer, Government, or Supplier).
- Internal-Defensive: Initiatives that would protect threats for current business by changing the Firm's organizations and practices.
- Internal-Offensive: Initiatives that would explore new opportunities by changing the Firm's organizations and practices.

For each type, 3 initiatives were formulated which focused on the Demand, Supply, or Operation side of the company.

The respondents were expected to allocate, on a 7-point rating scale, the degree of importance for each action for their company to succeed in the long term, in the aftermath of Covid-19. For scoring strategic choices preferences, all items were directly rated (responding '1' would denote a rating of '1' and responding '4' would add a score of '4'); and scores for each type were summed and standardized to 0-1 score.

3.3 Analysis

Strategic choices reflect the individual outlook of the respondent in a post-pandemic world. To associate their perceptions to their first-order constructs, correlations were made adapting Phadnis et al.'s (2017) typology. The analysis was calculated using 3 steps:

3.3.1 Step No. 1: Scoring ideal type model

Using the first-order constructs, the ideal profile for each quadrant was obtained according to Doty et al (1993), using the definition of each quadrant to label extreme values. For ideal types, extreme values for each parameter were labeled. This way, for every quadrant, there is

a correspondent ideal score for optimism, and another for regulatory focus (the highest for, either promotion or prevention focus) questions.

For example, the ideal pioneering quadrant would have the highest score possible (=1) for optimism and promotion focus (=1) in regulatory focus questions, whereas the ideal protective profile would have the lowest score possible in optimism (=0) questions and a higher prevention focus (=1) score in regulatory focus questions.

This way, for: y_C^Q ; Where: "y" is the ideal score, "Q" is the quadrant, "C" is the first-order construct (either optimism or prevention- or promotion-focus). The score follows as below:

$Pioneering\ Quadrant\ Ideal$: $y_{Opt}^{Pion} = 1$ and $y_{Prom}^{Pion} = 1$

$Pushing\ Quadrant\ Ideal$: $y_{\text{Opt}}^{\text{Push}} = 1$ and $y_{\text{Prev}}^{\text{Push}} = 1$

$Provocative\ Quadrant\ Ideal$: $y_{Opt}^{Prov} = 0$ and $y_{Prom}^{Prov} = 1$

$Protective\ Quadrant\ Ideal$: $y_{Opt}^{Prot} = 0$ and $y_{Prev}^{Prot} = 1$

3.3.2 Step No 2: Modeling the fit of individual's profile

Each respondent had its deviation from the ideal model calculated for every quadrant. The deviation of each respondent's first-construct scores from the ideal model would be the respondent's final score.

For example, for the pioneering quadrant, the calculation is as follows:

$$D_J^{Pion} = \sqrt{\left(0.5 * \left(y_{Opt}^{Pion} - x_{Opt}^{j}\right)^2\right) + \left(0.5 * \left(y_{Prom}^{Pion} - x_{Prom}^{j}\right)^2\right)}$$

When:

$D_J^{Pion} = Individual\ pioneering\ profile\ for\ respondent\ "J"$

$y_{Opt}^{Pion} = 1\ (Ideal\ score\ for\ optimism\ on\ pioneering\ quadrant)$

$y_{Prom}^{Pion} = 1\ (Ideal\ score\ for\ promotion - focus\ on\ pioneering\ quadrant)$

$x_{Opt}^{J} = (Score\ assigned\ by\ respondent\ "J"\ for\ optimism\ questions)$

$x_{Prom}^{J} = (Score\ assigned\ by\ respondent\ "J"\ for\ promotion\ focus\ questions)$

Similarly, the calculation was done for all quadrants using their specific first order constructs.

3.3.3 Step No 3: Associations

3.3.3.1 Correlation between the fit with Ideal Cognition Type vs Strategic Choices Score

In this step, the association was made between the individual final score (Deviation from ideal Score) of the four types of cognition with the four different types of strategic choice – our dependent variable. The calculation was done through Pearson's Correlation using the RStudio® Software as a tool.

3.3.3.2 Correlation between the Psychological Dimensions vs Strategic Choices Score

The association was made between the score of the 3 psychological dimensions (optimism, prevention, and promotion focus) and the 4 types of strategic choice. The calculation was done through Pearson's Correlation using the RStudio® Software as a tool.

3.3.3.3 Correlation between the Psychological Dimensions vs Strategic Goal

The relationship between the score of the 3 psychological dimensions (optimism, prevention, and promotion focus) and the scores for the goal (demand, operations, and supply) of the strategic choices were analyzed. The calculation was done through Pearson's Correlation using the RStudio® Software as a tool.

4 Results for Case 1: Tests of strategic cognition

This Chapter contains the presentation of our findings. The first sub-section brings the profile of our online survey respondents. The following three sub-sections present the results aiming at the research objective. The first exposes the group profile; the second refers to the correlations to test the hypothesis; and this is followed by an attempt to understand the divergence in results. Three correlations were presented: between the strategic choices and the individual ideal cognitive type, testing each hypothesis; the three psychological dimensions and the strategic choices; the psychological dimensions; and the strategic goal of the choices.

4.1 Participant's profile

The survey link was sent to 866 emails, and we obtained a response from 124 participants (response rate of 14.5%) agreeing to participate and 26 who either abstained from answering some questions or did not complete enough questions to be part of the analysis. Therefore, answers from 101 respondents were used in the analysis.

The participants were from a varied range of sectors, the top three being Health Care & Social Assistance, Manufacturing, and Construction. The main functional role was "Supply Chain" (58%), and the largest group of respondents (62%) reported their role as "Manager or Director".

4.2 Prospective strategic cognition

4.2.1 Typology test

The correlation between the deviation from ideal cognitive types to their preferences in the strategic choices is presented in figure 8 below; the significant correlations are presented in bold font.

	Strategic Choices	Mean	SD	Deviation from Ideal Cognition Types			
				Pioneering	Pushing	Protective	Provocative
Ext Offensive:	Explore new opportunities by influencing some entity outside the company	0.67	0.16	-0.091	0.005	-0.049	-0.099
Ext Defensive:	Protect current business by influencing some entity outside the company	0.71	0.14	0.080	0.025	**-0.255***	**-0.255***
Int Defensive:	Protect threats for current business by changing the Firm's organizations and practices	0.65	0.19	0.008	0.071	0.003	-0.044
Int Offensive:	Explore new opportunities by changing the Firm's organizations and practices	0.73	0.14	-0.122	-0.044	0.102	0.045

* p<0.05

Table 1: Means, Standard Deviation, and correlation among measures of Strategic Choices and Deviation from Ideal Types

A smaller deviation of an executive's cognition from the ideal type means a greater resemblance. Thus, a negative correlation means a greater preference for the corresponding strategic choice. The Pearson correlation analysis was used to test the hypothesis:

Hypothesis 1:

A correlation between the deviation from ideal type *pioneering* and the weight given to the strategic choice "Explore new opportunities by influencing some entity outside the company" is negative ($r = -0.091$). This was as expected but was not considered significant statistically ($p = 0.3792$) to support this hypothesis. No other significant correlation was found between this cognition type and any other strategic choice.

Hypothesis 2:

The deviation from ideal type *pushing* was expected to have a negative correlation to external-defensive strategic choices that "Protect current business by influencing some entity outside the company". However, a positive correlation ($r = 0.025$) was found and was not considered statistically significant ($p = 0.8094$). No statistically significant correlation between the deviation from this ideal type to any other strategic choice was found.

Hypothesis 3:

The correlation between the deviation from ideal type *protective* and the weight given to strategic action "protect threats for current business by changing the firm's organizations and practices" was positive ($r = 0.03$) and not statistically significant ($p = 0.9783$). This finding does not support our hypothesis.

However, when correlated to *external-defensive* actions we found a negative ($r = -0.255$) and statistically significant ($p = 0.012$) correlation. Our findings show that the respondents with a protective profile were linked to external defensive actions that are those prone to protect current business as expected for defensive actions, but with a tendency to

influence the environment rather than the company as expected. This correlation supports the attributes formed by our typology for this cognitive type for only one of the two constructs.

