NEXST

NEXST INSIGHTS

Implications of Inventory Optimization & Supply Chain Resilience on Future Supply Chains

How Businesses Can Prepare For A Transformed World

September 2022

Reefknot Investments is a global Venture Capital Fund seeking to partner and actively support high growth technology businesses driving to transform the Supply Chain and Logistics industry.

Reefknot invests in founders and companies that solve meaningful problems and have the potential to make a transformational impact in the Supply Chain and Logistics sector. Additionally, Reefknot is focused on companies that develop and/or uniquely utilise Technology as a foundation or differentiating anchor for their respective business models.

Their solution areas include but are not limited to Artificial Intelligence(AI)/Deep Tech, Digital Logistics and Trade Finance.

The Next Supply Chain (NEXST) is a think-tank initiative aimed at driving new business models and transformational technology in the Supply Chain and Logistics industry.

NEXST aims to positively create value and impact for the Supply Chain and Logistics industry, to partner with and support high growth technology businesses seeking to transform the Supply Chain and Logistics industry, and to become a global centre of gravity for all technology start-ups in the Supply Chain and Logistics industry.

CONTENTS

This is the 3rd year that NEXST is conducting our Supply Chain Digitalization survey, and for this year's survey, we find ourselves in a new dynamic environment where there are further disruptions from inflationary pressure, the opening up from COVID-19 lockdowns, the Russian-Ukraine war, and continued general macro-economic instability.

This year's Insights Paper has attracted an even greater participation from corporate as well as academic partners. Firstly, we would like to thank the NEXST members (Wolfgang Lehmacher, Simon Fich, Kong Wai Wei, Bharathi Viswanathan & Kelvin Tan), as well as our corporate partners International Finance Corporation (IFC) and Kuehne + Nagel, for their valuable contributions to the paper.

We would also like to thank the support from the Institute of Operations Research and Analytics (IORA) at the National University of Singapore (NUS) for their contributions to this report.

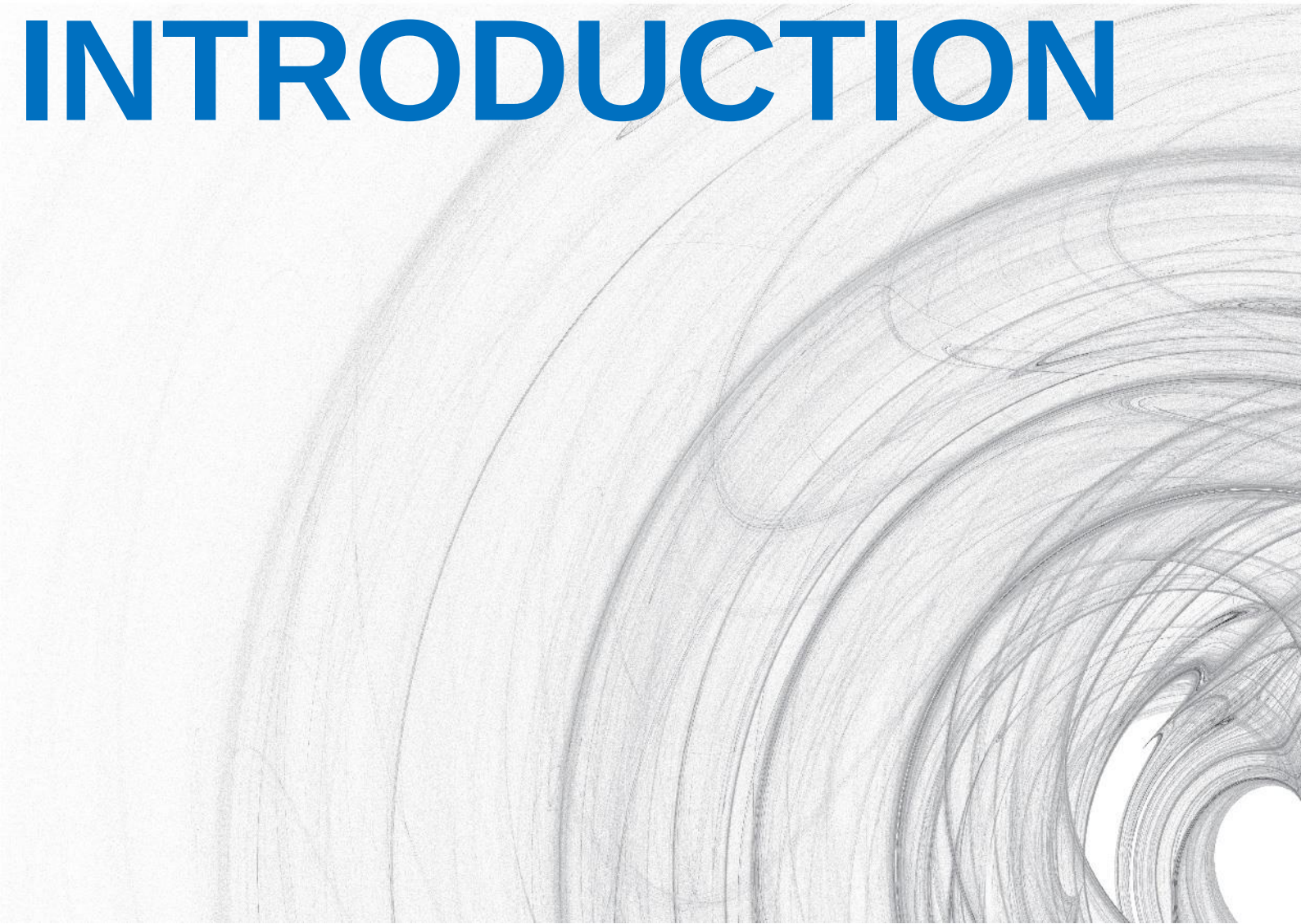
Finally, we would like to thank the respondents of our survey, who enabled us to have a better understanding of the thoughts of supply chain professionals around inventory optimization and resilience in future supply chains.

PREFACE

2.1 PURPOSE OF THE REPORT

It has been an eventful 2022. Inflationary pressures, opening up of economies following COVID-19 lockdowns, the Russian-Ukraine war, and continued general political and macro-economic instability have led to short and medium-term implications for the supply chain industry. With these macroeconomic developments, we set out to gather the perspectives of and for businesses across various geographical regions and different industries focusing specifically on the implications of inventory optimization and resilience on future supply chains.

INTRODUCTION



2.2 STRUCTURE OF THE SURVEY

Questions revolved around 4 main segments. In the first segment, respondents are asked about their satisfaction regarding their current supply chain planning performance and supply chain planning goals. The second segment explores the respondents' logistic improvement plans, specifically regarding warehousing and transportation capabilities. The third segment sought to find out the expected changes in costs and demand in the near future, while the last segment looked for the respondents' supply chain strategy priorities in the near future.

2.3 DEMOGRAPHICS OF RESPONDENTS

The specific breakdown of the survey respondents' demographics is depicted in the Figures 1 to 3.

