Restart: The Business of Warehousing in North America in the Post-Pandemic Era

Market Size, Major 3PLs, Benchmarking Costs, Prices and Practices

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ABOUT ARMSTRONG & ASSOCIATES, INC.

Armstrong & Associates, Inc. (A&A) was established in 1980 to meet the needs of a newly deregulated domestic transportation market. Since then, through its leading Third-Party Logistics (3PL) market research and history of helping companies outsource logistics functions, A&A has become an internationally recognized key resource for 3PL market information and consulting.

A&A's mission is to have leading proprietary supply chain knowledge and market research not available anywhere else. As proof of our continued work in supporting our mission, A&A's 3PL market research is frequently cited in media articles, publications, and securities filings by publicly traded 3PLs. In addition, A&A's email newsletter currently has over 88,000 subscribers globally.

A&A's market research complements its consulting activities by providing continually updated data for analysis. Based upon its unsurpassed knowledge of the 3PL market and the operations of leading 3PLs, A&A has provided strategic planning consulting services to over 40 3PLs, supported 24 closed investment transactions, and provided advice to numerous companies looking to benchmark existing 3PL operations or outsource logistics functions.

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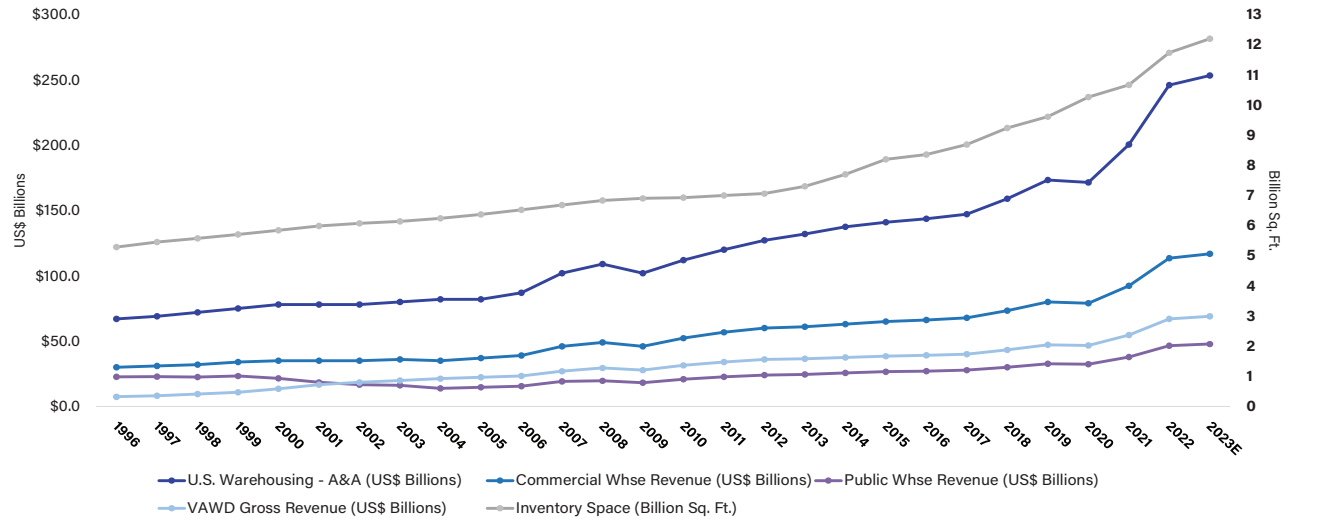
North American Warehousing Overview

Armstrong and Associates, Inc. (A&A) has been analyzing trends in North American Warehousing since 2004 when it published its first market report. Our concentration has been on commercial warehousing, particularly contract warehousing, which with increased outsourcing and e-commerce spending, has grown rapidly over the past decades.

Figure 1 provides basics concerning the U.S. warehousing market. We provide historical and forecasted gross revenues and inventory information for total U.S. warehouses, commercial warehouses, public warehouses, and Value-Added Warehousing & Distribution (VAWD). VAWD and public warehouses make up commercial warehousing; commercial warehousing and private warehousing make up the total U.S. warehousing market. The most significant difference between a third-party logistics (3PL) VAWD warehouse and a public warehouse is that public warehouses tend to offer a short-term place to store inventory and provide very few value-added services, while most VAWD 3PL providers operate on three-year contracts and provide customers with a host of value-added services. Key value-added services provided in the VAWD segment include kitting, pick and pack, packaging, repair and refurbish, sequencing and sub-assembly, merge-in-transit, and shipment consolidation.