Hypothesis 4:

The deviation from ideal type *provocative* showed a positive correlation ($r = 0.045$) with the weight given to strategic actions "explore new opportunities by changing the firm's organizations and practices" and was not statistically significant. This does not agree with our typology hypothesis. However, it shows a negative correlation ($r = -0.255$) and was statistically significant ($p = 0.012$) to *external-defensive* actions. Those findings suggest that low optimistic executives, i.e., with low expectancy that the company will adapt to the aftermath of the pandemic, regardless of their motivation to achieve the desired end were advocating external-defensive actions, are supposedly high optimistic actions.

4.3 Role of Psychological Dimensions and Strategic Goal

Since the quadrant's attributes were not shown to correlate to any of the attributes of the typology suggested by Phadnis et al.'s (2017) work, we decided to further evaluate by checking according to psychological theories of optimism and regulatory focus, which have been much more extensively tested than the more recent work of Phadnis et al. (2017), testing the strategic actions directly to those psychological dimensions.

In order to investigate the contribution of the components on the construction of our typology, we analyzed if instead of each quadrant, the Psychological Dimensions – first-order constructs – can contribute *per se* to validate our hypothesis:

Hypothesis 1: The higher the optimism scores, the more likely this executive is to choose externally focused strategic actions, be it offensive or defensive.

Hypothesis 2: Prevention-focused executives would prefer defensive strategic actions, either with internal or external focus.

Hypothesis 3: Promotion-focused executives are likely to prefer offensive strategic actions, regardless of whether it has an internal or external influence.

The correlation between the psychological dimensions to their preferences in the strategic choices are presented in table 2 below. The Pearson correlation analysis shows significant association in three cases.

			Strategic Choices			
Psychological Dimensions	Mean	SD	Ext Offensive	Ext Defensive	Int Defensive	Int Offensive
Optimism	0.66	0.18	-0.028	**-0.204***	-0.032	0.077
Prevention-focus	0.72	0.19	-0.009	0.102	-0.095	-0.022
Promotion-focus	0.77	0.11	**0.305****	**0.240***	0.067	0.175

* p<0.05 **p<0.01

Table 2: Mean, Standard Deviation and Correlation among Strategic Choices and Psychological Dimensions

Hypothesis 1: optimistic executives are negatively correlated to both external strategic actions offensive ($r = -0.028$) and defensive ($r = -0.204$) but are statistically significant ($p = 0.045$) only to *External Defensive* actions. It implicates that the lower the optimism, the more likely it is to prefer those actions. This contradicts the optimism theory and Hypothesis 1.

Hypothesis 2: Executives with *prevention focus* were positively ($r = 0.102$) correlated to external defensive strategic actions, as predicted by hypothesis 2. However, the correlation is not statistically significant. Furthermore, prevention focus was negatively correlated ($r = -0.095$) with internal defensive actions, which contradicts the hypothesis. In both cases, the low statistical significance ($p = 0.3109$; $p = 0.3422$) of the results shows no support for this hypothesis.

Hypothesis 3: *Promotion* focused executives are correlated with *External Offensive* actions ($r = 0.305$; $p = 0.002$). This supports hypothesis 3 – the only result where hypotheses based on psychological theories are supported. *Promotion focus* is also positively correlated with *External defensive* ($r = 0.240$; $p = 0.016$) actions, which contradicts Hypothesis 3. Its correlation with *Internal offensive* actions is positive but not statistically significant, and hence does not support Hypothesis 3.

The lack of support to the hypotheses of strategic cognition (Phadnis et al., 2017), as well as established psychology theories of optimism and regulatory focus (Higgins et al., 2001; Scheier et al., 1994), suggest that the executives completing our survey were ambivalent about their understanding of the pandemic's implications and the strategies to respond to them. We decided to further evaluate by detailing the goals of those actions.

In each option of strategic choices listed in the questionnaire, one of the three components of the supply chain structure was presented: External suppliers, here designated as "*Supply*"; Internal functions of the company, appointed as "*Operations*"; and External distributors, here identified as "*Demand*". To investigate the goal of actions, we checked for the correlation between the psychological dimensions to their goal preferences in the strategic choices is presented in Table 3 below.

			Goal of Strategic Choices		
Psychological Dimensions	Mean	SD	Demand	Operation	Supply
Optimism	0.66	0.18	0.029	-0.109	-0.026
Prevention-focus	0.71	0.19	0.099	-0.060	-0.380
Promotion-focus	0.77	0.11	**0.305***	0.180	0.124

* p<0.05

Table 3: Mean, Standard Deviation and Correlation between Psychological Dimensions and Goal of strategic choices

The Pearson correlation analysis shows that *promotion-focused* executives are correlated ($r = -0.305$) and are statistically significant ($p = 0.002$) to *demand-sided* actions. This result indicates the promotion-focus type of executives, i.e., those who look for means of advancement, would prefer initiatives that center the attention to the customer base – be it for the new or current product or revenue source – rather than any other supply chain component.

4.4 Conclusion

All our results did not follow the expected correlations according to psychological theories. For example, the individual cognition was supposed to anticipate the actions preferred by the executives. However, we used well-established psychologic questionnaires to evaluate the executive cognition that had been tested in the literature in and out of the working environment.

The pandemic has impacted not only professional but also personal aspects for an unforeseeable length of time creating a blurring of boundaries. Unlike many disruptions that affect only the work environment, at the time of the survey, our group was facing its first set of restrictions imposed in the country that forced them to adjust their personal life as well. The possibility of personal repercussion could have affected their confidence and their choices when projecting the future, differently than other disruptions.

Executives whose scores for cognition type should, according to the literature, correlate with lower optimism strategic choices were actually choosing higher optimistic actions. When evaluating motivation for actions, those who according to the literature should be choosing actions motivated by gains were being correlated to optimistic strategies, regardless of the motivation (either gains or avoiding threats).

5 Research Method for Case 2: Scenario creation

Given the ambiguity faced by supply chain executives about dealing with the Covid-19 pandemic as evidenced from the lack of support to the hypotheses in case 1, we decided to develop scenarios to be used as cognitive devices (Wack, 1985) to help managers make sense of the ambiguity and uncertainty generated by the pandemic. In this chapter, we use the scenario development approach to come up with alternative views for a post-pandemic world. We intend to narrate plausible scenarios that could be helpful for industries, in general, to broaden the decision-makers' thinking about possible responses and outcomes. Our work is based on the Intuitive Logics School (ILS) using the structured process from Phadnis et al. (2014). The first section details the scenario creation process, followed by the development of scenarios.

5.1 Scenarios Development

The methodology used in this research follows the structured process from Phadnis et al. (2014) that follows the Intuitive Logics School (ILS) school of techniques. Since this approach gives a practical step-by-step process that can be applied and generalized to various contexts, we will develop scenarios that are non-firm specific for the prevalent context of the pandemic.

The process of scenario development is based on the relationship between the organization and the environment. Macro-environments are those under the STEEP category – an acronym for Society, Technology, Economy, Environment and Politics – and encompass elements that are beyond the company's control, such as legislation and regulations, population demographics, economic conditions, etc. In fact, they are forces driving industries to alter their actions. The micro-environment is where the transaction takes place, and is the part of the environment that the organization is influencing and being influenced by. It includes an interface with suppliers, market side, competitors, etc.

Leaders of an organization cannot control any aspect of the macro-environment, but there is sufficient power to influence the conditions prevailing within environments where they are already placed. An organization may manipulate the environmental variables, and its ability to control or influence helps distinguish different parts of the environment. Those different parts define the key terms below:

- *Focal Decision:* decision controlled by the organization to be answered using the scenarios.
- *Local Factor:* Features of the business environment (element external to the organization) the organization can influence but cannot control.
- *Driving Force:* Features of the business environment (element external to the organization) in which the organization can neither influencer nor control. They are classified into:
  - Trend: prediction of value over planning horizon is reasonably accurate
  - Uncertainty: prediction of value over planning horizon is not reasonably accurate.