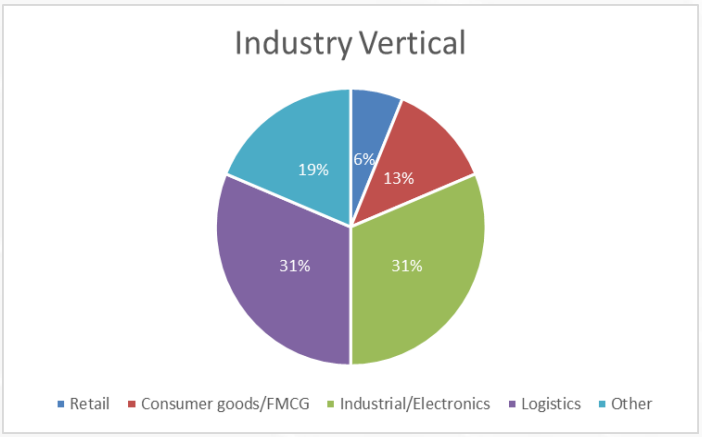


Figure 1: Breakdown of Respondents' Industry Vertical

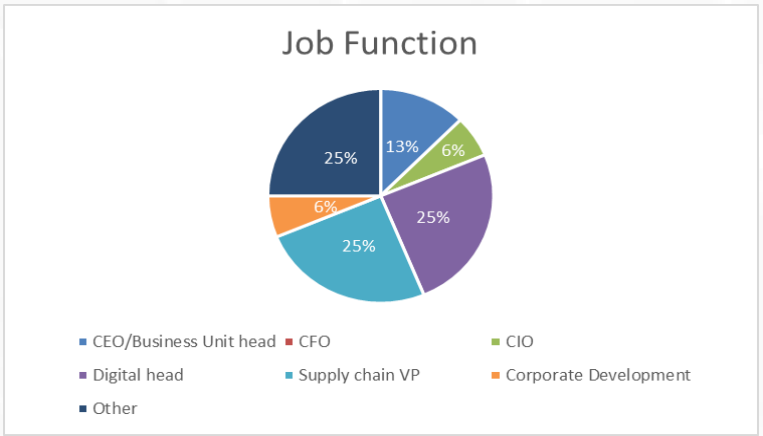


Figure 2: Breakdown of Respondents' Job Function

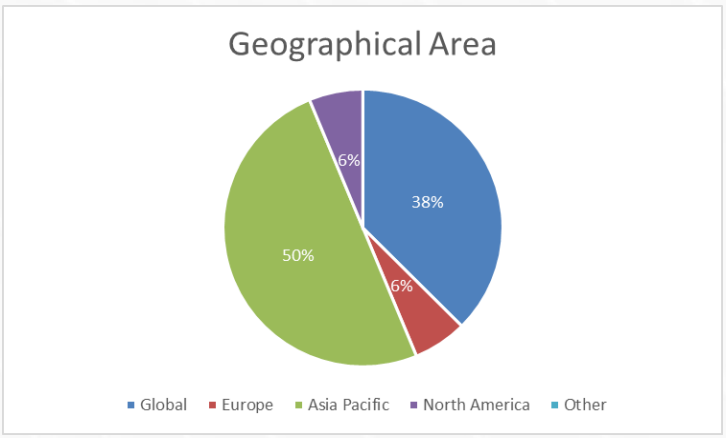


Figure 3: Breakdown of Respondents' Geographical Area

2.4 GENERAL INSIGHTS

Based on the categories of the questions mentioned in section 1.2, we can further classify the responses into 4 key categories, namely supply chain planning, warehousing, transportation, and supply chain resilience.

Categories	Colour
Supply chain planning	Dark Blue
Warehousing	Red
Transportation	Yellow

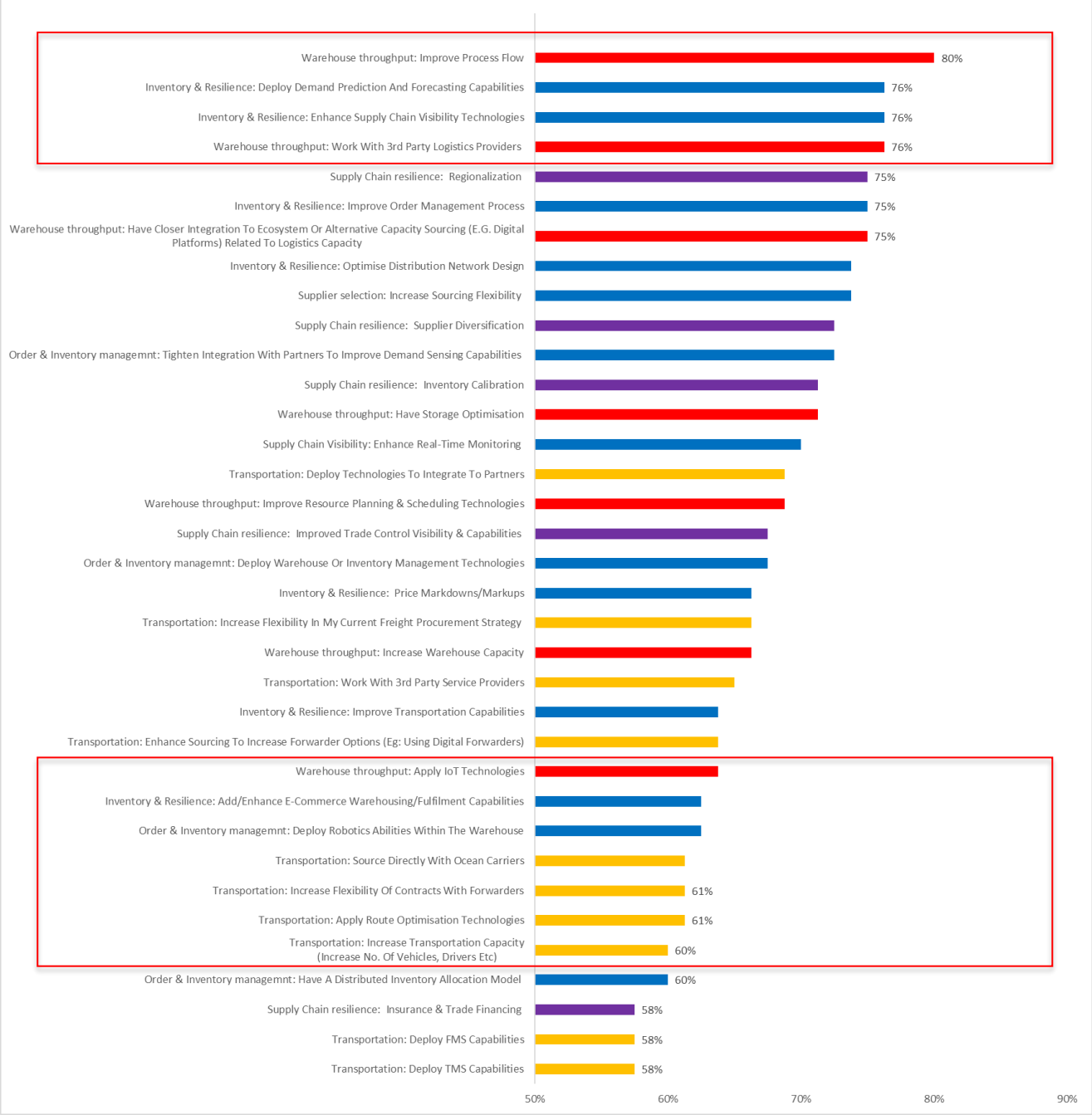


Figure 4: Respondents' likelihood of engaging in the various solutions

Two general insights emerged

- Improving Warehousing (red) & demand planning (blue) seem to be the top areas of focus, especially as plans to improve these areas are in the majority of the top 20% (top 7 options) of the answers.
- Improving transportation capabilities (yellow) seem to be the least of the supply chain leaders' concerns, as plans to improve these areas are in the majority of the bottom 20% (bottom 7 options)

We then took the average of the likelihood that respondents would engage in the solutions in the various categories, as per answers in the survey, and placed them on a distribution curve (Figure 5).

Based on further analysis, solutions for supply chain resilience have been found to be significantly more important than the rest, with >1 standard deviation above the mean of 67%.

Whereas transportation improvement solutions have been found to be the least significant, with >1 standard deviation below the mean.

With supply chain resilience solutions being called out as an area of focus, we will further examine the relevant factors specific to this in a later section of this report.

