SUPPLY CHAIN RISK INDEX™ LEHIGH + CSCMP

Lehigh Business Supply Chain Risk Management Index

Quarterly Report

2nd Quarter / 2023

LEHIGH UNIVERSITY | College of Business

CENTER FOR SUPPLY CHAIN RESEARCH AT LEHIGH

CSCMP™ Council of Supply Chain Management Professionals

Educating and Connecting the World's Supply Chain Professionals.™

LEHIGH BUSINESS SUPPLY CHAIN RISK MANAGEMENT INDEX

Welcome to the **Lehigh Business Supply Chain Risk Management Index Report** developed by the Center for Supply Chain Research at Lehigh University and the Council of Supply Chain Management Professionals.

We developed this index to better understand the different kinds of supply chain risks businesses face. **Supply chain professionals rated the likelihood that the risk in the 2nd Quarter of 2023 compared to the risk in the 1st Quarter 2023 would likely increase, remain the same or decrease for 10 different Supply Chain categories.**

The Lehigh Business Supply Chain Risk Management Index (LRMI) value is a number between 0 – 100, where greater than 50 suggests increased risk, equal to 50 suggests the same risk and less than 50 suggests decreased risk. **The average LRMI for the 2nd Quarter is 64.09 which is a decrease from the 1st quarter suggesting a lower level of risk in the 2nd Quarter 2023.**

The table below reflects the 10 categories of risk from highest risk to lowest risk when evaluated independently as perceived by supply chain professionals.

If you would like to have additional information about the survey or to participate in the survey, please contact Dr. Zach G. Zacharia at zacharia@lehigh.edu.

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Executive Summary

This is the first time that Cybersecurity is the highest risk overall and at 77.54 is the lowest number 1 risk in the last 3 years. Economic risk is 2nd overall but has dropped sharply down from 87.97 to 74.64. Economic risk has been one of the top 3 risks in every quarter in the last 3 years but you have to go to the 1st Quarter of 2021 to have such a low number for economic factors such as energy costs, labor shortages and sudden demand shocks. Customer risk is the third risk, again very much reduced from last year. Another surprise was that Transportation Risk was the lowest out of 10 risks for the first time in 3 years, again suggesting that transportation is widely available at much-decreased costs. Finally, it is worth noting that the average overall risk is 64.09 which is the lowest overall risk in the last 3 years clearly suggesting supply chain professionals view there is less overall risk in the 2nd Quarter of 2023.

Risk Type	1st Quarter 2023 Risk Index	2nd Quarter 2023 Risk Index	Trend
Cybersecurity and Data Risk	73.42	77.54	⬆
Economic Risk	87.97	74.64	⬇
Customer Risk	72.78	73.91	⬆
Government Intervention Risk	68.35	71.01	⬆
Technological or Competitive Risk	60.13	65.22	⬆
Supplier Risk	69.62	60.14	⬇
Operational Risk	59.49	59.15	⬇
Environmental Risk	56.96	55.07	⬇
Quality Risk	56.33	53.52	⬇
Transportation Disruption Risk	64.56	50.70	⬇
Average Risk Index	66.96	64.09	⬇

The Risk Index is a number between 0 – 100.
The further the number is from 50 the greater the level of risk.
The arrow indicates whether the risk is increasing or decreasing in comparison to the previous quarter.

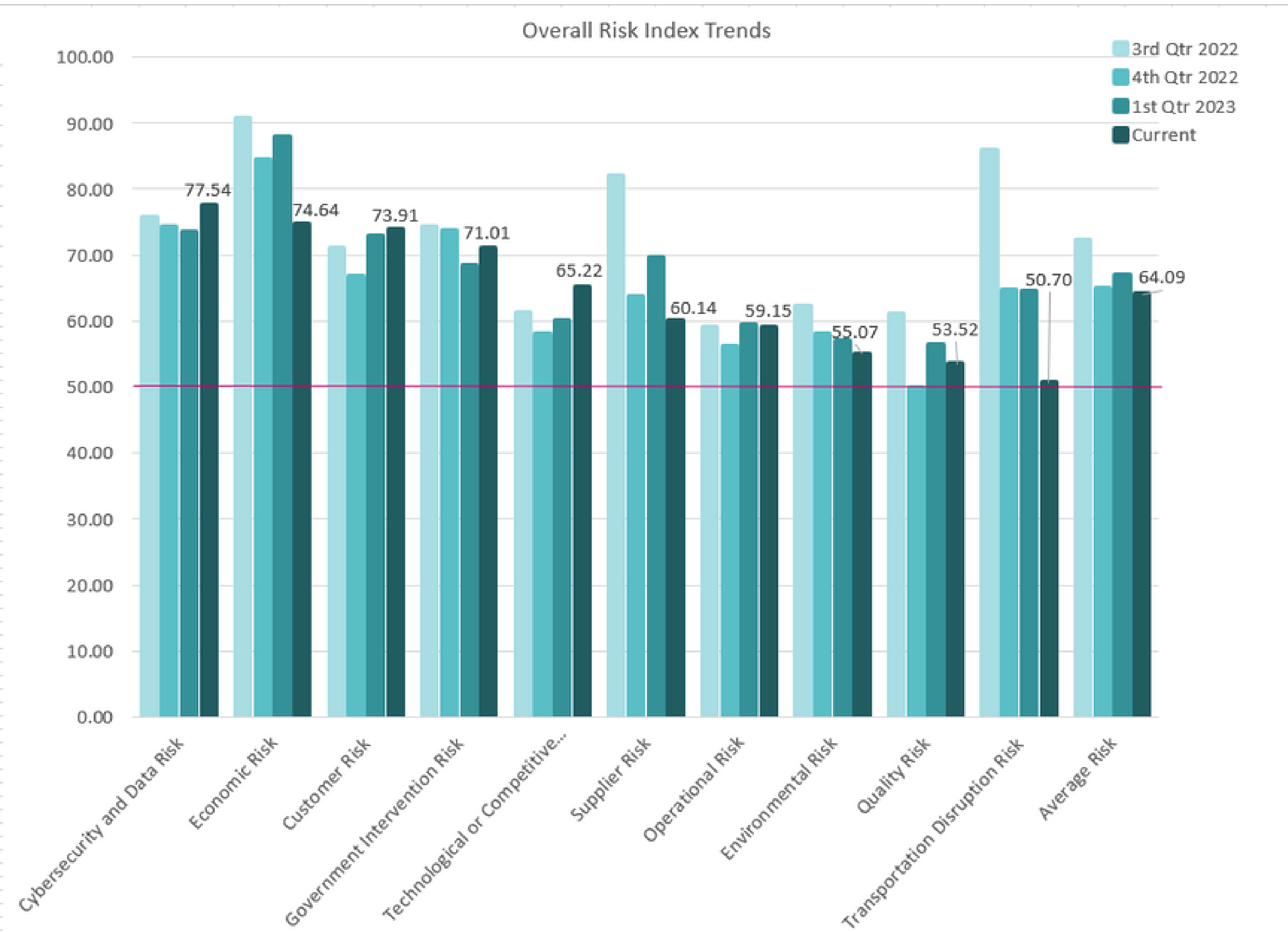
Did You Know?