The book "The Art of the long view: planning for the future in an uncertain world" by Schwartz (1991) is considered the primary reference for ILS methodology (Figure 5). It provides an eight-step process for ILS methodology using those key terms.

Figure 2: Steps for Scenario Planning from Schwartz

5.2 Scenario development application

The following process applies the structured guidelines suggested by Phadnis et al. (2014) based on the ILS methodology from Schwartz (1991). Here, we will apply steps 1 to 6 because they describe the scenario development. Since steps 7 and 8 involve scenarios use, they are out of our scope. Our research intends to develop a non-firm-specific framework for Scenario development for making sense of the post-pandemic environment. Firms from any industry should be able to follow those steps, incorporating their own particularities yielding scenarios that would fit for the aftermath of the pandemic.

5.2.1 Step 1: Define the scope of the scenario planning project.

The scope of a scenario planning project consists of defining 3 variables: Focal decision, part of the organization the decision is to be made, and time horizon considered. The focal question is: "*What supply chain design should a company adopt in a post-covid world?*". This question should be interpreted from the perspective of 6 functional areas for the range of 5 years from the pandemic.

1) *Focal decision*: Supply chain design.

2) Functional areas: Sourcing, Manufacturing, Distribution, Customer Relations, Human Resources, Closed-loop supply chain.

3) Planning horizon: Five years.

5.2.2 Step 2: Identify the Local Factors

The local factors list was compiled through an extensive literature search from professional magazines published from March 2020 onwards. A literature search was conducted to identify published reports that invoked the concept of the supply chain in the post-pandemic world. The website *google.com* was used as the initial search engine page for front end inquiry, using keywords such as "post-covid-19", "post-pandemic world", "the new normal" along with "supply chain", "scenario planning", or by adding supply chain terminology, for example "procurement".

This was a starting point that led us to a variety of articles published in a wide spectrum of journals. The search was refined to those within the top ten results and the most relevant magazines including *The Economist, The Wall Street Journal, Forbes, Nature, Harvard Business Review, McKinsey Quarterly, The New Yorker;* and organization publications such as *International Monetary Fund, World Economic Forum, World Bank, Organization for Economic Co-operation and Development (OECD)*. A further search was done using the search tool internally to those selected magazines, using the same keywords.

In each article, the selection was done after seeking information about elements that fit into local factors description: "Environmental variables that can affect the decision, cannot be controlled but can be influenced by the firm". Local factors are identified when translating the focal question to each supply chain function. For example, from the sourcing perspective, when asked *"What should be the new way of sourcing in the post covid world?"* local factors such as "reliability of supplies" should affect the answer for this particular decision.

5.2.3 Step 3: Identify and assess Driving Forces.

A similar literature search was done to identify the driving forces. Once the magazines were selected, the article chosen was the one with information about the driving forces: "The elements in the macro-environment that influences the local factors identified but cannot be neither controlled nor influenced by the organization". The process we follow from Phadnis (2014) obeys the recommendation of Schwartz (1991) to assess the driving forces across the five domains of the environment: Society, Technology, Economy, Environment, and Politics (STEEP).

In our search, we considered *social factors* to include aspects within society, values, family, lifestyles, consumer trends, demographic influence, etc. *Technology* included new releases, development, lifecycle, research, effects, etc. For *Environments*: emission regulations, transport routes, global effects, etc. were used. *Economic factors* included inflation, economic growth, unemployment, etc. *Politics* includes labor policies, political framework, competition political stability, legislation, etc.

5.2.4 Step 4: Rank by importance and uncertainty

Since scenarios should be described in terms of driving forces, these elements are the ones to be ranked: How predictable they are and how important they are to the focal decision.

Uncertainty: Once identified, the driving forces are classified qualitatively according to the level of uncertainties, which could be "High", "Medium" or "Low" (trend). It depends on to what extent and how accurately the planning horizon studied they can be known.

For instance, low uncertainties or trends are the events whose outcomes can be fairly known, in our study we considered that behaviors and perceptions adjusted as a response to experiences during the pandemic may last longer, so a higher "new marketing strategies" is here considered as a trend. Weforum (Remes & Fabius, 2021), Accenture (Accenture, 2020) and Swiss Re institute (Puttaiah et al., 2020) are three examples of articles that agreed on this prediction.

High uncertainty events are less predictable, which is the case of the "course of the pandemic", and with so many variables appearing and little consensus among scientists and public health officials, it is hardly predictable if 5 years after the outbreak, the coronavirus will or will not still be an issue for the business environment. McKinsey (Charumilind et al., 2021), Nature (Scudellari, 2020), and Reuters (Steenhuysen & Kelland, 2021) are three

examples of articles that agree that transition to normalcy may depend on the progress of crucial variables. The level of uncertainty was evaluated according to the diversity of opinions found in the articles selected. A high diversity means a high uncertainty, when in doubt about the appropriate level, assumes a high level.

The same process was followed for all driving forces and the summary of the level of uncertainties is shown in the results in table 4.

Importance: The importance of the Driving Force is evaluated by its impact on the focal decision. For this, firstly the influence of each driving force on local factors is evaluated since it establishes a relationship between them, transferring the local factors' importance degree to the Driving Forces. This influence was evaluated by answering the question *"Does this Driving Force (DF) influence this Local Factor (LF)?"*. An extensive search within the selected magazines was done narrowing the results to those containing keywords for both the driving force and the local factor. For example, for the DF "expansion of supply base" and LF "Covid-19 as a health issue" the keywords "supply base" + "covid-19" were searched together, and thus the information from the article would be the answer for the influence. This search was repeated for all possible DF-LF, and the answers formed a table designated as "influence table" (Appendix D).

From here, an influence table was created in which the first columns contain the *n* Local Factors, and the Driving Forces are listed on the top row in the next *m* columns. The value that populates the table is the *n*m* possible combinations and corresponds to the existence or not (binary answers: either 1 or 0) of influence between the Driving Force and Local Factor in the corresponding column and row respectively.

For example, *"When projecting for 5 years after the pandemic, does the new customer value proposition (DF1), affects the (LF1) expansion of supply base?"*. The score of all relationships of each Driving Force was summed up and normalized, and the value calculated is the Influence Score of Driving Force (F).

For example, as *n* is the number of Local Factors, I_1 the Influence value of Driving Force 1 over Local Factor 1, the Importance Score for DF1 (F_1) is calculated as follows:

$$F_1 = \left(\frac{\sum_{i=n}^{1} (I_1 + I_2 + I_{\dots} + I_i)}{m} \right)$$

This score was computed for each of the *m* Driving Forces and the value is the one considered to determine the importance rank sequence. For example, for the DF "Course of

the Pandemic" summing up all LF that showed influence over this DF, the result was 25. Considering 33 is the total of DF, we have an Importance Score for DF1 (F_1) that equals 0.758.

5.2.5 Step 5: Select Scenario Logics

The previous step reveals the most critical and uncertain elements: the driving forces that have the greatest impact on the focal decision. The design of a scenario logic consists of the combination of two extreme values from 2 environmental elements providing 4 different scenarios.

In this step, the scenario elements will be chosen. Since the Scenarios are described using Driving Forces only, they will be selected assessing on:

a) Impact on the focal decision: those with the greatest impact were listed (not necessarily using the highest).
b) Uncertainty: only selecting high or medium levels. Trends are relatively predictable and can be used in any scenario so the scenarios should not be based on them.
c) Correlation: low correlations between the driving forces, ensuring the scenarios are diverse in terms of their impact on the organization's transactional environment.

The Driving forces were then mapped into two axes resulting in four scenario seeds. Phadnis et al. (2014) suggest two to four candidates of Scenario Logics could be evaluated before selecting one that fits the project.

5.2.6 Step 6: Flesh out the Scenarios.

This last step involves specifying values to all driving forces and fitting each scenario.