Figure 1. U.S. Warehousing Market – 1996-2023E



2021 was a great rebound year for VAWD after the COVID-19 pandemic shutdowns. A&A estimates the total U.S. Warehousing Market at $200.5 billion with Commercial Warehousing Revenue at $92.4 billion. VAWD gross revenue reached $54.6 billion in 2021, a 17% rebound in growth compared to 2020, and net revenue expanded 15.2% to $41.1 billion. For 2022, we estimate the total U.S. Warehousing Market reached $246.0 billion, with VAWD gross revenue having 22.7% growth to $67 billion and net revenue reaching $49.8 billion with 21.1% growth. Total U.S. Warehouse Inventory Space reached an estimated 11.7 billion square feet by the end of 2022. Public Warehousing, which was the dominant form of warehousing in the U.S., only accounts for 41% of the commercial warehousing market. It reached an estimated $46.4 billion in 2022. This estimate is based on the revenue results of 3PLs comprising over half of the total U.S. VAWD market. Most of these providers are privately held but report revenues to us annually. Others are publicly held, have public annual reports, and are generally helpful with clarifications.

With the U.S. central bank's ("The Fed") Federal Open Market Committee increasing interest rates to

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reduce inflation, overall consumer demand for automotive and durable goods has already declined and it is expected that further demand declines will occur as 2023 brings an expected short-lived economic recession. Even with an overall contraction in the North American 3PL Market in 2023, we expect that VAWD gross revenue will have a 3% growth compared to 2022, and total U.S. warehouse inventory space will reach an estimated 12.2 billion square feet by the end of 2023.

Table 1 details A&A's estimates of VAWD Gross Revenue, Commercial Warehousing Revenue, Total Warehousing Market, and Inventory Space for the U.S. The estimates reflect a Compound Annual Growth Rate (CAGR) of 5.2% in the U.S. VAWD Market from 2010 to 2021.

Table 1. U.S. Warehousing Market – Recent Values (US$ Billions) – 2010-2023E

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023E
VAWD Gross Revenue	$ 31.4	$ 34.0	$ 36.0	$ 36.5	$ 37.4	$ 38.4	$ 39.1	$ 40.1	$ 43.3	$ 47.2	$ 46.7	$ 54.6	$ 67.0	$ 69.0
Commercial Warehousing Revenue	$ 52.3	$ 56.7	$ 60.0	$ 61.0	$ 63.0	$ 65.0	$ 66.2	$ 67.8	$ 73.3	$ 79.9	$ 79.0	$ 92.4	$ 113.4	$ 116.8
U.S. Warehousing – A&A	$ 112.0	$ 120.0	$ 127.2	$ 132.0	$ 137.5	$ 141.0	$ 143.6	$ 147.2	$ 159.0	$ 173.3	$ 171.5	$ 200.5	$ 246.0	$ 253.4
U.S. Warehousing Inventory Space (Sq. Ft. Billions)	6.9	7.0	7.1	7.3	7.7	8.2	8.4	8.7	9.2	9.6	10.3	10.7	11.7	12.2

Many VAWD 3PLs are supporting retail brands' strategies to manage their own order fulfillment channels and avoid being captive to large e-retailer platforms such as Amazon. Operationally, the growth in e-commerce business has meant an expansion in multi-client warehousing/fulfillment operations; many having footprints of under 100,000 square feet.

An ongoing headwind for VAWD 3PLs has been the tight warehouse labor market and competition from Amazon. 3PLs are continuing to see increased competition from Fulfillment by Amazon (FBA) which controls 60% of the U.S. E-commence 3PL Market. It has dramatically impacted warehouse employee wages and lease rates in key distribution areas such as Plainfield, Indiana, and California's Inland Empire. In turn, it is driving significant interest from VAWD 3PLs to automate warehouses with autonomous robotic solutions. With some autonomous robots costing less than $500 per month to operate, the cost/benefit and positive return on investment are increasing 3PLs' interest in warehouse robots to support activities such as picking, putaway, and cycle counting.