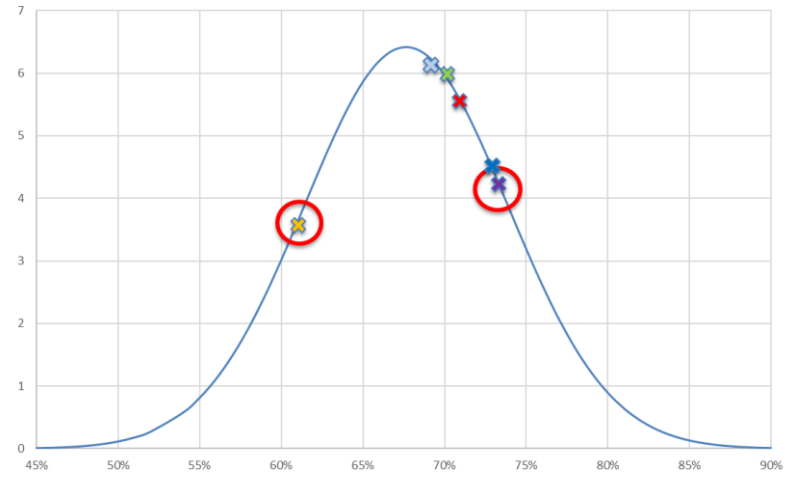


Figure 5: Distribution curve of the respondents' likelihood to engage in the various solutions

3.1 INCREASING SUPPLY CHAIN RESILIENCE TURNS OUT TO BE THE TOP AREA OF FOCUS

A resilient supply chain is defined by its capacity to resist and recover. This refers to the capability to mitigate most supply chain disruptions and greatly limit the impact of those that occur[1]. In view of recent macroeconomic events producing various types of uncertainties along the supply chain (such as demand uncertainty, supply uncertainty, delivery uncertainty and forecasting uncertainty), our survey investigated if increasing supply chain resilience is of growing importance and asked supply chain leaders about their intent and plans to improve supply chain resilience.

[1] *https://www.sap.com/insights/what-is-a-resilient-supply-chain.html*

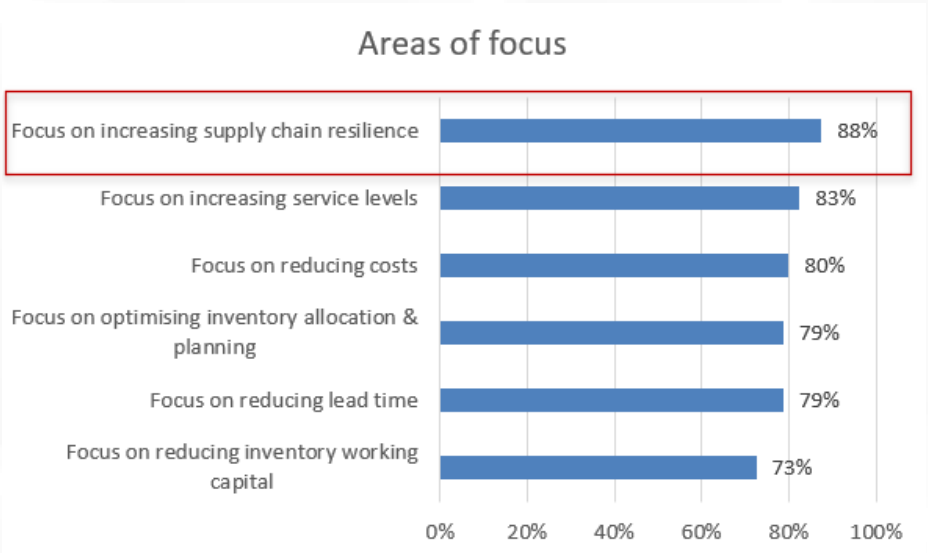


Figure 6: Respondents' rating in their area of focus in the next 24 months

Unsurprisingly, it is more important than ever to have flexible and resilient supply chains to deal with the volatilities across the economy today. Respondents report that their greatest area of focus (88%) in the next 24 months lies on increasing supply chain resilience. Additionally, fulfilling demand is also at the top of respondents' minds since increasing service levels is rated second highest with 83%; whereas reducing inventory working capital is rated last at 73%.

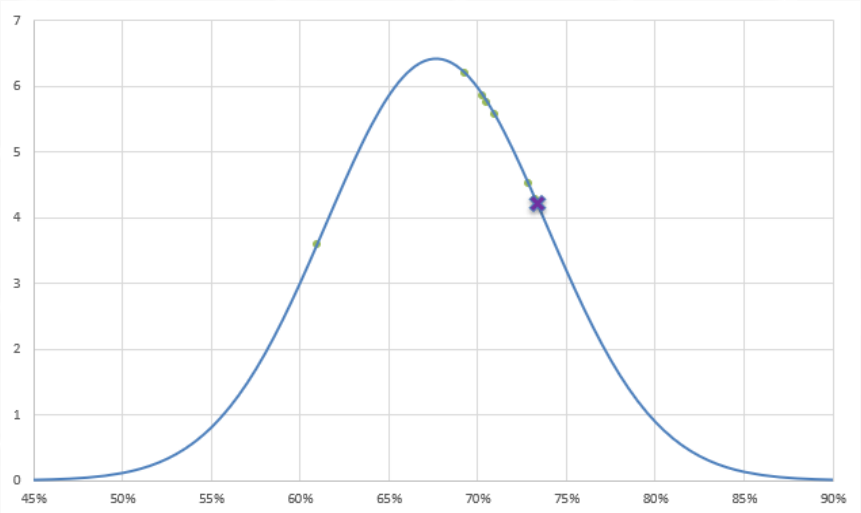


Figure 7: Distribution curve of the respondents' likelihood to engage in solutions to increase supply chain resilience

Respondents regard solutions to increase supply chain resilience as significantly more important compared to their other plans, as its aggregate to a trimmed average of 73% of the distribution curve is 1 standard deviation above the mean of 67%.

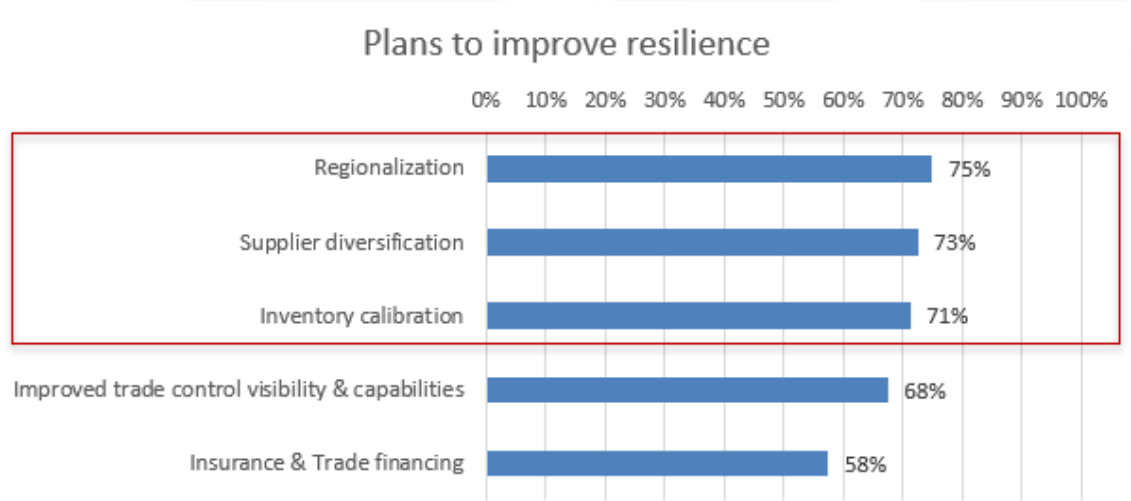


Figure 8: Respondents' rating in their plans to engage to increase supply chain resilience in the next 24 months

When asked about plans to increase supply chain resilience, respondents answered that they are more likely to engage in regionalisation (75%) and supplier diversification (73%) & inventory calibration (71%); the likelihood to engage in such plans are above the average of 67%.

Our findings are in line with a review of earnings calls and conference presentations transcribed by Bloomberg. CEOs have been highlighting plans to relocate production through onshoring, reshoring or nearshoring, at a greater clip this year than they did in the first six months of the pandemic. Bloomberg links this to disruptions caused by the most recent wave of strict Covid lockdowns in China, triggering the decision to move production out of China[2].