The values for each driving force are defined broadly and qualitatively as high and low, based on extensive industry research. Each trend takes the same value in all four scenarios. For each uncertainty, two extremes of possible outcomes are specified.

The scenario structure is presented so that values for the two driving forces chosen as an axis for the scenario logics are presented first, followed by the remaining in descending order of impact.

The values in each scenario are also specified to check dimensions of *internal consistency* and *plausibility*. For this, a high or low value for each axis was assigned by

judging which value would be consistent with the one already specified, in order that "impossible scenarios" are ruled out.

Another criterion used for prescribing values was the variation among the highly-correlated driving force pair. To deliberately create variation, an attempt to make high-low value combinations to one of the four scenarios was made. The correlation was calculated using Pearson's method for every pair of driving forces using the association between the driving forces and its influence value on local factors.

After Scenario Structure, the next step was to write the Scenarios Narratives. The scenario had to be described vividly, narrating how this driving force would evolve from its present state. For each narrative, a vivid name that expresses its essence was designated.

6 Results for Case 2: Scenario creation

In this chapter, we present the application of developing scenarios for general industries in a post-pandemic environment. First, we will present the identification of and assessment of Local Factors and Driving Forces, following the influence between the latter on the former. Lastly, we will present the scenario logics and narratives for a horizon plan of five years from the outbreak of the pandemic.

6.1 Identification and assessment of Local Factors and Driving Forces

A total of 43 elements were identified as a relevant feature of the business environment in a post-pandemic world. Of these, 33 were pointed out as Local Factors and are detailed in Appendix C; the remaining 11 are defined as Driving Forces, summarized in table 4 and each one is described below.

DF-1: New consumer confidence

This driving force is based on the consumer confidence index which is a leading indicator of economic activity built from how consumers are expressing their activities of saving and spending.

Customer confidence, as a response to experiences during the pandemic, may affect business strategies for the post-crisis environment. The challenges customers have been facing during the pandemic can alter their needs and priorities by either higher consumerism, as well as by realizing the importance of saving and conscious consumerism.

What was appealing before the pandemic can be seen differently today, and it is likely to have an imprint in what will be seen as the greatest value in the aftermath. For example, health and wellbeing concerns can be seen as a decision point for discernment, and awareness of what to consume. Engagement with brands can be influenced by the experiences during times of crisis.

DF-2: New marketing strategies

Companies have adapted to better reach customers during the pandemic. It is likely customers expect that some of these changes outlast the immediate crisis and companies should consider

marketing strategies to fulfill new requirements. Behaviors may bounce back, for example, fear to catch the disease may ease, and there should also be a reduction in the need for isolation in socialization and leisure. However, the perception of convenience and positive experience may last longer, such as in the use of online grocery shops. This links to permanent behavior shifts that were already underway even before the pandemic that have been accelerated.

DF-3: Covid-19 as a health issue

The severity of Covid-19 as a health emergency is an uncertain macro-element that can continuously affect all steps in a supply chain design. This diving force is based on how critical the disease will be seen as a threat in a 5-year horizon. The success to eradicate a disease to the point of lifting all restrictions depends on many aspects. Vaccines and treatment/preventive medicine may be a powerful tool, but their ability to bring the pandemic to a definite end is limited.

DF-4: Population profile

The new generation rises with new concerns not only as consumers but also as employees and employers. While on one side Millennials and Generation Z are facing the instability of their first and fundamental steps in life decisions (entering work, starting a family, buying a house, etc.), they are also enduring a historical crisis. This is likely to be a generation-shaping event and their response is a boost to the already existing trend.

On the other side, the increased life expectancy is bringing new opportunities from the demands and expectations of a new group of an aging population. For example, the pandemic has accelerated their engagement with technology, which may come as a shift for business to the eldercare section on how to provide care and social engagement.

DF-5: Usage and reliance of technology solutions

The use of technology, which was amplified by the pandemic, is likely to be maintained, however, the reliance on technology solutions may give different power to the industry.

Under this driving force, supply chains should see the possibility of the usage of data and technology to bring new levers, if well understood and cautiously used. This new environment can influence the organizational internal behavior and external interface, and

may include a range of aspects: from breakthrough innovation and technology dependency to seeking cybersecurity and digital privacy.

DF-6: Economic activity

Once the crisis has subsided, economic impacts will persist. What will be the reflex of the pandemic in economic activity is not certain, but its impact on organizations is very likely to continue. This macro-environment encompasses equalities or inequalities of the income distribution, private or public initiatives for economic revival or social assistance, as well as opportunities that emerged as solutions/innovations during the pandemic.

DF-7: Focus on Environmental Social Governance (ESG)

During the pandemic, the unexpected scale of disruption and the significant consequences made clear to businesses became a priority of survival over the environment. However, debates have stirred in society and governments about the industries and their management of risks and social responsibility, giving prominence to ESG topics. The collective response of particular actions became clear after the magnitude of this sudden crisis.

Those topics have been key to post covid strategic planning of corporate boards. Shareholders and proxy advisors are likely to assess the company's response to the crisis, highlighting those issues. The global pandemic has put ESG under scrutiny, often in areas that had been already in the spotlight. This trend includes seeking transparency/more information about products/services, risk oversight, environmental and social disclosures, the balance of short- and long-term considerations.

DF-8: Environmental regulations

Habit changes during the pandemic had a great impact on the environment. Regulations to minimize the negative effects could emerge, including government intervention in industries; the rise of eCommerce leading to traffic regulations as express lanes, delivery parking zones, night delivery, decarbonization pressure, etc.; regulations for use of disposable items (mask, gloves, take out container, etc.) etc.

DF-9: National trade regulations

The debate of the gain from regionalization outweighs the risks of supply security and the financial impacts of a globalized economy have intensified in the aftermath of the pandemic. International transactions may emerge differently according to policy tensions across countries and how far affected and recovered the economy was in different countries. This driving force includes the government position in international trade regulations, as well as the focus of network developing policies.

DF-10: Regulatory Practices for Industry

As government and businesses are rethinking and rebuilding themselves, an agile approach for regulation is needed. Rules may be rewritten to avoid holding back advances that were unfolded by the pandemic, but also reinforcement or flexibility of relevant temporary shifts may become permanent. Regulatory practices towards technology, data safety, emergency response, industry interventions, and oversight of working sanitary/hygienic conditions are examples of what may appear differently.

DF-11: Government support to local businesses

It is likely that we will still witness structural changes in supply chains over the next 5 years. Governments have an important role in taking actions to translate those changes into economic development. Indeed, government support can affect supply chains in aspects such as training programs to fill gaps of technologies on work labor, incentives for companies to invest in equipment/technologies, loans facilitation, and financing packages for companies, vulnerable individuals and agriculture.

6.2 Ranking of Driving Forces

The presence or absence of influence that the 11 driving forces exert over 33 local factors yielded an influence table that is detailed in Appendix D. This influence table enables the impact and uncertainty of local factors to be transferred to driving forces as scores. Those scores are used to rank the importance of the driving forces. The same scores were used to evaluate the correlation within the Driving Forces. This was done to create cross-scenario variation in highly correlated driving forces. Two driving forces are considered highly correlated if they influenced a similar set of local factors. We used Pearson's correlation for

every possible combination within the driving forces and the results are shown in Appendix E.

The level of uncertainty of each driving force was assigned and the extreme values that were specified are shown in table 4. Since they are forces for changes whose directions are largely unknown, their values range from the low extreme to the high extreme. At this point, the values are just being described broadly and quantitatively and will be elaborated during the scenario narratives.