The Lehigh Business Supply Chain Management Risk Index for the 2nd Quarter in 2023 is

64.09

LRMI Risk Index Over the Last Year

One of the advantages of examining supply chain risk is to consider how these risks change over time. The table below shows the changing levels of the risk across the 10 different areas of the supply chain this last year. It is also insightful to see that some areas of the supply chain are consistently seen as high risk and other areas of the supply chain as lower risk over the same 1-year time period.



Four Biggest Risks in Head-to-Head Comparison 2nd Quarter 2023

(This enables respondents to compare across all 10 risks simultaneously, instead of one risk at a time as found above, which provides a numerical ranking)

1. Economic Risk
2. Transportation Disruption Risk
3. Supplier Risk
4. Government Intervention Risk

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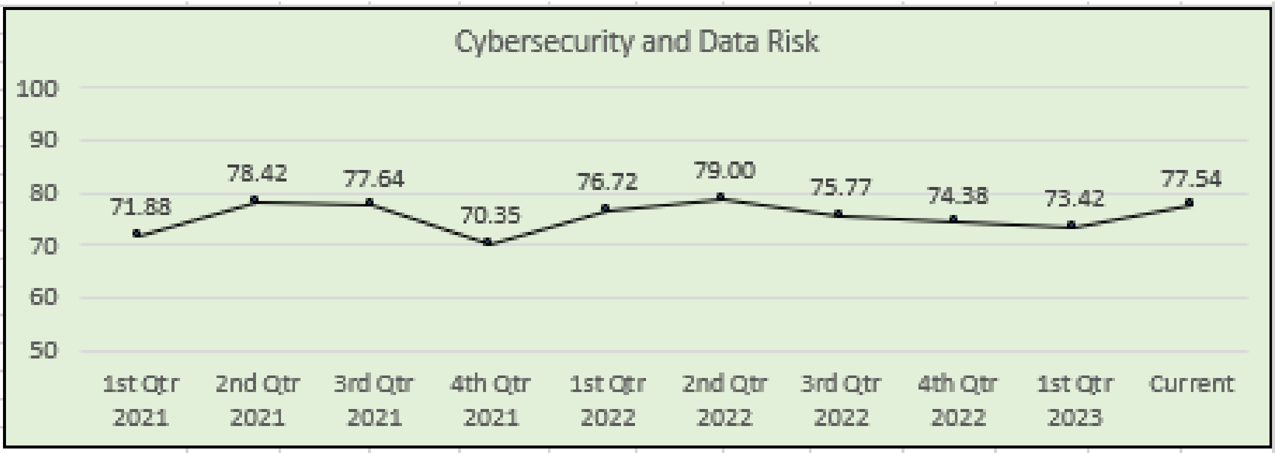
01 Cybersecurity and Data Risk

Some examples are: cyber-attacks, data corruption, data theft, system viruses, hardware and software issues and security platform controls.

Selected Comments:

- There has been more and more but they are just quietly being dealt with. The more technology we use the more we will be open to these types of problems.
- Hackers are constantly developing creative new methods to breach systems, and always seem to be two steps ahead of the cybersecurity folks who work to prevent attacks.
- We have begun to see the increase at corporate, personal, and infrastructure levels. Hacking is a business.
- Major data incursions and/or cyberattacks have increased in my supplier base. More are in the headlines - Dole, Expeditors logistics, etc... It seems as some element of cyber criminals have pivoted to logistics and manufacturing as a target.
- Compounding of previous data breaches. Volatility in cryptocurrencies.
- The current war is being fought in cyberspace and industry is the primary target.
- We have seen two major linehaul carriers shut down for weeks at a time due to Cyber related risk.
- Thieves will get smarter. Also, as folks leave traditional work, they will be paid for just staying home and hacking.
- Global political instability, economic challenges, increased poverty during this time period, & lack of guardrails around crypto currencies all introduce risk of theft. Cybersecurity being a popular means of theft.
- Always a threat.

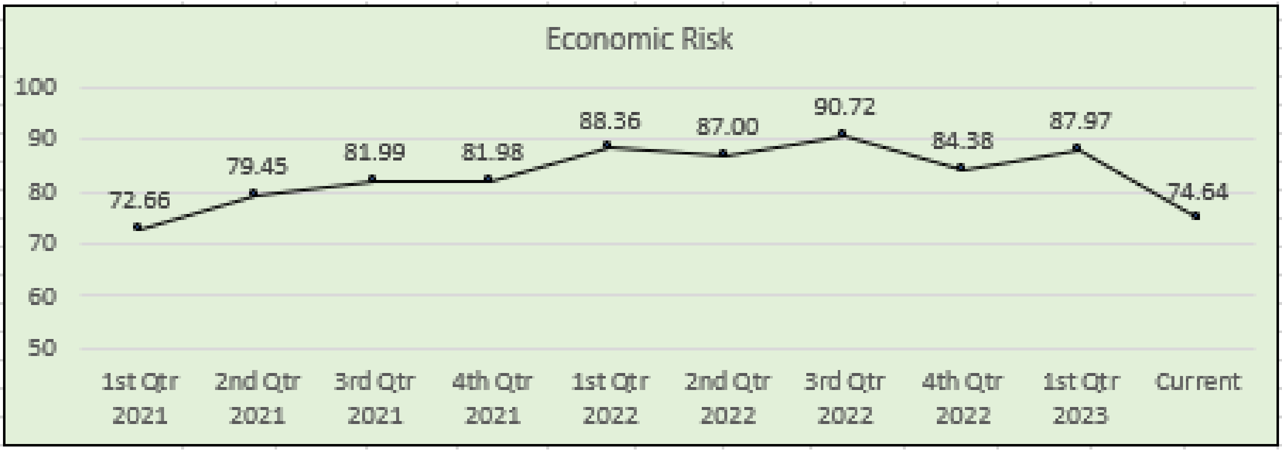


02 Economic Risk

Some examples are: increasing energy costs, commodity price volatility, labor shortages, sudden demand shocks, global energy shortages and border delays.