[2]https://www.bloomberg.com/news/articles/2022-07-05/us-factory-boom-heats-up-as-ceos-yank-production-out-of-china

3.2 RISING COSTS, ESPECIALLY MANPOWER & RAW MATERIALS COSTS, ARE OF SIGNIFICANT CONCERN IN VIEW OF THE NEXT 24 MONTHS

Recently, high logistical cost has become a growing concern for supply chain leaders. The average price to ship a 40-foot container from China to the U.S.

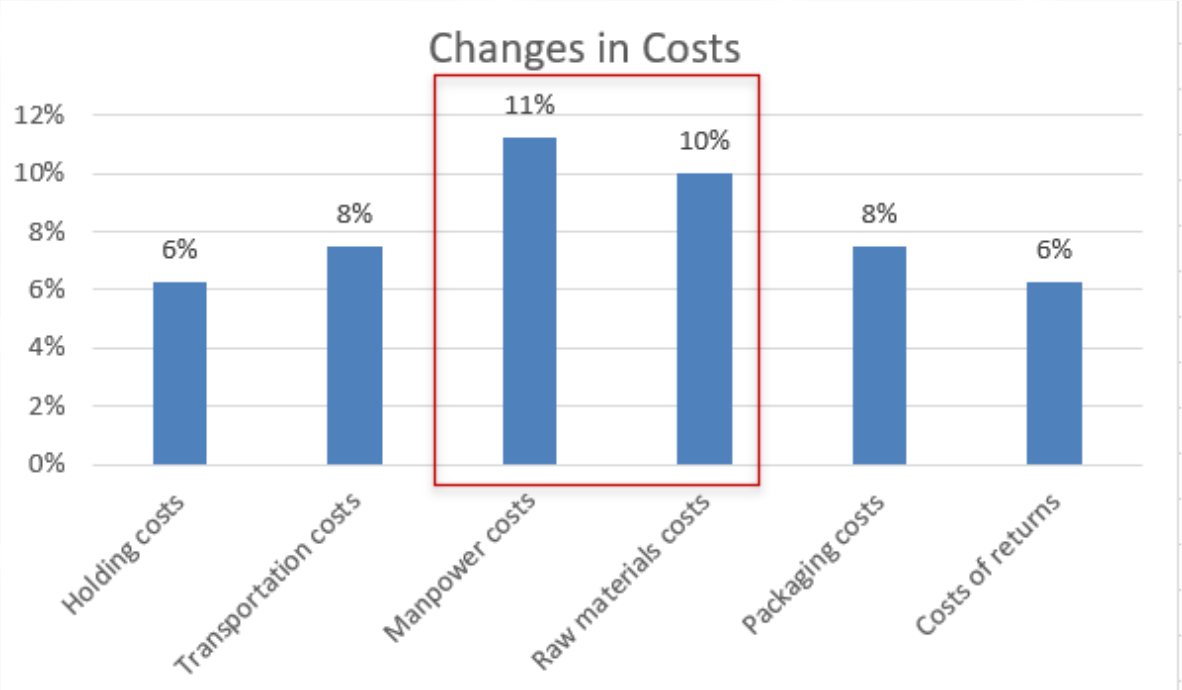


Figure 9: Expected changes in costs in the next 24 months

On average, respondents anticipate a general increase in average of 8% across all categories of costs due to inflationary pressures. More specifically, respondents expect the greatest increase in manpower (11%) and raw materials (10%). The anticipated increase in manpower costs seem to be in line with current industry labour shortages, driving up wage costs.

West Coast increased from $1,500 at the start of 2020 to over $20,000 in September 2021 (this average price includes premiums and surcharges), while logistics costs and inventory carrying costs rose by 22% and 25% respectively in 2021. As such, our survey inquired if respondents anticipate a further increase in prices and, hence, the need for corrective action.

[4] https://pubsonline.informs.org/doi/abs/10.1287/mnsc.1090.1099

According to McKinsey & Company, there is a labour mismatch in U.S. logistics and supply chains. With demand for workers exceeding supply, the cost of labour has increased too. Transport and warehousing have been most affected, with wages increasing four times faster than before the pandemic[5]. Since the transport and logistics industry is labour-intensive, and the sector was already experiencing recruitment challenges before the crises, the upward pressure on wages will be all the greater[6].

Also, the supply chain disruptions brought about by the Russian-Ukraine war may have contributed somewhat to the rise in raw materials and transportation costs. This is especially evident in Europe, where two out of three European CFOs (64 per cent) report that their companies are affected by supply chain problems to a moderate or large extent. The main supply chain issues stem from the increasing costs of raw materials, intermediate goods and transport according to a 2022 survey done by Deloitte[7].

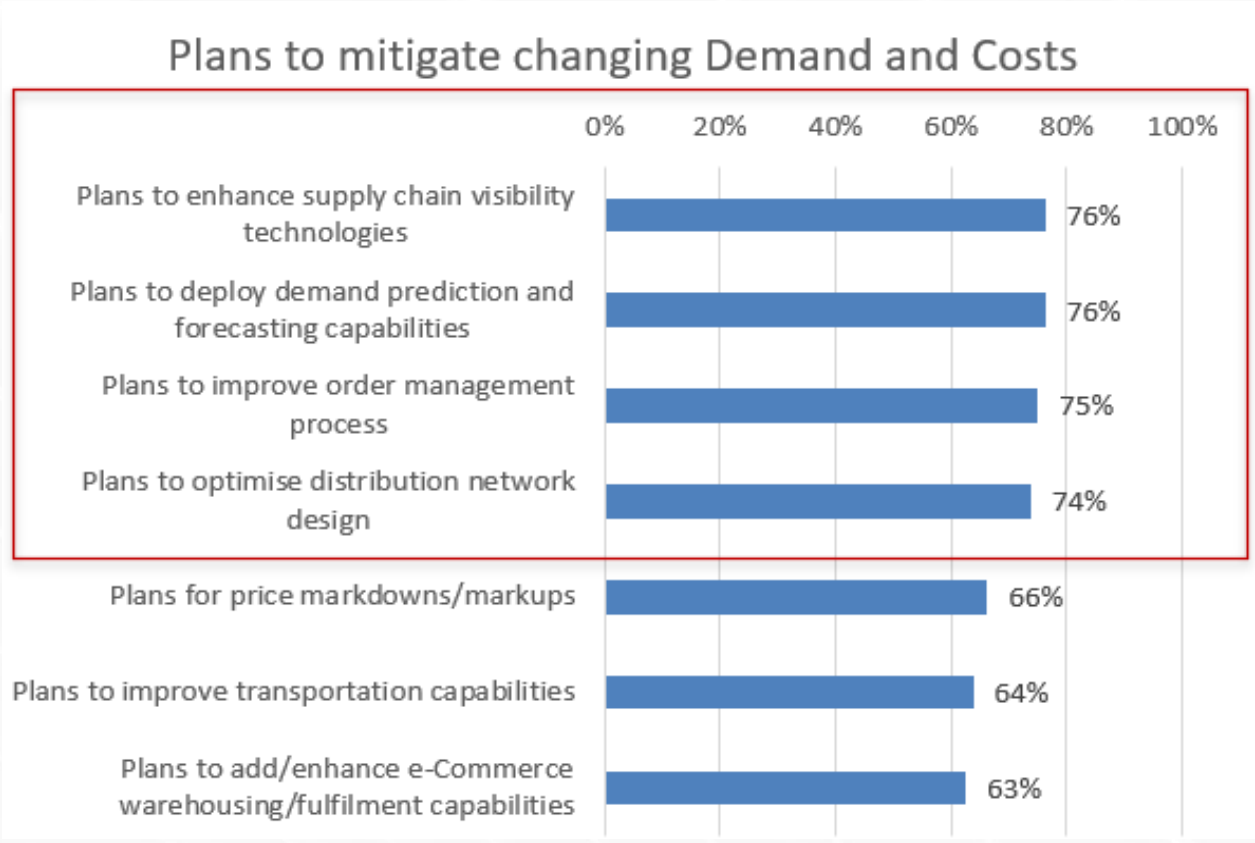


Figure 10: Respondents' plans to engage to mitigate changing levels of costs & demand in the next 24 months