No	STEEP	Driving Force	Extreme Value 1: Low	Extreme Value 2: High	Level of Uncertainty	Importance Score
		Uncertainties				
3	Society	Course of the pandemic	Covid-19 under control	Covid-19 will continue to be a public health emergency	High	0.758
5	Technology	Adoption of technology solutions	Higher than before, but lower than today	Higher or about the same as today	Medium	0.636
11	Politics	Government support to local business	No significant changes	Higher than today	High	0.636
10	Politics	Regulatory practices for industries	Not much different than before	Higher than before	Medium	0.576
8	Environment	Environmental regulations	Not much different than before	higher than before	High	0.394
1	Society	New consumer confidence	Lower	Higher or similar as before	High	0.364
9	Politics	National trade regulations	Global network focused	Local network focused	High	0.364
6	Economy	Economic activity	Lower or about the same as today	Much higher than today	High	0.364
		Trends				
4	Society	Population profile	higher concerns than before	higher concerns than before	Low (Trend)	0.788
7	Environment	Focus on Environmental Social Governance (ESG)	Higher than before	higher than before	Low (Trend)	0.545
2	Society	New marketing strategies	higher than before	higher than before	Low (Trend)	0.424

Table 4: Rank of Driving Forces, extreme values, and levels of uncertainties

6.3 Scenario Logics and Scenario Narratives

The typical Scenario Logics in ILS consists of a combination of two driving forces as axes, providing four scenario seeds. The two extreme values that are described qualitatively as high and low (from table 4), define two seeds for each axis. Combining two axes, four scenarios are yielded populated by four seeds, two from each axis, as seen in Figure 3.

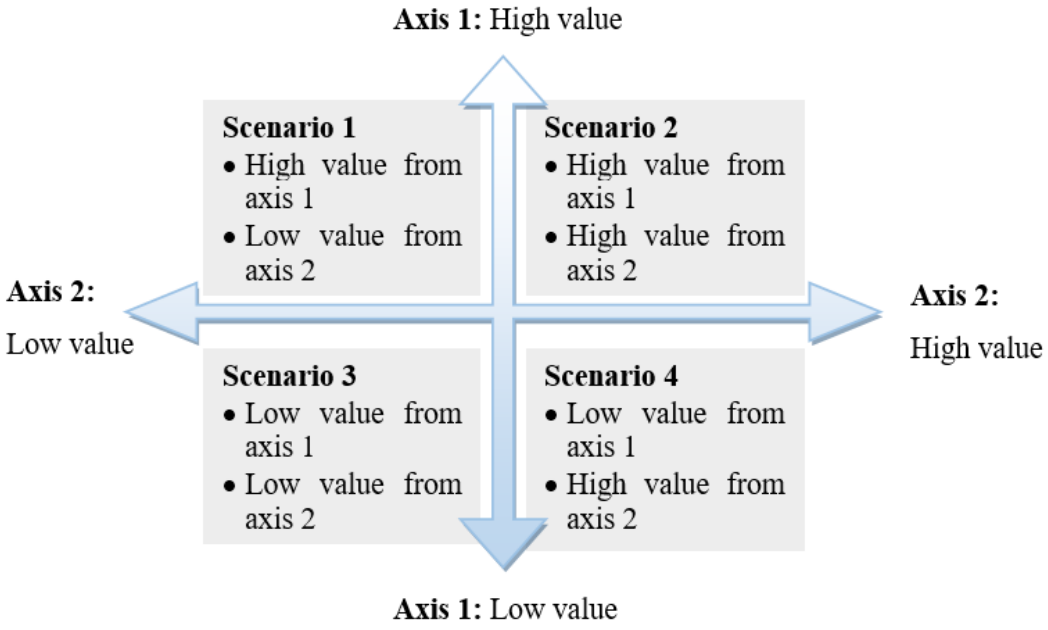

Figure 3: Scenario Formation

After selecting the axes, the value of other driving forces will be added to each scenario assigning high or low values according to the plausibility and consistency to what is already specified in the scenario logics.

However, Phadnis et al. (2014) highlight that choosing the scenario logics is not an exact science; therefore they suggest that three aspects should be taken into account when forming the possible axes.

The driving forces should be based on:

a) Their greatest impact on local factors.

In our study, this was determined by the importance rank.

b) To have a high and medium level of uncertainties.

This aspect excludes all trends.

c) Those that are not highly correlated.

This aspect is to ensure diverse scenarios in terms of impact in the organization's transaction environment.

From the correlation in Appendix E, we have 11 low correlation pairs of driving forces. We excluded four of them because they contained low uncertainties and 3 of them because of the lower importance ranked. This way we have a three axes combination to be used as scenario logics in the following rank from table 5:

	Correlation	Axis 1	Importance Score	Axis 2	Importance Score
Scenario Logic 1	0.13	Course of the pandemic	0.76	National government response towards global	0.36
Scenario Logic 2	0.17	New consumer confidence	0.36	Adoption of technologic solution	0.63
Scenario Logic 3	0.19	Environmental regulation	0.39	Regulatory practices for industries	0.57

Table 5: Scenario Logics ranked by correlation.

Interesting insights from any of those scenario logics could be appealing if applied for any specific situation in a specific industry. This way, any of those could be suggested as Scenario Logics. In our case, for a generic scenario analysis, we will use the axes containing the higher importance score.

The combination of the high and low values of those axes provides four scenario seeds as shown in figure 4 below:

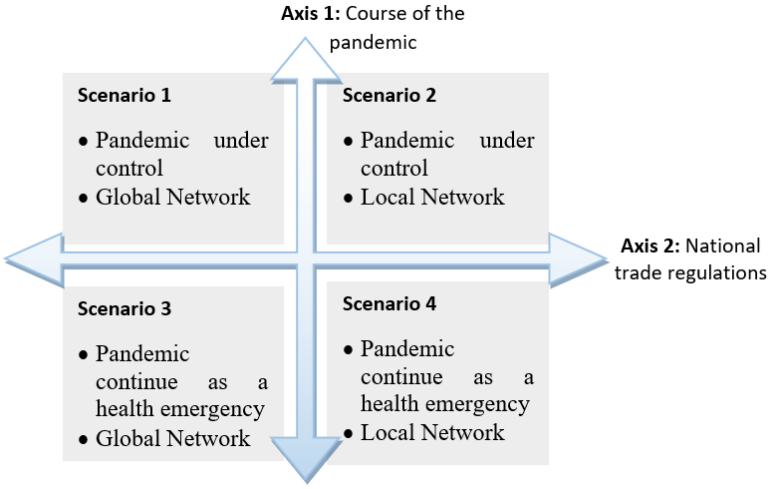

Figure 4: Scenario Logics

The scenario structure is shown in table 5. First, uncertainties for the chosen scenario axes, and then the remaining uncertainties in descending order of importance. Lastly, the trends were presented and described equally across all four scenarios.

Each driving force was assigned high and low values for at least one of the four scenarios, in order to maintain the internal consistency of the scenario determined. Highly correlated driving forces were attempted to assign each of the four high-low value combinations to one of the scenarios. For example, the highest correlation (0.62, between DF-10: Regulatory practices for industries and DF-11: Government support to local business) had the combination low-low, high-high, low-high, high-low assigned to scenarios 1,2,3 and 4 respectively.

For the development of Scenario Narratives, from the two extremes of possible outcomes identified, plausibility and consistency were taken into account to rule out any "impossible outcome" (e.g.: Pandemic continues to be a health emergency and technology adoption becomes lower than today).