Selected Comments:

- No indication of a change yet being noticed after demand profile has been adjusted down.
- Economic slow down will impact the demand. We are heading towards recession in FY23.
- Labor shortages have seemed to decline over the last year. With trucking typically being a leading indicator for the economy, the demand issues we have experienced and continue to will have a corresponding effect on the economy in the coming months.
- Enormous money spent on the energy infrastructure with high inflation winds up in the same spot- chaos.
- Labor shortages in the service and medical industries.
- We have completely decoupled from China. For those who haven't, I would ask: would you have kept your business in the USSR or Nazi Germany during war/cold war? The disruptions will be major for those who continue to remain in hostile countries.
- Until the Biden Administration is turned out of office, the future economic outlook for our country is bleak.
- Continued interest rate increases & a reduction in consumer confidence translating to a reduction in consumer spending.
- Jury still out on full impact of current economic environment: high inflation, fed work to control, low unemployment but fewer people in the work force etc. Unpredictable.

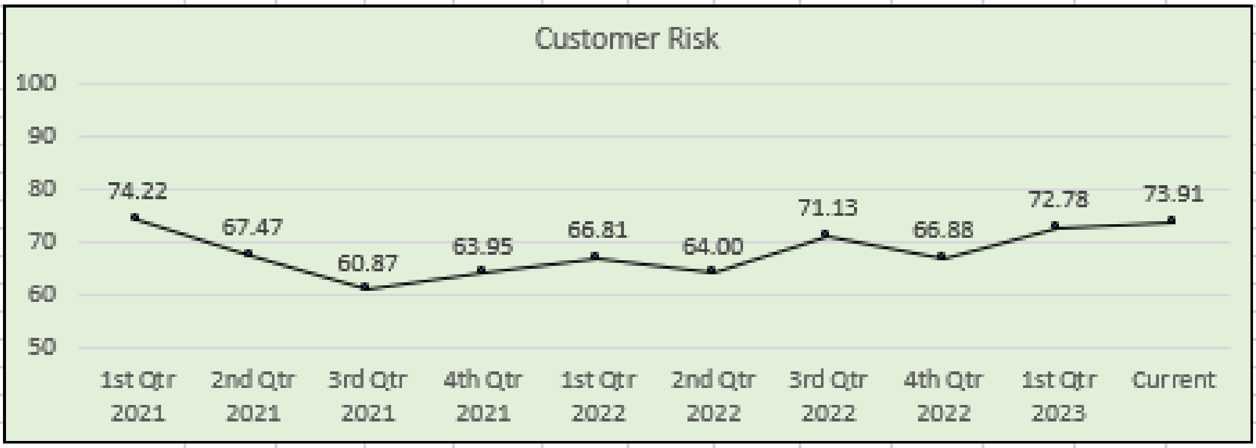


03 Customer Risk

Some examples are: fast changing customer demand, easy to lose customer loyalty, changing customer base demographics, hard to predict customer behavior and hard to service customer.

Selected Comments:

- Customer risk at the supplier level is a growing problem. As manufacturers and retailers are not ordering from suppliers and many times even trying to delay or cancel orders.
- Adjusting to new lower demand profiles based on macroeconomic conditions. Expect turn around to be abrupt and with few if any leading indicators giving early warning.
- Pricing drops to extreme levels and it becomes easier for shippers to find trucks to cover their freight. It also common for decision making to shift to 'corporate' in order to cut trucking costs through bid processes. Relationships become less important and consistent, reliable service and support means less than saving a few dollars on freight.
- New demand patterns are not yet established. Fears about recession.
- Shippers expect better rates, without thinking they may drive capacity out of the market in their quest for a bargain cost structure. Carriers need support from shippers to maintain a good bottom line too.
- People have long adjusted back to their pre-Covid lives, and the third anniversary of the beginning of restrictions will only cause people to further settle into their buying habits.
- As housing starts wain in the first quarter of 2023, it will be hard to predict sales in the marketplace.
- Reduced volumes and higher demand for efficiency, savings, etc.
- Market uncertainty.
- Post covid, garden products consumer behavior is to pre-covid levels. Customer behavior also is affected by weather.

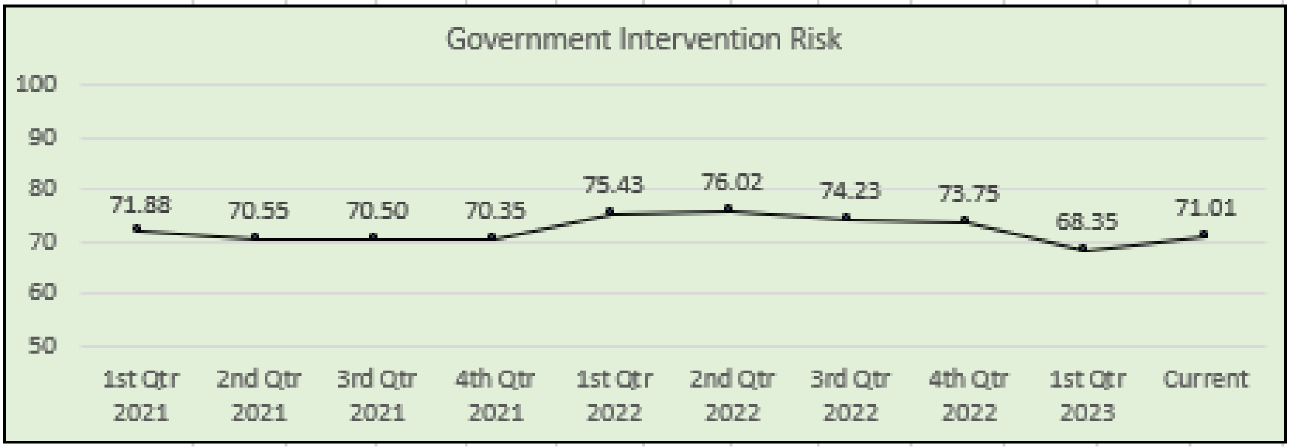


04 Government Intervention Risk

Some examples are: new regulations, tariffs/trade wars and governmental restrictions on source material, methodologies or technologies.