[5]https://www.mckinsey.com/business-functions/operations/our-insights/navigating-the-labor-mismatch-in-us-logistics-and-supply-chains

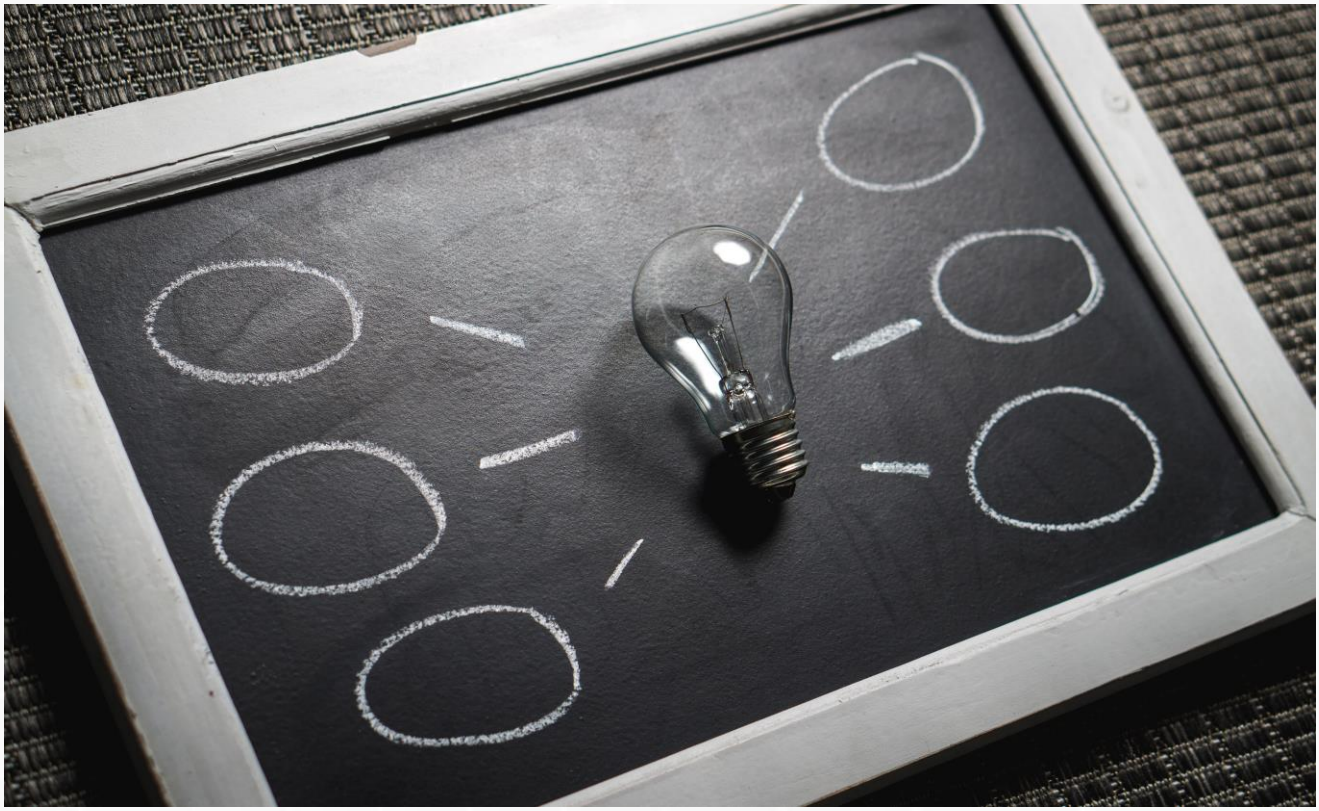
[6]https://market-insights.upply.com/en/inflation-is-invading-the-entire-supply-chain

[7]https://www2.deloitte.com/uk/en/insights/economy/russia-ukraine-war-inflation-impact.html

In response to rising costs, respondents plan to improve demand forecasting, supply chain visibility, order management process and optimise distribution networks. The top two measures to mitigate rising costs are technology-related, specifically the intent to enhance demand prediction and supply chain visibility.

This is in line with current efforts undertaken by companies today. P&G, one of the world's largest consumer goods manufacturers, makes actual demand visible by picking up scanner data at the point of sale and making it visible at the plant where it becomes part of the daily production schedule.

It is also interesting to note that plans to add/enhance e-commerce capabilities are rated lowest at 63%. While respondents do not view e-commerce as a solution to lower costs, capturing the e-commerce market is of fundamental importance for business leaders, and is also of crucial importance to supply chain leaders in the areas of fulfilment and increasing



[8] https://www.supplychainbrain.com/articles/575-procter-gamble-uses-consumer-demand-info-to-drive-supply-network

3.3 ENHANCING TECHNOLOGY APPLICATIONS ARE EMBEDDED ACROSS ALL AREAS, WITH UNDERSTANDING DEMAND AS A TOP PRIORITY

As shown in the previous year's NEXST insight paper, companies across regions and industries began to show an increased interest in enhancing current supply chain capabilities using technological innovations such as supply chain visibility, data integration, dynamic planning, and having a dedicated e-commerce fulfilment strategy. As such, we analysed the technology-driven solutions and our survey found that technology solutions aggregate to a trimmed average of 69% of the distribution curve. While this is higher than the mean of 67%, it is not significantly higher than the mean technology solutions are embedded across the different Supply chain services and operations capabilities. Therefore, the focus on technology adoption has shifted demand from purchasing pure-technology solutions to technology-enabled services, which are being well-distributed across all the options (Figure 11).

Using a similar analysis as section 1.4, we can also further group the responses into technology related solutions and non-technology related solutions.

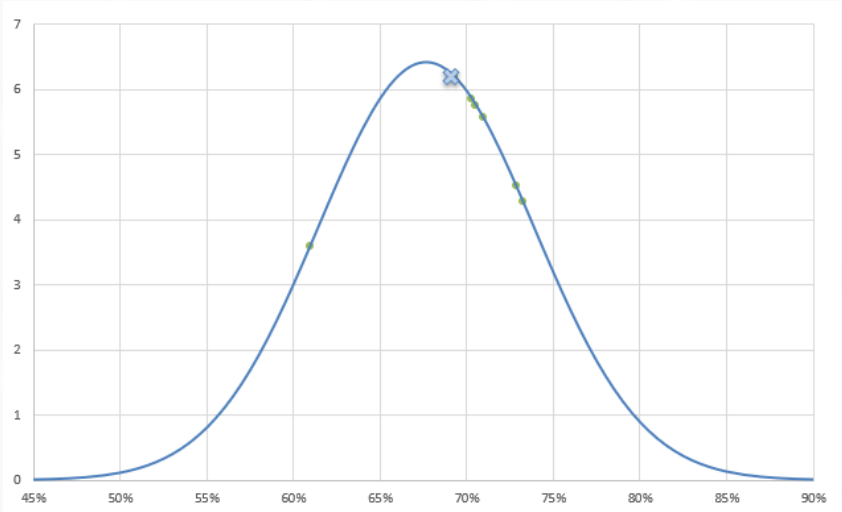


Figure 11: Distribution curve of the respondents' likelihood to engage in technology-related solutions

Categories	Colour
Technology related solutions	Light blue
Non-technology related solutions	Grey

[8] https://www.supplychainbrain.com/articles/575-procter-gamble-uses-consumer-demand-info-to-drive-supply-network