Driving Forces	Scenario 1	Scenario 2	Scenario 3	Scenario 4
1st Candidate for Scenario Logic (uncertainties)				
DF3: Course of the Pandemic	Under control	Under Control	Continue as health emergency	Continue as health emergency
DF9: National Trade Regulations	Global Network Focused	Local Network Focused	Global Network Focused	Local Network Focused
Other Uncertainties				
DF5: Adoption of Technology Solution	Higher than before but lower than today	Higher or about the same as today	Higher or about the same as today	Higher or about the same as today
DF11: Government Support to Local Business	No significant changes	Higher	No significant changes	Higher
DF10: Regulatory Practices for Industries	Not much different than before	Higher	Higher	Not much different than before
DF8: Environmental Regulations	Not much different than before	Higher	Not much different than before	Higher
DF1: New Consumer Confidence	Higher or similar as before	Lower	Lower	Higher or similar as before
DF6: Economic activity	Much higher than today	Much higher than today	Lower or about the same	
Trends				
DF2: New Marketing Strategies	Higher than before	Higher than before	Higher than before	Higher than before
DF4: Population Profile	Higher concerns than before	Higher concerns than before	Higher concerns than before	Higher concerns than before
DF7: Focus on Environmental Social Governance (ESG)	Higher than before	Higher than before	Higher than before	Higher than before

Table 6: Final Structure of Scenarios

6.3.1 Description of Trends run equally across all scenarios:

"When shifting our mind for 5 years after the pandemic being declared, it is completely reasonable to understand that many behaviors may bounce back, for example, fear to catch the disease may ease and there will be a reduction in the need for safe socialization/leisure. However, some behaviours have emerged during the outbreak of coronavirus that may persist and become **new competitive requirements,** especially those under the perception of convenience and positive experience. Many other new concerns may rise also due to the **population profile.** As "baby-boomers" are leaving the market, the new generation brings new perspectives not only as consumers but also as employees and employers. In parallel, **Environmental Social Governance,** which had been coming into the corporate radar, received a push when the collective response of particular actions became clear after the magnitude of this sudden crisis. A health and environmental issue became a profound social and economic problem."

6.4 Scenarios for supply chains: 2022-2026

6.4.1 Scenario 1: Thrive Globally

"Vaccines will be effective and treatment/preventive medicines will be available and the presence of the virus will be at very low risk, as happens with many diseases. The lesson that the world is already interconnected, bouncing back alone is hardly an option, and efforts to quickly get back to a global network operating principles of a global community will be required. However, the mandatory adoption of technology for the enduring days of isolation can lead to a sentiment of intrusion, and although people will still use technologies, they may avoid it for private life and increase the search for "freedom". This temporary health event may not be enough for profound changes in government supports or revision of regulatory practices for industries. People will need to feel less anxious and more physically socially interacted, and thus seek whatever products or experiences that may fill the gap created by the restrictions imposed. As businesses reopen, customer spending could revive; customers who were less impacted financially may be eager to consume as before and new forms of income may rise due to flexibilities that were non-existent before."

6.4.2 Scenario 2: Bounce Back Locally

"The world has moved on from Covid-19, but the vulnerability created by globalization during the pandemic has shifted the eyes to reduce global dependency. The same cautiousness will be reflected in conscious consumerism, maintaining priorities to essentials and health. National responses will focus the policies on localized economic development, local production network, and local sustainability. The heavy technology used made the unthinkable possible and significant adoption will unlock the pace of progress. As restrictions are lifting, the world will reopen to a new era of economic growth with a permanent shift of positive solutions created and opportunities will arrive in the forms of training, gig jobs, or in new ways of work, in technologies reaching those living far from big centers. On one hand, this progress growth will require governmental programs and investments and public-private collaborations; on the other hand, regulatory practices for industries and the environment will take place to help ensure new crises can be averted."

6.4.3 Scenario 3: Careful Global Re-engagement

"Infections and deaths fail to slow down and even though the rates may be lower due to vaccines, it is not enough for uniform herd immunity across countries to lift restrictions. Governments and industries understand that this reality must be embraced: technology adoption continues and may bring breakthrough innovations or significant tech advances on how we interact; regulations practices for industries are settled; and global network operations continue. The national government depletes emergency funds and low support is available. All these prolonged restrictions from crisis management lead to significant unemployment and a mental health crisis, low consumer confidence and consequently a slowing of economic activity."

6.4.4 Scenario 4: Protect My Citizens

"Vaccine's immunity does not last long enough, and the Coronavirus is still there as a threat. Restrictions are still in place and since technology adoption is not a refusal, significant advances may come up as well as the importance of digital literacy. Government response towards localized economic development may give way to initiatives and programs for the spread of basic technologies, for acquiring equipment/technology, and blue-collar training. Regulation towards industries with technical regulations, the importance of emergencies

responses, oversight of working conditions, and hygienic/sanitary conditions gives a sense of the guided path in the midst of unknowns. Consumer confidence increases again; and the better people feel about the economy and their jobs and incomes, the more likely they are to make purchases. Economic growth comes as a natural consequence."

7 Discussion

A summary of the significance of our study's main findings is presented in this Chapter. The contributions in the theoretical field as well as in the practical field are examined. Limitations along with future research are exposed to direct more clarity to the topic.

7.1 Theoretical contribution

This research examined the prospective strategic cognition of executives amid the pandemic disruption. Past studies show that the individual's cognition can be a predictor of one's decision-making behavior. Some research extrapolates those actions to a work environment showing that a professional's cognitive style can be reflected in their choices about the company's strategies.

In our study, we found little relationship between the cognition-strategy link proposed. An executive's projections are only partially associated with their strategic visions for the company. An overall characteristic of this supply chain executives' group are *A) Executives are favoring optimistic actions; B) Executives are prioritizing demand by focusing mainly to influence or change externally.*

Different strategic cognitive types should be associated with different types of strategies. Our results suggest the executives are not making strategic choices according to their cognition style, rather, different cognitive styles are defending similar optimistic strategies of satisfying the consumer with less possible interference internal to the company. Those that showed motivation to pursue opportunities were linked to all kinds of optimistic actions, instead of those restricted to exploratory features.

Interestingly, our group's optimistic choices preferences agree with the data from other surveys in the literature. A survey from McKinsey shows moderated positivity among the majority of executives; they continue to believe the economy will improve, even though this share has decreased when comparing to the previous survey (Seiler, 2021). A Monash study done in February 2020 with Malaysian Companies showed that the majority of business leaders in Malaysia are confident and positive, even though there was an increase in the level of negative outlook, as well as a decline in the confidence levels of their company's prospects for the following year, when compared to the previous two years (Nair et al., 2020).

Disruptions used as a context in past studies of managerial cognition probably affected the company alone or perhaps a small section of an industry segment. The cognition-strategy relationship in those circumstances could be affected differently than in our current pandemic with a unique impact. Besides, this is a prospective study done at the very beginning of the pandemic, and the unprecedented crisis may have affected the respondents' answers. Therefore, this study has contributed to the literature by testing the cognition-strategy relationship theory in a prospective study, using a situation that actually forces prospective thinking, and not only suggests.

The creation of possible scenarios in our second study came to fill this gap. The first study showed supply chain executives cannot treat this pandemic as a regular disruption, and so need to look at the effects and consequences of this pandemic five years ahead. The development of scenarios may give a different perspective from those professionals towards different sides of the supply chains and also the influence of the macro-environment.

Our theoretical contribution is the fact that our study extends the applicability to a generic approach. Scenario planning has been used widely with different underlying guidelines but in a very specific application, i.e. it starts from a very firm-specific issue and expands to the macro-environment to lighten the solution. This study uses the pandemic context that is very disruptive *per se* and affects every industry to a certain degree. This means, we should start with the common question *"what should our supply chain look like in the aftermath?"* and expand this to the common macro-environment. Finally, the process is detailed enough so that it can be easily adjusted to any particular considerations or directions an organization wants to.

7.2 Practical contribution

These results showed the voice of supply chain executives from a varied range of sectors and industries. In this group, their strategic cognition could not predict the preferences for strategic actions as expected from our hypothesis. However, they did show a tendency of actions that should be heard, so that c-level executives could align it to their strategies.

From an industry perspective, our data shows that executives whose cognition type suggested actions internal to the company's processes were actually defending external actions, attempting to avoid losses in the current process, and doing their best to not fail in whatever is the current process. Executives with a cognitive style of having the motivation to

explore taking actions in either internal or external environments also preferred not to change internally; they would rather influence externally even if they were acting with an exploratory underlying focus. This may have been due to inevitable losses from external causes – as because of the consequences from the government's orders of movement restrictions that were taking place in the country at the time of the survey – or even due to the necessary physical distancing – some businesses were adversely impacted and the avoid loss sentiment grew stronger than exploring new ventures.