Based on the takeaways from A&A's Annual 3PL Value Creation Summit held on October 12-13, 2022, in Chicago, VAWD will continue to do well given the general lack of warehousing space, which is nearing a critical level in the cold chain, and ongoing growth in e-commerce fulfillment and last-mile delivery. E-commerce is one of the fastest growing 3PL segments that takes up more warehouse space and is more labor intensive. E-commerce growth is expected to continue as companies outsource versus building internal fulfillment operations. A lot of shippers that 3PLs work with are examining their supply chain networks and providers to improve inventory management and on-time delivery performance. We anticipate continued focus on supply chain network flexibility and warehouse optimization.

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Top North American Warehousing 3PLs

Our Top 50 VAWD 3PLs manage 4,272 facilities totaling 1,046.1 million square feet. The Top 50 have an average of 85 warehouses with an average size of 283,067 square feet. In 2019, the top 50 warehouses had an average of 71 warehouses with an average size of 311,081 square feet. The average warehouse numbers are 20% higher while the average warehouse size was 9% smaller compared to 2019. The top three 3PLs with the greatest warehousing space have remained the same: DHL Supply Chain leads the pack with 143 million square feet of warehousing space within North America, GXO Logistics is second with 90 million square feet, and Ryder SCS is third with 75.2 million. NFI is fourth with 60 million square feet, and GEODIS North America rounds out the top five with 52 million square feet. Cold chain leaders Americold and Lineage Logistics, which have been active acquirers, now command over 50 million square feet of cold reefer/frozen storage space apiece. In a very tight cold chain warehouse capacity market, Americold North America increased net revenue 23.1% from 2020 to $1.6 billion in 2021. With a network of 250 warehouses, Americold provides extensive refrigerated and frozen warehousing with value-added services for food products. Its customer list is a "Who's Who" of the food business.

Table 2 lists the Top 50 North American warehousing 3PLs based on warehousing space within North America. It also includes their core warehouse distribution center capabilities, value-added services capabilities, and latest warehouse management systems (WMS) utilized.

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Table 2. A&A's Top 50 VAWD 3PLs by Warehousing Space within North America – 2022