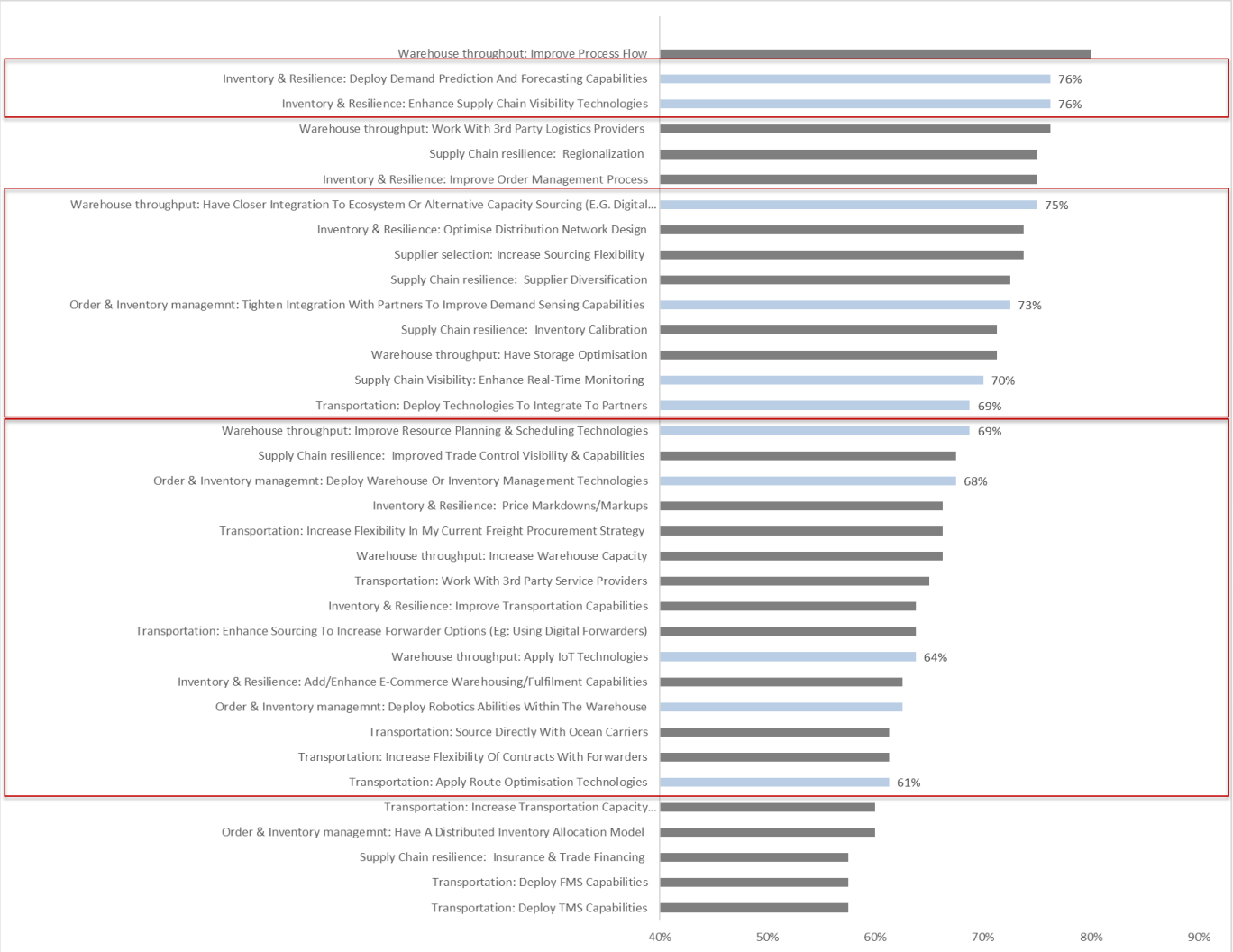


Figure 12: Respondents' likelihood to engage in technology-related plans

Among the technology solutions, understanding demand is the top priority (Figure 14) - deploying demand prediction & forecasting capabilities as well as enhancing supply chain visibility technologies landed within the top 10% of the options. These findings are in line with an article from Forbes[9], which stated that 65% of global enterprises increased analytics spending in 2020, with demand forecasting as a primary function.

Following just behind, demand prediction & forecasting would be integration-focused technology solutions. Respondents are found to be keen on creating tighter integration with their ecosystem and partners.

Enhancing technology specifically for logistics (warehousing & transportation) is the least important item among the technology solution areas, despite warehousing being one of the top few areas of focus to improve.

[9] https://www.forbes.com/sites/forbestechcouncil/2022/07/14/covid-19-altered-the-supply-chain-does-your-forecasting-strategy-reflect-the-new-reality/?sh=38c286935e24

[10] https://www.businessfinland.fi/490cb2/globalassets/julkaisut/future-of-supply-chain-20210105_future-watch.pdf

3.4 SUPPLY CHAIN BIFURCATION PLANS (I.E. SOURCING & PROCUREMENT DIVERSIFICATION, REGIONALISATION, AND DISTRIBUTION NETWORK DESIGN) ARE NOT PRIORITIZED, HOWEVER IS LIKELY SEEN AS PART OF INCREASING SUPPLY CHAIN RESILIENCE

Supply chain bifurcation can be defined as the division of supply chains, resulting in reduced dependency between the separated supply chain. Plans to mitigate supply chain bifurcation disruption include sourcing & procurement diversification, regionalisation, and distribution network design.

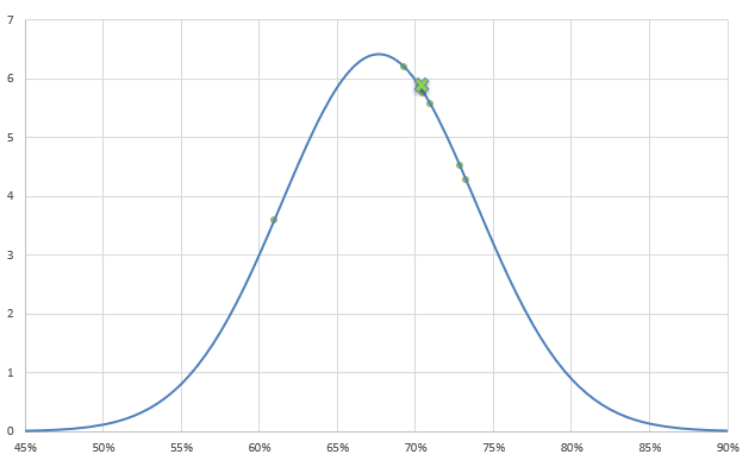


Figure 13: Distribution curve of the respondents' likelihood to engage in supply chain bifurcation plans

Solutions regarding sourcing & procurement diversification, regionalisation and distribution network planning aggregate to a trimmed average of 70% of the distribution curve. While it is not significantly higher than average, it is still higher than the mean of 67%. This implies that the supply chain industry views supply chain resilience and bifurcation differently, despite some similarities regarding the various supply chain strategies - such as planning for sourcing & procurement diversification, regionalisation, and distribution network design.

As mentioned previously, supply chain resilience means having the capability to mitigate most supply chain disruptions and greatly limit the impact of those that occur. Therefore, the key difference lies in supply chain resilience referring to the capability to mitigate disruptions to the supply chain, while bifurcation is viewed as the result of the implementation of specific supply chain resilience strategies.

Using a similar analysis as section 1.4, we can also further group the responses into Bifurcation & distribution network strategy and non-bifurcation & distribution network strategy.