Selected Comments:

- Look across the globe at the impacts of governments around the world. It is not just our government which creates the problems.
- Slight increase in geopolitical risks, more restrictions on EV raw materials, etc.
- The AB5 independent contractor law could create significant issues in trucking. Many of these smaller trucking companies will close their doors rather than deal with the headaches of becoming 'company employees'.
- Keep spending money we don't have on things we don't need, and you create risk.
- Potential new railroad legislation. Shifting legislation around environmental concerns.
- We need a legitimate administration and DOT secretary. The misguided initiatives continue to do damage.
- Our government is passing the EU as the most regulated on the planet. Too much regulation will stifle innovation and bog down industry.
- The relative stagnation of the Russo-Ukrainian war will likely cause some major power to force a hand, soon. Ukraine must be supported to ensure our enemies do not gain an upper hand.
- Political headwinds regarding trade with China. I don't foresee anything changing in the near term.
- Eyes on China and Taiwan.
- Government are not working with private business to improve community concerns. Need more partnerships to solve issues.

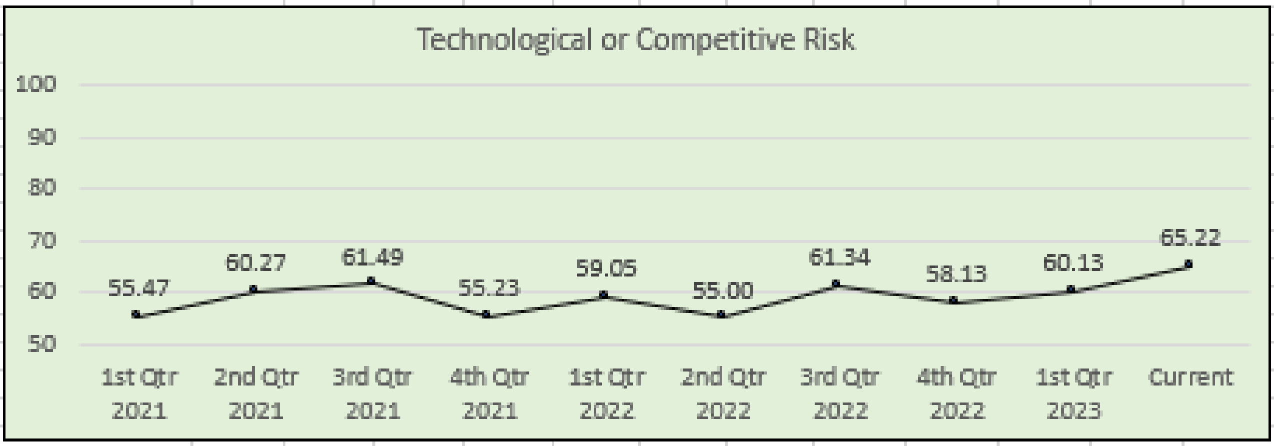


05 Technological or Competitive Risk

Some examples are: disruptive or replacement technologies, introduction of new competitor firms and ineffective or non-existent regulation for competitors.

Selected Comments:

- Some signs of increasing disruption in some industries or functions (ex. introduction of AI, machine learning).
- As the supply chain has become more recognized due to challenges we all experienced during covid, technology companies continue to look to enter the logistics space with new tools to provide better visibility to shippers and make logistics companies more efficient.
- Tech and supply chain is still delayed.
- The broader and more dependent our systems become, the more risk we assume.
- All hat, no cattle. From "digital" forwarders to automation - the reality is most of these products are not ready for prime time.
- Web 3.0 has a poor reputation, and ChatGPT's will surely persist, but the period of excitement and fear for it is over.
- Lack of organizations willing to invest during a recessionary environment.

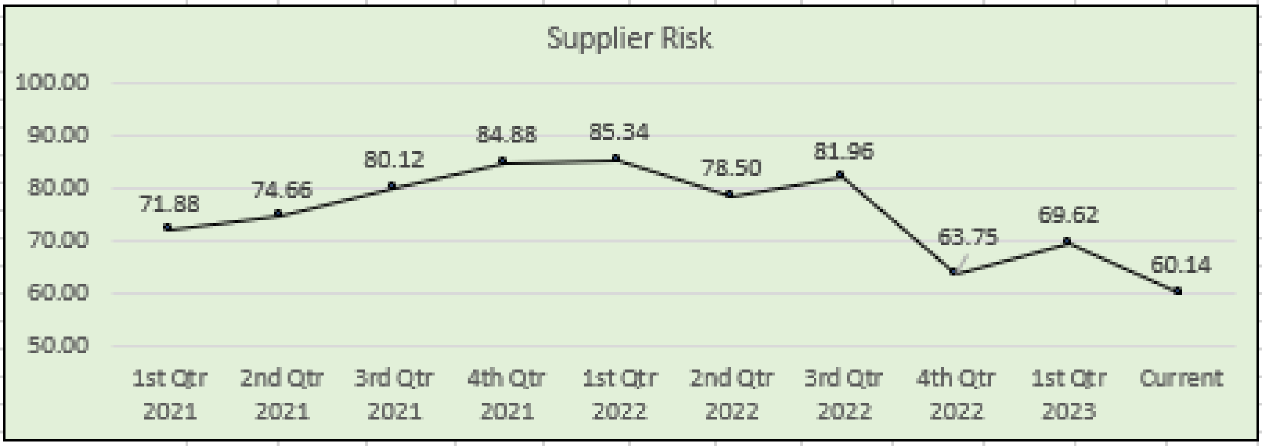


06 Supplier Risk

Some examples are: single/sole source supplier, suppliers from one geographic location, supplier quality issues, price volatility and counterfeit products.