	Third-Party Logistics Providers (3PLs)				Warehouse/ DC Capabilities					Value-Added Services Capabilities																			WMS
Rank	Third-Party Logistics Providers (3PLs)	Number of Warehouses	Total Sq.Ft. (Millions)	Avg. Sq. Ft. (000's)	Whse. Mgmt.	Frozen	Refrigerated	Temp. Control	Rail Siding	Call Centers	Cross Docking	Customization	Inventory Control/ Vendor Mgmt.	KanBan	Kitting	Labeling	Lot Control	Merge-in-Transit	Mfg. Support	Pick/Pack	Pool Dist.	Repair/Refurb.	Returnable Container Mgmt.	Reverse Logistics	Store Support/ Delivery	Sequencing/ Metering	Specialty Packaging	Sub Assembly	Main Brand(s) Used
1	DHL Supply Chain (North America)	500	143.0	286.0	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	RedPrairie, Manhattan, HK Systems, Insight, Proprietary
2	GXO Logistics	316	90.0	284.8	•			•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Proprietary, Infor Provia, SIMS, Reflex 400, Infolog, RedPrairie, Cadre-Accuplus, SAP. Nuloav
3	Ryder Supply Chain Solutions	330	75.2	227.9	•	•	•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Manhattan SCALE, Zethcon Synapse, Korber/Accellos
4	NFI	162	60.0	370.4	•	•	•	•	•		•	•	•		•	•	•	•	•	•	•	•	•	•	•		•	•	Manhattan, Softeon, Maves, Foursite, Proprietary
5	GEODIS (North America)	144	52.1	361.8	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	GEODIS WMS, Manhattan (WMOS), Blue Yonder (RedPrairie LMS)
6	CJ Logistics America	71	51.1	719.7	•		•	•	•		•	•	•		•	•	•	•	•	•	•	•		•	•		•	•	Proprietary, RedPrairie
7	Americold	201	46.0	228.9	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•		JDA
8	Lineage Logistics	244	45.0	184.4	•	•	•	•	•		•	•	•						•	•							•		HighJump, Infor, Proprietary
9	Kenco	103	36.3	352.4	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Korber, Blue Yonder, Deposco
10	Saddle Creek Logistics Services	80	31.0	387.5	•		•	•	•	•	•	•	•		•	•	•	•	•	•	•	•		•	•		•	•	Infor WMS, Softeon WMS
11	FedEx Logistics	110	30.7	279.1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Infor/EXCEED 4000, Manhattan, JDA/RedPrairie, Proprietary
12	Penske Logistics	94	26.5	281.9	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	JDA (i2), Flux, RT Systems, MARC, Proprietary
13	DB Schenker (North America)	91	23.7	260.4	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•		•	•	•	•	•	Infor, TECSYS, SAP, RedPrairie
14	Kuehne + Nagel (North America)	87	18.7	214.9	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	CIEL Warehouse, Provia FourSite, KN SwiftLOG
15	CEVA Logsitics (North America)	119	18.1	152.1	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	JDA, Manhattan Associates
16	Maersk Logistics (North America)	65	18.0	276.9	•						•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	Proprietary, Manhattan, JDA
17	UPS Supply Chain Solutions	144	17.3	120.1	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Infor/EXE, Manhattan, LMS, Proprietary
18	DSV (North America)	65	16.4	252.3	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	RedPrairie, Infor/EXE, Logimax
19	Kintetsu World Express (North America)	83	15.0	180.7	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Proprietary--UWS
20	Warehouse Services	30	14.0	466.7	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Oracle
20	WSI	52	14.0	269.2	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	Manhattan
21	United States Cold Storage	42	13.9	331.0	•	•	•	•	•		•	•	•			•				•							•		Proprietary
22	Radial	22	13.4	609.1	•	•	•	•		•	•	•	•	•	•	•	•	•			•	•	•		•	•		•		Manhattan Associates
23	C.H. Robinson	283	12.9	45.6	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•		•	•	Proprietary, HighJump
24	Metro Supply Chain Group	83	12.8	154.2	•	•	•	•			•	•	•			•	•		•	•					•		•		Proprietary, Blue Yonder/RedPrairie, Manhattan, Oracle
25	Neovia Logistics Services	49	10.2	208.2	•				•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	SAP, JDA RedPrairie, Proprietary
26	syncreon	44	9.9	225.0						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Proprietary
27	LEGACY Supply Chain	27	8.0	296.3	•			•		•	•	•	•	•	•	•	•	•	•	•		•	•	•	•		•	•	Manhattan--SCALE, Synapse, Proprietary
27	Peoples Services	42	8.0	190.5	•	•	•	•	•		•	•	•	•	•			•		•				•	•		•		Proprietary, Zethcon--Synapse
27	Wagner Logistics	23	8.0	347.8	•				•		•	•	•		•	•	•		•	•	•		•	•	•		•	•	RAMP

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Table 2. A&A's Top 50 VAWD 3PLs by Warehousing Space within North America – 2022