Categories	Colour
Bifurcation & distribution network strategy	Green
Non-bifurcation & distribution network strategy	Grey

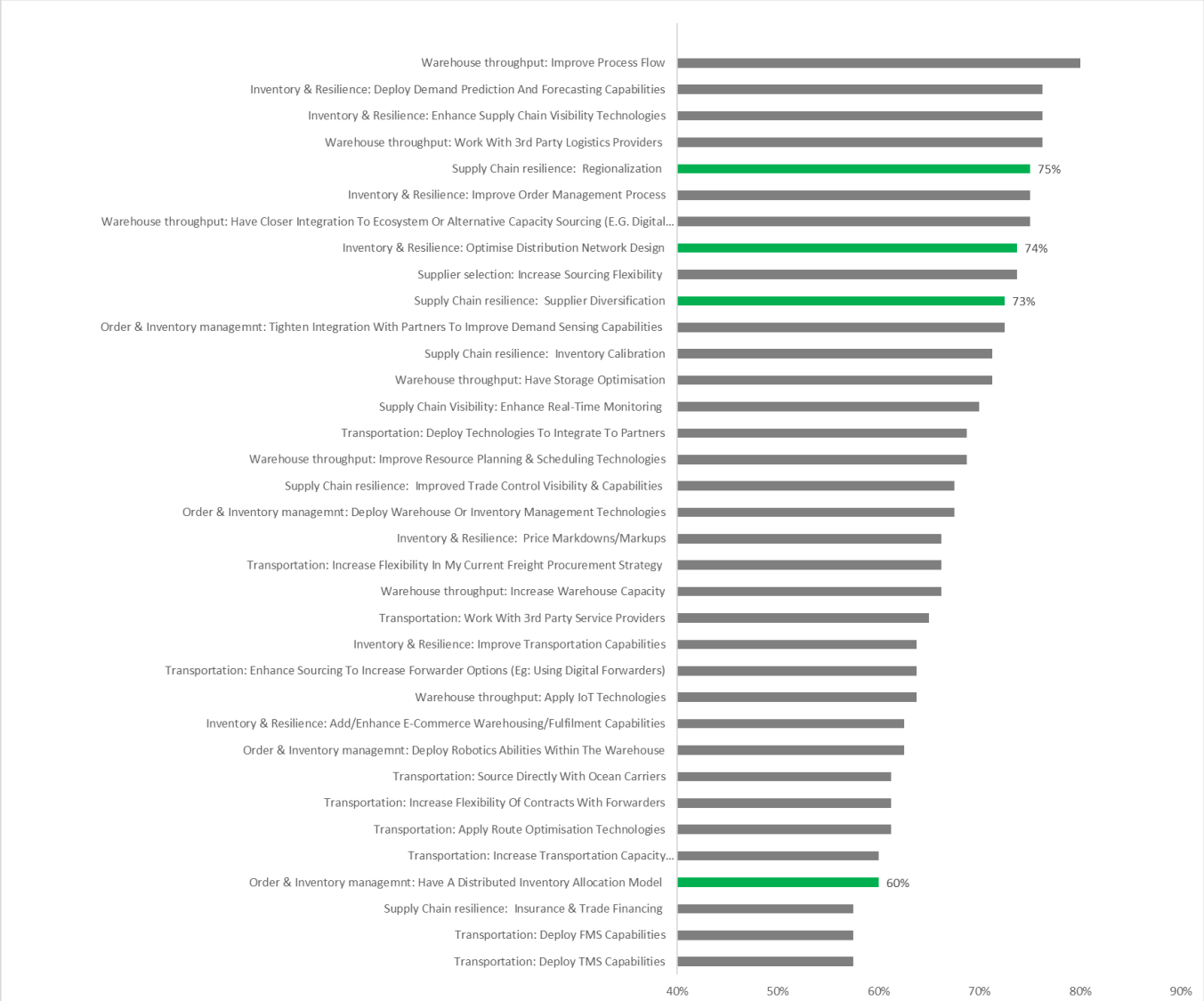


Figure 14: Respondents' likelihood to engage in bifurcation-related plans

Plans of regionalisation, optimising network designs and supplier diversification are top of respondents' minds. Such moves may be prioritised due to its important role in increasing supply chain flexibility & resilience.

These findings correspond to insights from the Kearney 2021 Reshoring Index, which found that 92% of the CEOs surveyed stated positive sentiments toward reshoring to the U.S. [11]

[11] https://www.natlawreview.com/article/reshoring-trending-choice-manufacturers

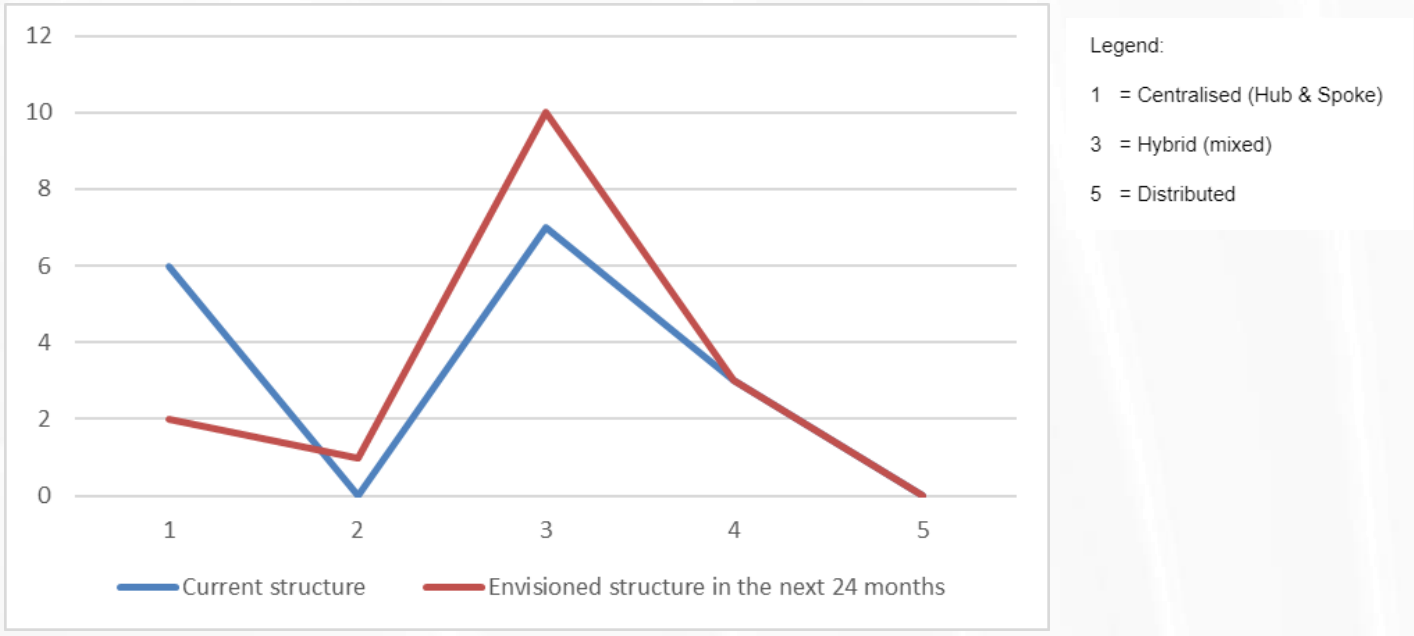


Figure 15: Respondents' current distribution structure & their envisioned structure in the next 24 months

We also asked respondents to compare their current distribution networks with their envisioned structure in the next 24 months. Based on the findings, respondents are currently skewed towards a more centralised structure, and are motivated to move to a more decentralised/hybrid structure in the next 24 months. This can be seen from the increase in responses for a hybrid structure (x axis = 3). There is also a decrease in responses for a centralised structure (x-axis = 1).