Selected Comments:

- Too much off shore sourcing.
- Suppliers are already starting to disappear. The global issues also limit where materials can come from consistently.
- Significant pressure from suppliers with tier II supply base that had extended lead-times and required NCNR(non cancellable non returnable) orders while the demand profile has been normalizing down from Covid/post-covid levels.
- There are positives like better, shorter, on-time delivery of goods but negatives like supplier exposure to high geopolitical risks remain.
- As opposed to the truck shortages throughout the covid years, available capacity in trucking has increased tremendously. This will put some smaller, owner operators out of business. Available capacity should remain high in Q2 until demand starts to pick up.
- Supplier risk or "Supply Chain Crisis" is improving. But close watch will be needed on supplier financial risk or suppliers obsoleting low margin product lines.
- China supply concerns long term.
- The supply chain continues to push through cost increases for equipment, fuel, and supplies.
- My company is working on localization and dual-sourcing projects in raw material to mitigate these risks.
- Financial instability & turnover/reduction in force leaving gaps in operations due to lack of inherent knowledge.
- Supply chains have become more stable but still prone to disruption on short notice.

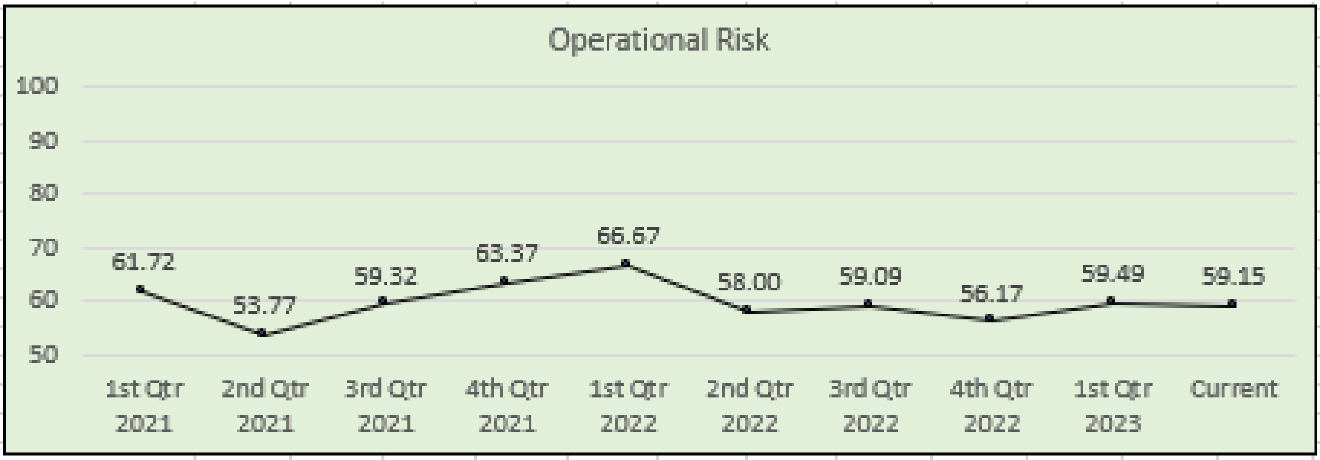


07 Operational Risk

Some examples are: site disasters, product counterfeiting, damage or disruption to physical assets and machine breakdown.

Selected Comments:

- Labor, suppliers, demand are all the top things on the risk charts.
- Key supplier is taking their plant down for month of May.
- The current freight market is down and Q1 has been slow. Expecting a slight increase in Q2 as it typically has higher demand than Q1 year over year.
- The greatest way to mitigate risk is to have experienced, competent folks running the railroad. Those attributes are being diluted on a number of fronts.
- Climate change is causing more extreme weather. Extreme weather increases the potential for property damage.
- Inflationary pressure created by runaway government spending remains the greatest risk to sustainable operations. Biden Administration policy to block energy development contributes to fuel costs, and adds additional inflation pressure for employees. Shippers are expecting rate reductions, which creates a scissors effect for carriers.
- Natural disasters are a big worry.
- We have added and continue to implement a early warning system for Supply Chain - Resilience for weather, political and internal company events.
- Lower customer volumes due to high inventory levels & carrying costs. Shipment volume will drop until inventories are depleted across the US, thus creating a reduction in operational efficiency per person without layoffs.
- Labor, particularly quality of labor, remains principal risk.
- In garden industry, calendar Q2 is our busiest. Heavy use of equipment and assets, and longer hours.

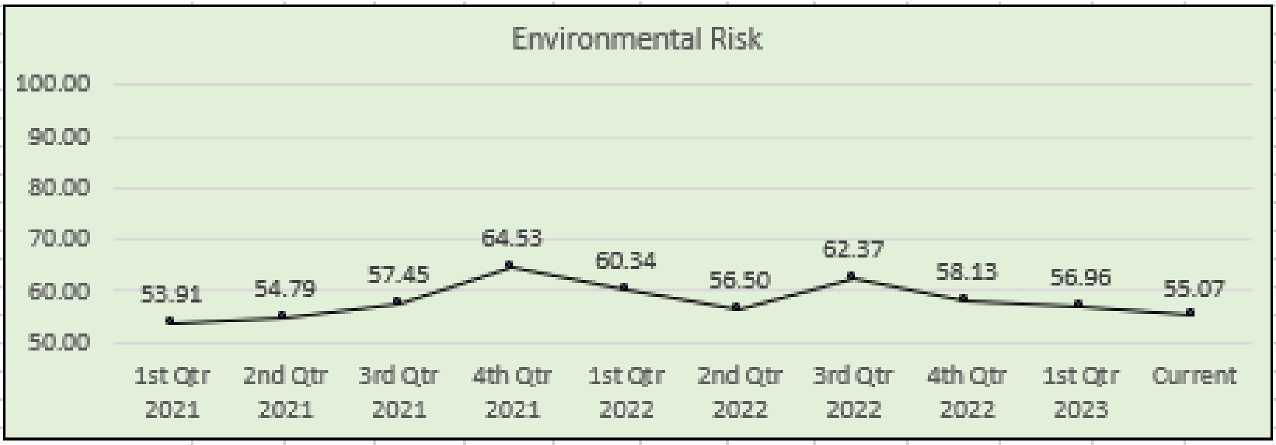


08 Environmental Risk

Some examples are: natural disasters, extreme weather, industrial accidents and pandemics.