The best solution chosen to bounce back is to look externally by lobbying the government, enhance supplier relationships or target the customer, yet looking internally on the company is not shown as preferred. Depending on the company, a government financial support scheme could be essential for any strategic direction, so it would be the main strategic focus. Finally, this group seems to be strongly demand-oriented: and understand what is required to maintain customer loyalty.

Our second study provided four possible scenario outcomes that may surge and broaden the thinking and solutions for strategic actions. Our first practical contribution is to offer them as four different possibilities that may not be seen through operational lenses or when dealing with pandemic priorities. Each scenario calls for different sets of supply chain strategies, which comes to our second contribution: the strategic action depends on how the future is seen, then decides which side of the supply chain should be reinforced and if the action should be internal or external to the company. Most importantly, macro-environmental forces are easily left out of strategic planning, and thus a scenario analysis brings attention to cause (present event) and effects (future event) that will help improve responses as occurrences unfold.

7.3 Research limitations

It is important to note that is the study uses a rather limited dataset of 101 answers analyzed from a database of the same university. Therefore, it does not reflect the behavior in a specific sector, company or supply chain executives in general.

The answers were collected from April to May 2020, and so even though by then, a pandemic had already been declared, this period was also the time when the first set of restrictions was imposed in Malaysia. As a result, the uncertain duration, rigidity of the restriction, and profundity of the consequences had not yet been experienced. Furthermore,

since different countries were hit at a different pace, the results may not be generalizable to all industries.

All strategic actions were designed to be as generic and encompassing as possible, but one company or individual may not find it suitable for its specific work. This is because the agility for changes in some industries are different and may not be seen with the same importance than others at the time of the survey.

Every important event or decision, be it global or countrywide, may be a turning point in how future scenarios could unfold. Therefore, our second study is based on some assumptions and reflects specifically the current period of time. Any specific event that may affect one sector more than another, may be too specific to be included.

7.4 Future research

The first part of our research deals with individual perspectives, which is a subjective view and can change through time. Potential changes could be verified by altering the results of the cognition-strategy relationship, especially if the study were replicated in different periods of the pandemic, for example, during vaccination stages. We could suggest future research to be built on this by replicating it in those moments.

In our second case, about scenario planning, the methodology used of online publication sources could be enhanced if professional perspectives from inside the supply chain were included. It could therefore be enriched with more elements, insight, and details specific to the characteristics of the country/region.

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9 Appendix A: Psychometric questionnaire

FIRST SET OF QUESTIONS: OPTIMISM LEVELS

Perception of COVID-19.

Please rate your level of agreement with the following statements regarding your outlook about your company in the aftermath of the COVID-19 pandemic. There are no right or wrong answers.

Each question is read as: "In the aftermath of the COVID-19 pandemic..."

Q1. ... I expect the best for my company

Q2. ... if something can go wrong with my company, it will

Q3. ... I'm optimistic about the future of my company

Q4. ... I mostly do not expect things to go my company's way

Q5. ... I do not count on good things happening in my company

Q6. ... overall, I expect more good things to happen than bad in my company

SECOND SET OF QUESTIONS: REGULATORY FOCUS

Strategic Thinking in the Aftermath of COVID-19.

Please rate the importance of following qualities, in your opinion, for your company for making long-term strategic choices about its supply chain in the aftermath of the COVID-19 pandemic. There are no right or wrong answers.

Q1. Being able to get what my company wants, compared to most companies

Q2. Not "crossing the line" by doing things that would not be tolerated in my company's industry

Q3. Accomplishing things that get my company's employees “psyched” to work even harder

Q4. Not getting admonished (i.e., scolded) by the relevant authorities

Q5. Obeying the practices and norms established in my company's industry

Q6. Not acting in ways that are thought objectionable in my company's industry

Q7. Doing well at different things my company tries

Q8. Not getting into trouble, by being careful enough

Q9. Performing as well as my company ideally would like, when it comes to achieving things that are important to us.

Q10. Making progress toward being successful in the next 5 years

Q11. Pursuing activities that capture my company's employees' interest or motivate them to put effort into them.

10 Appendix B: Strategic Choices

THIRD SET OF QUESTIONS: STRATEGIC CHOICES

Strategic Choices in the Aftermath of COVID-19.

Listed below are 12 types of strategic choices a company may make (this is a representative list, not a complete one). For each item in the list, describe how important, in your opinion, each action is for your company to succeed in the long-term, in the aftermath of the COVID-19 pandemic.

If your company provides a service and not a product, replace the word "product" by "service" in the following sentences

Q1. Promoting my company's products to new customers and markets emphasizing their qualities that appeal in the wake of the pandemic

Q2. Lobbying government agencies to support my company's initiatives to develop new products to exploit the opportunities created by the pandemic

Q3. Developing suppliers to produce material and parts of my company's new products aimed at exploiting the opportunities created by the pandemic

Q4. Emphasizing to current customers the value provided by my company and encouraging them to continue our relationship

Q5. Lobbying government agencies to provide protection and support to my company's current business in the aftermath of the pandemic

Q6. Engaging current suppliers to launch joint initiatives to improve resilience of my company's current supply chain with them to future disruptions

Q7. Assessing my company's finished-goods inventory policies to make deliveries of our current products to our customers less vulnerable to future disruptions

Q8. Re-designing my company's current products to reduce dependence on parts sourced from regions vulnerable to future disruptions

Q9. Increasing sizes of buffer inventories of my company's current critical raw materials and parts to mitigate impact of future disruptions

Q10. Funding development of new products and revenue sources within my company to remain competitive in the aftermath of the pandemic

Q11. Training my company's Operations team to upgrade skills their skills to support new revenue sources to exploit the opportunities created by the pandemic

Q12. Educating my company's Procurement team to understand the raw material needs for my company's new revenue sources in the aftermath of the pandemic

11 Appendix C: Local Factors

1) **Sourcing:**

LF1. *Expand supply base to avoid dependency*: tendency in supply diversity may increase the search for alternate suppliers in other countries or locally.

LF2. *Availability of new suppliers*: the acceleration towards more flexibility and multi-level sourcing, logistics hubs may emerge at regional level increasing the search for local suppliers.

LF3. *Reliability of supplies:* multi source comes with the challenge of consistency for the same standard of final product.

LF4. *Cost of supplies:* supplies cost may incur from new supplier source, other than previously used.

LF5. *Visibility of supply network*: the normalization of the use of technology and capabilities that will produce status detail of the product.

LF6. *Availability and affordability of sourcing optimization*: digital tools to optimize sourcing and decisions in an automated way.

LF7. *Digital interaction with supplier:* new digital sourcing levers: eSourcing, electronic catalogue, eInvoicing, etc.

2) **Manufacturing:**

LF8. *Readiness to operate processes remotely:* Company's readiness to operate automated processes/machines, enabling remote work or allowing physical distancing.

LF9. *IT infrastructure for management:* Company's readiness to support management using IT infrastructure.

LF10. *IT infrastructure for operations:* Company's readiness to support operations using IT infrastructure.

LF11. *Managerial ability to build work relationship from remote work:* To maintain operations working remotely in a post pandemic environment, the ability to oversee workload, progress status, worker wellbeing/mental health etc. would be a differential.

LF12. *Cost of work labour:* Companies who depends on foreign work labour base may be vulnerable if recruitment laws change.

LF13. *Ability to influence working conditions throughout the supply chain:* Environmental and social impacts of each phase of SC, may rise as a concern to the final consumer, especially if the manufacturing takes place in unregulated environments.

3) **Distribution:**

LF14. *Customer's preferred location for receiving the product: either at home or in-store:* the rise of ecommerce made changes on the origin of deliveries (from warehouse/in-store) changing processes and technologies leading warehouses to act more like stores and stores to act more like warehouses.

LF15. *Availability and feasibility of last mile technologies:* ecommerce is likely to continue in post covid and customer may look deeper into greener solutions, deliver cost and consequences on traffic volume.

LF16. *Smart warehouse:* company's maturity level of interconnected technologies in warehouse.