[11] https://www.natlawreview.com/article/reshoring-trending-choice-manufacturers

3.5 UNDERSTANDING DEMAND AND ENHANCING INTEGRATION IS OF PRIORITY IN OPTIMISING INVENTORY

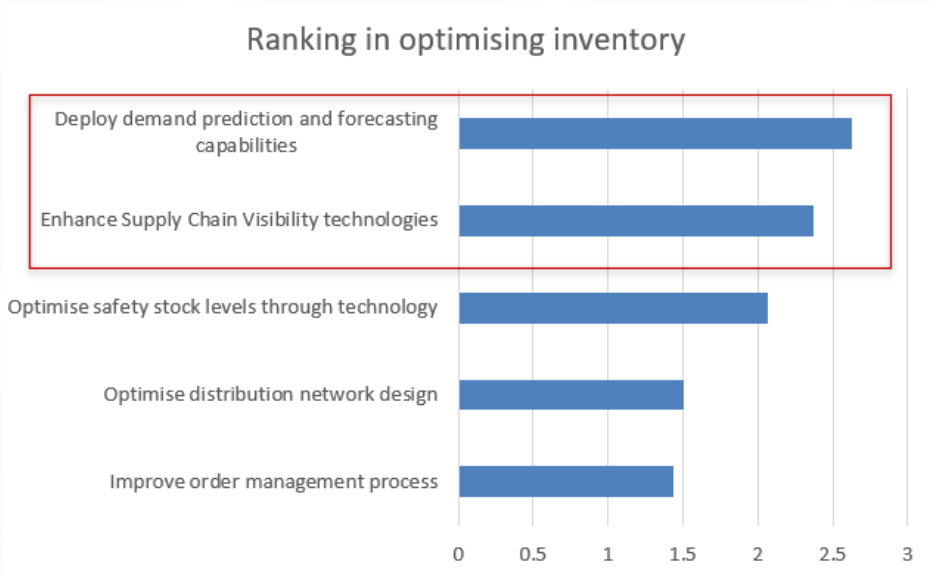


Figure 16: Respondents' ranking in terms of priority of their plans to engage to optimise inventory in the next 24 months

When asked to rank their plans in respect to optimising inventory, respondents unveiled that enhancing demand forecasting and supply chain visibility are top priorities, which is in line with earlier findings that understanding demand as well as increasing supply chain resilience are viewed as a top priority among technology solutions (Figure 19).

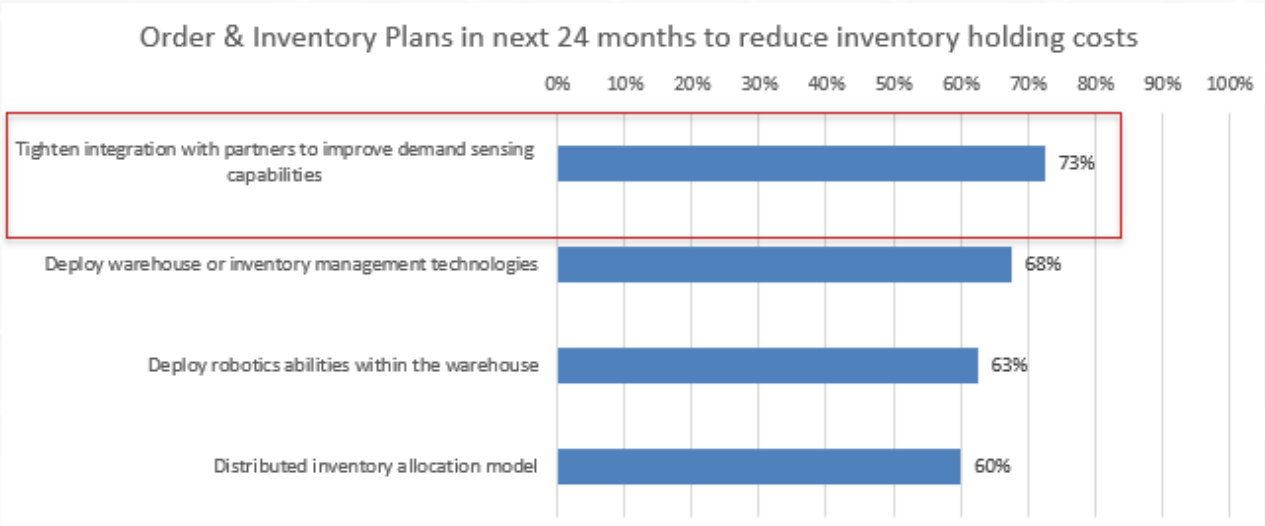


Figure 17: Respondents' rating in their plans to engage to reduce inventory holding costs in the next 24 months

When asked about plans to reduce inventory holding costs, only integration with partners turns out to be significant.

However, operating a distributed inventory allocation model is rated lowest in plans to reduce inventory holding costs. As depicted in Figure 16, respondents favour more hybrid distribution structures rather than operating more centralised solutions (which is currently the case). This exhibits that when respondents are considering a hybrid/decentralised structure, service level improvement is the key factor instead of inventory holding cost reduction. This also supports the notion that Supply chains have been seen moving from JIT (just-in-time) to JIC (just-in-case), where previously, supply chains have been focused on optimizing working capital, and the focus for the time being has shifted to creating buffer against disruptions[13].

[13]https://www.ft.com/content/8a7cdc0d-99aa-4ef6-ba9a-fd1a1180dc82

While COVID 19 remains one of the main supply chain disruptions, other supply chain issues have also started emerging – demand variability, supplier reliability, and labour shortages just to name a few. This has further stretched the supply chain and the need for supply chain resilience has never been more obvious than now. In this survey, we have examined respondents' thoughts on supply chain networks (supply chain resilience and bifurcation), supply chain costs, technologies, and inventory optimization.

To summarize our key findings, we have learnt that supply chain professionals plan to improve resilience through strategy around network configurations and design. In addition, Supply chain visibility and demand forecasting have been called out as technologies to supplement mitigate the cost and improve inventory optimization. We have previously seen supply chain visibility being ranked high in various reports, but interestingly, adoption has yet to reflect this.

With regards to the supply chain network, respondents are also moving towards a more decentralised/hybrid network from a centralised network in the near future. Supply chain costs have overall increased, and the expectation is for this to continue in the next 24 months, including raw material and manpower costs.

CONCLUSION

From a technology perspective, it seems to be perceived to be embedded across different services and capabilities. Regardless, Demand and integration technologies and capabilities are prioritized ahead of logistics related technologies.

Supply chain resilience

Out of the various supply chain resilience strategies, supplier diversification has been highlighted as a near-term plan despite regionalisation being top of mind for many supply chain professionals. This ties back to the tangible benefits as well as the ease of implementation which have driven professionals to prioritise supplier diversification. Although supply chain bifurcation plans share similar strategies, we can also conclude that bifurcation plans are in fact a result of supply chain resilience plans.

At the start of the report, we noticed that process flow improvement for warehouse throughput has been ranked first. We believe this is the manifestation of increasing throughput throughout the supply chain network. Improving process flow in the warehouse is a relatively easier approach than configuring the supply chain network which will require extensive effort. Therefore, improving warehouse process flow is also aligned with the overall survey findings regarding the importance of network structure and design in improving supply chain resilience.

Demand fulfilment

In the current environment, we have found that companies have placed more emphasis on capturing and fulfilling demand. This is a conclusion derived from distributed inventory allocation and e-commerce fulfilment being ranked highly for service level but ranked low for optimising cost. This illustrates the position of supply chain professionals in focusing their strategies to meet demand, due to the imbalance of supply and demand. However, we are starting to see inventory increasing more than demand, leading to companies slashing prices[15]. A new scenario where demand is shrinking and could result in supply chain players changing their stance to cost optimization. Therefore, the next 12-24 months will be crucial to observe the development of the situation

[15]https://www.nbcnews.com/business/consumer/walmart-slashing-prices-get-rid-excess-inventory-rcna40033

Variance of importance to different groups

There are some general areas of capability building that APAC & Global Business Unit leaders see now & over the next 24 months, and these are more inventory, fulfilment, and supply related capability areas. APAC especially does not seem as concerned about Demand Prediction areas but are still focused on building the fulfilment and supply-side, almost with the assumption and expectation of continued demand growth over the next 24 months. Hence warehousing (capacity building and increasing throughput, although not so much warehouse robotics for APAC leaders), supply chain planning & fulfilment (especially move towards more distributed models), as well as inventory visibility and management are more important. Interestingly, improving transportation capabilities are the least of their concerns, however, this might be due to them having an outsourcing mentality to get the Logistics Providers to figure out this area.

Technology specific solutions seem not to be of that high in importance compared to previous surveys, however, this might be as technology seems to be more embedded within specific capability areas, and thus is acquired as these service/solution capabilities are acquired (e.g. via Digital logistics providers or otherwise).

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