Selected Comments:

- Hard to predict natural disasters and the like, but we know they will happen. Certain areas are better equipped to deal with them than others, but the results become unfortunate to so many.
- Q1 tends to bring more severe weather which impacts transit and operations.
- Global warming is real and causing flooding, risk of widespread destruction, and the shutdown of manufacturing and port facilities.
- We are more concerned with climate change extremism than we are with actual climate change. Hopefully people will stop being duped by the "climate emergency" grift. We need to - and are - making strides toward sustainability. Real changes are being implemented and will take time.
- The only risk to the environment is presented by COP27 and the environment grift. We need to do better to be greener, but it is not the end of the world despite what some gullible, useful idiots might think.
- Winter weather during this period can cause issues in our northern areas, due to ability of labor to reach our warehouses. It can also delay pickups of our orders/delivery of product.
- This risk is always increasing no matter what. Anybody who says their risk is decreasing is either profiting from disaster or lying.
- I think we are more cognizant to environmental risk than we've been in the past. we've looked at our end-to-end supply chain and reduced the fragility of the suppliers, specifically in APAC. Environmentally, we've been focused on government and civilian and organizational pushes to reduce carbon footprints through renewable sources.

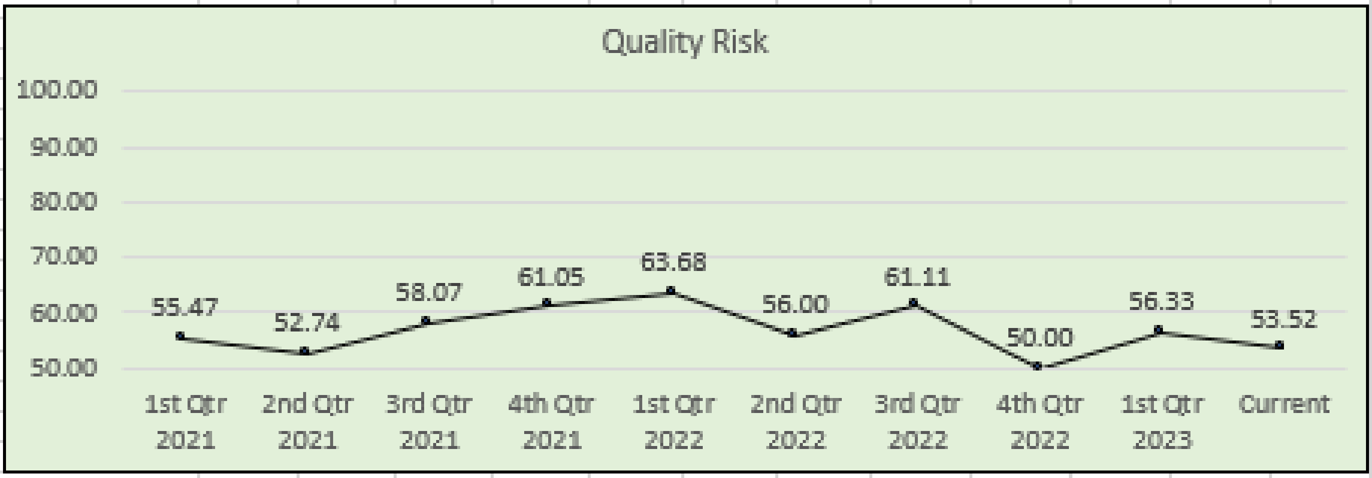


09 Quality Risk

Some examples are: lack of sufficient quality testing, changing quality standards, informal quality control documentation, customer safety issues and product recalls.

Selected Comments:

- Suppliers continue to have issues providing quality RAW and WIP. They are short staffed and short materials.
- Software and technology products are being released and updated constantly under the banner of agile development. Seems fast and buggy is better than well-tested and ready. Letting the end customer be the test lab is bad.
- Higher staff turnover cause higher defect rates.
- Driver capacity and availability should improve customer service.
- I believe that slowing inflation and minor economic upturn contrasting with pessimism about the economic future will cause people to buy more hazardously and companies to put less emphasis on quality control before the next downturn.
- Carrier service tends to diminish when volumes are low and freight rates drop in the US. Drivers will try to make as much money as possible during these recessionary environments. Carriers tend to cut corners which causes a reduction in service levels.
- Quality control was an issue last year but I do not see it getting better or worse.
- Increased volume and limited labor causes decrease in quality checking-- higher risk of quality issues.

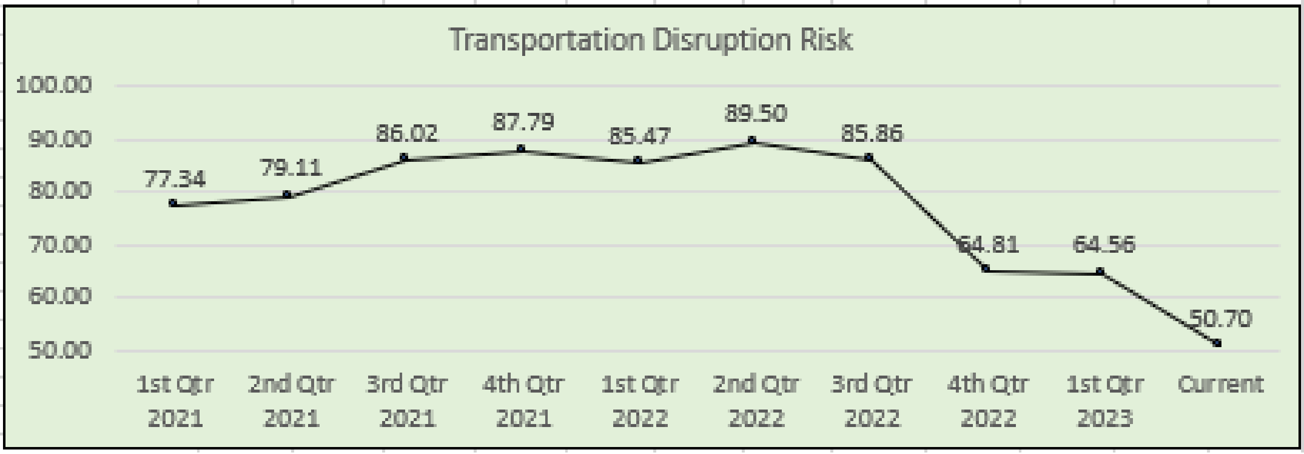


10 Transportation Disruption Risk

Some examples are: fuel prices, driver shortage, infrastructure and demand volatility.