LF17. *Customer expectation for reaching the product:* willingness from customer to accept new ways for reaching to the product. E.g.: unattended delivery as parcel lockers and boxes; night deliveries; trunk deliveries

4) **Customer Relations:**

LF18. *Ability to reach customer expectation*: Customer's value may shift to essentials, convenience, quality, purpose drive (e.g.: suport locals, awareness of health, clarity of information), changing the pattern of consumer behavior.

LF19. *Ability to maintain brand value:* New customer views and the need to pivot during the pandemic may deviate the core business or push its importance aside.

LF20. *Ability to maintain competitive:* New customer proposition may bring up competitors not before considered.

LF21. *Maturity level of digital interface with customer:* Digital interaction arise during the pandemic may persist (pre-sales, sale and post-sale activities through digital channels). Innovative ways to create engaging experience, for example, use of augmented reality to walk the customer through visual procedures instructions, may come as a lever.

LF22. *Ability to influence complex dimensions of consumer behavior*: the high exposition to newer influence may require different methods for modeling (influence) the customer behavior.

5) Human Resources

LF23. *Local availability of managerial talent:* some managerial skills may surge as key in a modified workplace: cognitive skills, interpersonal skills, resilience skills etc.

LF24. *Local availability of work force:* advances in technology accelerated by the pandemic may be likely to persist and increase need for differentials in work force (as familiarity/proficiency with technologies, experience with digital tools, digital dexterity, digital literacy etc.).

LF25. *Ability to meet employee expectation:* uncertainty experienced on the pandemic (instability, mental health issues, increase of stress levels etc.) may lead workers to search for more stable jobs and more wellness opportunities/support, new policies for safety measures (monitoring wellbeing); flexible schedules may be expected (hybrid workplace).

LF26. *Ability to adapt to variation in laws:* Economic protection strategies may lead government to alter recruitment regulations.

6) Closed Loop Supply Chain

LF27. *Company's transparentness (brand transparency) and information clarity about the final product:* environmental consciousness along with the rise of fake news may increase the need for information about the final product (e.g.: additives, pesticides, chemicals etc.) as well as the environmental/social consequences.

LF28. *ability to influence transparency and information clarity in each phase of the SC:* environmental consciousness along with the rise of fake news may increase the need for information, as environmental/social consequences, in each phase of the SC.

LF29. *Company's ability to use local relevant problems and solutions as way to close loop:* Local features of problems that could be eased by changes in the SC (e.g.: Adapt products to be design for recyclability).

LF30. *Availability and feasibility of technology for circular manufacturing:* Technologies, collaborations or adjustment in processes can enhance this capability in multiple levels.

LF31. *Company's policy and solutions for maximizing value recovery (accepting back products/packages/waste):* Willingness of the company to consider integration and technology to activate circular supply chain.

LF32. *Company's capability for recycling/repair*: willingness of the company to collaborate with recyclers/packaging manufacturers or other companies across the SC would allow cut cost or material waste.

LF33. *Company's ability to have a symbiotic relationship between production and consumption side*: awareness/willingness of the consumer to not only demand, but to actively participate in the process.

12 Appendix D: Influence of Local Factor over Driving Forces

INFLUENCE TABLE

	Driving Forces										
Importance score (F):	0.36	0.42	0.76	0.79	0.64	0.36	0.55	0.39	0.36	0.58	0.64
Local Factors	New Consumer Confidence	New Marketing Strategies	Covid-19 as Health Issue	Population profile	Adoption of Technology Solutions	Economic Activity	Focus on ESG	Environmental regulations	National Trade Regulations	Regulatory Practices	Government support
Expansion of supply base	0	0	1	0	0	0	1	1	1	1	1
Availability of new suppliers	0	1	1	1	1	1	0	0	1	1	1
Reliability of supplies	0	0	0	0	0	0	1	0	1	1	1
Cost of supplies	0	0	1	0	0	1	1	1	1	1	1
Visibility of supply network	0	0	1	1	1	0	1	0	1	1	1
Availability and affordability of sourcing optimization	0	1	1	0	1	0	0	0	0	0	1
Digital interaction with supplier	0	1	1	1	1	0	0	0	0	0	1
Readiness to operate processes remotely	0	0	1	1	1	1	0	0	0	1	1
IT infrastructure for management	0	0	1	1	1	0	0	0	0	1	1
IT infrastructure for operations	0	0	1	1	1	0	0	0	0	1	1
Managerial ability to build work relationship from remote work	0	0	1	1	1	0	0	0	0	0	0
Cost of work labour	0	0	1	1	0	1	0	0	1	1	1
Ability to influence working conditions throughout the Supply Chain	0	0	1	0	0	0	1	1	0	1	1
Customer's preferred location for receiving the product	1	1	1	1	1	0	1	0	0	0	0
Availability and feasibility of last mile technologies	1	1	1	1	1	0	1	1	0	1	1
Smart warehouse	0	0	1	1	1	0	0	0	0	1	1
Customer expectation for reaching the product	1	1	1	1	0	0	0	0	0	0	0
Ability to reach customer expectation	1	1	0	1	1	0	1	0	0	0	0
Ability to maintain brand value	1	1	0	1	1	1	1	0	1	0	0
Ability to maintain competitive	1	1	1	1	1	1	1	1	1	1	1
Maturity level of digital interface with customer	1	1	1	1	1	0	0	0	0	0	0
Ability to influence complex dimensions of consumer behavior	1	1	0	1	1	1	0	0	0	0	0
Local availability of managerial talent	0	0	1	1	0	1	0	0	1	0	1
Local availability of work force	0	0	1	1	0	1	0	0	1	1	1
Ability to meet employee expectation	0	0	1	1	0	1	0	0	1	1	1
Ability to adapt to variation in laws	0	0	1	0	0	0	1	1	1	1	1
Company's transparentness (brand transparency) and information clarity about the final product	1	1	1	1	1	0	1	1	0	0	0
Ability to influence transparency and information clarity in each phase of the SC	0	0	1	1	1	0	1	1	0	1	0
Company's ability to use local relevant problems and solutions as way to close loop	0	1	0	1	1	0	1	1	0	1	0
Availability and feasibility of technology for circular manufacturing	0	0	0	0	1	0	1	1	0	0	0
Company's policy and solutions for maximizing value recovery (accepting back products/packages/waste)	1	0	1	1	0	0	1	1	0	1	1
Company's capability for recycling/repair;	1	0	0	1	0	1	1	1	0	0	1
Company's ability to have a symbiotic relationship between production and consumption side	1	1	0	1	1	1	1	1	0	0	0

13 Appendix E: Correlation of pairs of Driving Forces

CORRELATION BETWEEN DRIVING FORCES

		DF1	*DF2*	*DF3*	*DF4*	*DF5*	*DF6*	*DF7*	*DF8*	*DF9*	*DF10*	*DF11*
New Consumer Confidence	DF1	1										
New Marketing Strategies	DF2	0.625711	1									
Covid-19 as Health Issue	DF3	-0.30735	-0.22978	1								
Population profile	DF4	0.392232	0.295418	0.052414	1							
Adoption of Technology Solutions	DF5	0.178571	0.521426	-0.13363	0.378224	1						
Economic Activity	DF6	0.083333	-0.01159	-0.16036	0.238141	-0.21429	1					
Focus on ESG	DF7	0.31053	0.044777	-0.37439	-0.3248	-0.05751	-0.19552	1				
Environmental regulations	DF8	0.164083	-0.06464	-0.12279	-0.34018	-0.16408	-0.09376	0.73598	1			
National trade regulations	DF9	-0.30952	-0.26651	0.133631	-0.22413	-0.47619	0.47619	0.057505	-0.09376	1		
Regulatory Practices	DF10	-0.49825	-0.50376	0.372857	-0.14544	-0.26651	0.011587	0.07836	0.190126	0.393966	1	
Government support for local business	DF11	-0.47619	-0.49825	0.454344	-0.23814	-0.44048	0.178571	-0.18402	-0.03516	0.440476	0.625711	1