Selected Comments:

- Although costs have reduced there is the risk of numerous owners operators leaving the industry. As building grows we will see a number leaving the over the road portion of trucking. There are trailers everywhere but few can be roaded because they are being utilized as storage or are in poor condition from just sitting.
- Major issues like semiconductor shortage continue to improve and global demand remains relatively stable so supply begins to catch up to demand.
- Fuel prices will likely remain somewhat high, driver shortage is a continuous issue and the barriers to entry. Infrastructure is an issue and fear of recession creates a decline in buying behavior for individuals as well as businesses.
- Logistical flows in all methods and lanes continue to approach normalcy. Evident by improved rate structures. Improved availability of physical assets.
- Drivers still unreliable for transportation.
- Potential new railroad legislation.
- We are preparing to allay the negative effects of the ill-guided push to Evs.
- Gas prices have been decreasing, and I believe that efforts have been made to improve infrastructure.
- As certain industries demand begin to soften, transportation demand will too. Transportation supply should increase; pricing should decrease.
- Increased demand for transportation causes risk in missed pickups and deliveries. Also causes order backups and cluttered docks.

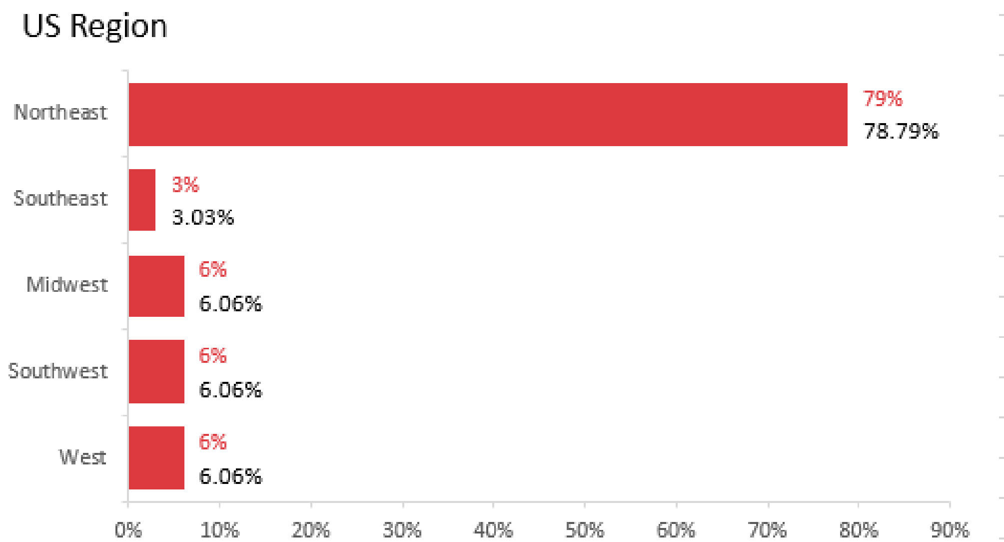


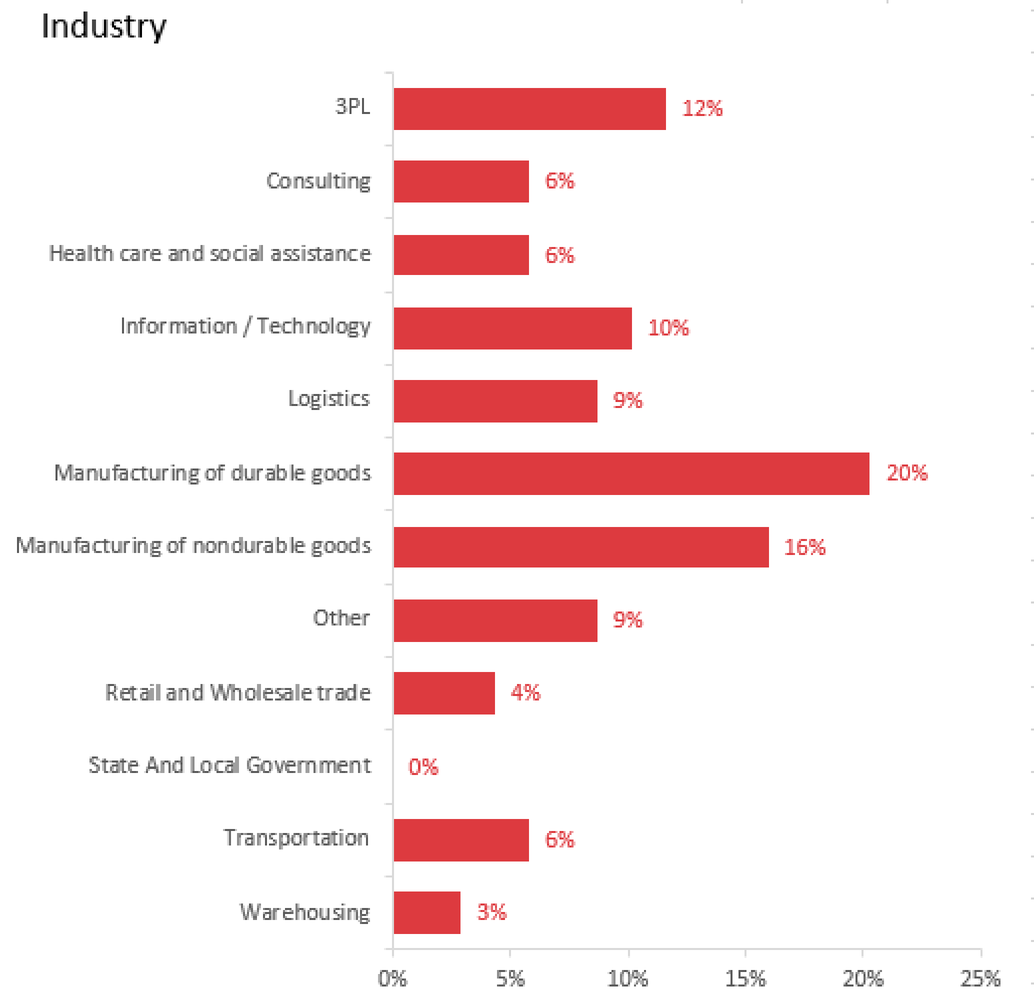
Appendix A
Risk Index Summary

The Risk Index is a number between 0 – 100.
Risk Index ≤ 49 suggests less risk
Risk Index = 50 indicates no change in risk
Risk Index ≥ 51 suggests greater risk

The further the number is from 50 greater the level of risk.
LBRI = (P1 * 1) + (P2 * 0.5) + (P3 * 0)
P1 = percentage of answers reporting an improvement
P2 = percentage of answers reporting no change
P3 = percentage of answers reporting a deterioration

Appendix B
Survey Demographics





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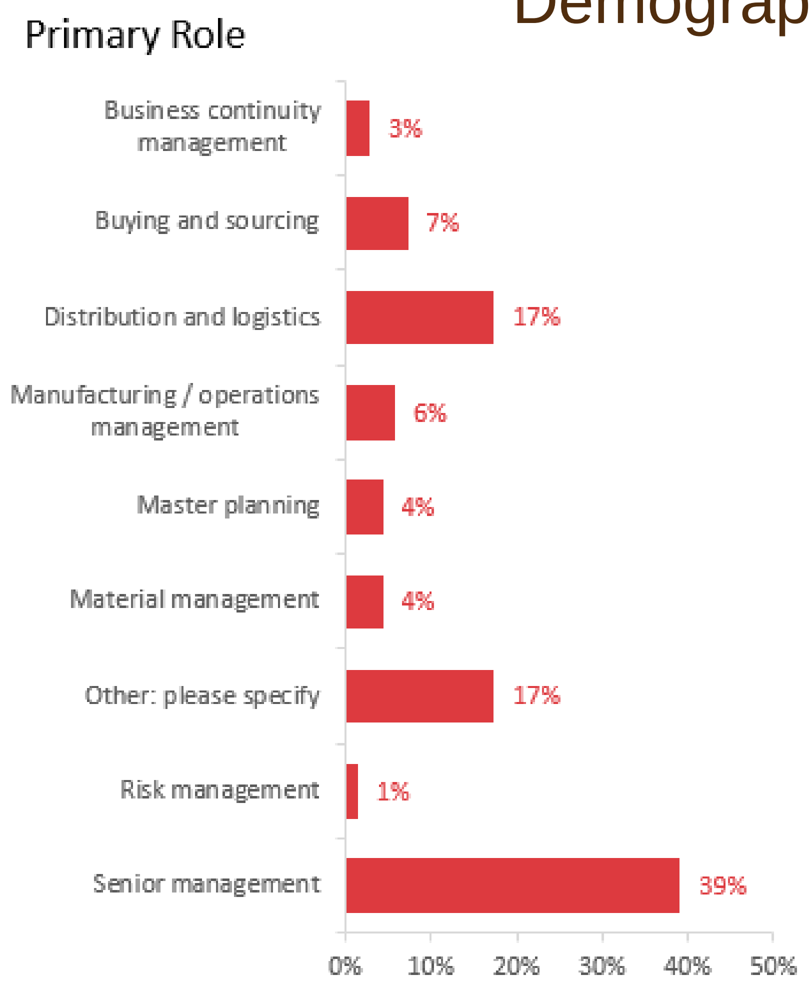
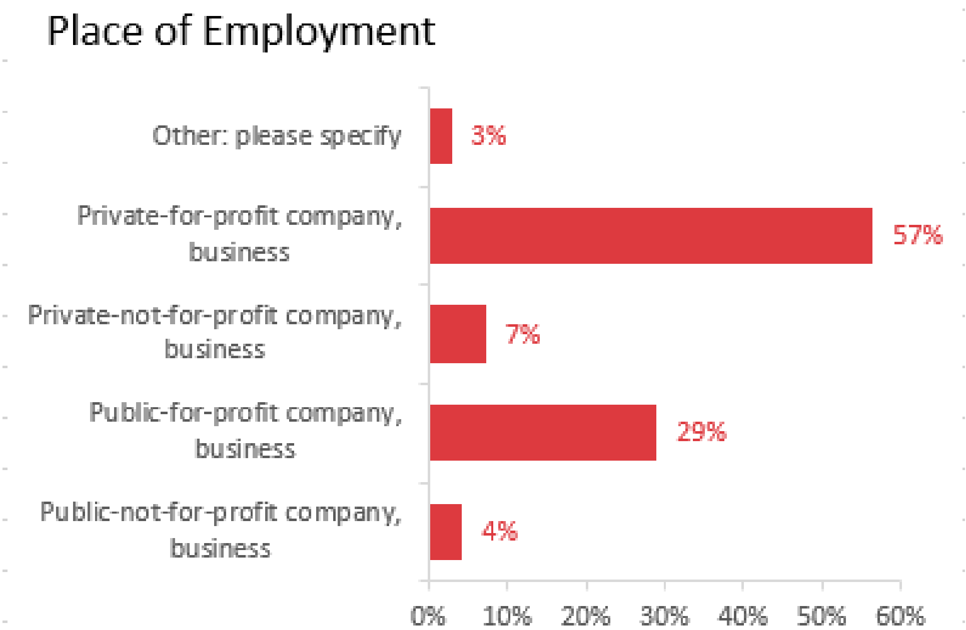
Appendix B
Demographics (continued)





Appendix B

Demographics (continued)