	Third-Party Logistics Providers (3PLs)				Warehouse/ DC Capabilities					Value-Added Services Capabilities																		WMS
Rank	Third-Party Logistics Providers (3PLs)	Number of Warehouses	Total Sq. Ft. (Millions)	Avg. Sq. Ft. (000's)	Whse. Mgmt.	Frozen	Refrigerated	Temp. Control	Rail Siding	Call Centers	Cross Docking	Customization	Inventory Control/ Vendor Mgmt.	KanBan	Kitting	Labeling	Lot Control	Merge-in-Transit	Mfg. Support	Pick/Pack	Pool Dist.	Repair/Refurb.	Returnable Container Mgmt.	Reverse Logistics	Store Support/ Delivery	Sequencing/ Metering	Specialty Packaging	Sub Assembly	Main Brand(s) Used
28	Holman Logistics	20	7.9	395.0	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	HighJump
29	Hub Group	23	7.2	313.0						•	•	•	•		•	•					•			•	•		•	•	Proprietary
29	Verst Logistics	25	7.2	288.0	•	•	•	•	•		•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	Korber
30	Nippon Express (North America)	66	6.9	104.5	•		•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	Proprietary--REWARDS
31	Atlanta Bonded Warehouse Corporation	15	6.4	426.7	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Blue Yonder / RedPrairie
31	ODW Logistics	26	6.4	246.2	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Korber (HighJump), WDLS 2.0, Zethcon--Synapse
32	Whiplash (Port Logistics Group)	18	6.0	333.3	•				•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•		•	•	Proprietary--Event Tracker = omnichannel, Whiplash = ecommerce
33	Sunland Logistics Solutions	16	5.4	337.5	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Infor
34	Barrett Distribution Centers	21	5.0	238.1	•		•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•		•	•	Zethcon--Synapse
34	Comprehensive Logistics	20	5.0	250.0	•				•		•	•	•	•	•	•	•		•	•			•	•		•	•	•	Proprietary--STREME
34	Dimerco Express Group (North America)	38	5.0	131.6	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	Proprietary--Dimerco Value Plus System
34	Logistics Plus	14	5.0	357.1	•			•		•	•	•	•		•	•				•	•			•			•	•	CargoWise ediEnterprise (eWorldPlus.com); DiCentral Smart Turn; Vericore; FF&Eplus (Proprietary)
34	United Facilities	12	5.0	416.7	•			•	•	•	•	•		•	•	•	•		•	•				•			•	•	Infor; SWIMS
35	Taylored Services	12	4.5	375.0	•						•	•	•		•	•	•		•	•				•	•		•	•	Syanpse, HighJump, Accellos, FoxPro
36	Odyssey Logistics & Technology	56	4.2	75.0	•	•	•	•	•		•	•	•			•	•	•	•	•	•	•	•	•	•	•	•		Proprietary
37	Estes Forwarding Worldwide	17	4.0	235.3				•		•	•	•	•		•	•		•			•		•	•	•		•		3PL Central
37	Reo Logistics	5	4.0	800.0	•			•	•		•	•	•	•	•	•	•	•	•	•		•	•	•		•	•	•	Cadence/Accuplus
37	SCI	32	4.0	125.0	•			•		•	•	•	•	•	•	•	•	•		•		•	•	•	•		•	•	Manhattan, SAP, Oracle
37	Seko Logistics	90	4.0	44.4						•	•	•	•		•	•	•	•	•	•	•		•	•	•	•	•	•	SEKO WMS
38	Kintetsu World Express (North America)	40	3.8	95.0	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Proprietary--UWS

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The top three warehouse capabilities offered by 3PLs are Facilities Management (92%), Temperature Controlled warehouses (82%), and warehouses with Rail Siding (70%). We compared the capability percent of Top 50 VAWD 3PLs with our 2019 top list. It is worth noticing that 50% of the top 50 VAWD providers provide Frozen services in their warehouses, compared to 37% in 2019. More Top 50 VAWD providers have warehouses that are temperature controlled, refrigerated, frozen, and have rail siding, compared to 2019.

Table 3. Warehouse Capabilities Summary 2019 vs. 2022

	Capability Percent Providing	2019	2022
Warehouse	Facilities Management	94%	92%
	Temperature Controlled	80%	82%
	Rail Siding	67%	70%
	Refrigerated	56%	62%
	Frozen	37%	50%

For Value-Added Services among the Top 50 3PLs, Cross Docking, Specialty Packaging, and Customization were provided by 100% of the Top 50 in 2022 while only 89% of the Top 50 3PLs provided Customization in 2019. The other noticeable change is that 62% of the top 3PLs are providing Call Center services, compared to 46% in 2019. More Top 3PLs are providing value-added services such as Inventory Control/Vendor Management, Labeling, Kitting, Reverse Logistics, Lot Control, Store Support/ Direct Store Delivery, Manufacturing Support, Merge-in-Transit, Returnable Container Management, and Kanban manufacturing support.

Table 4. Value-Added Services Capabilities Summary 2019 vs. 2022

	Capability Percent Providing	2019	2022
Value-Added Services	Cross Docking	100%	100%
	Specialty Packaging	96%	100%
	Customization	89%	100%
	Inventory Control/Vendor Management	96%	98%
	Labeling	94%	96%
	Pick/Pack	98%	96%
	Kitting	91%	92%
	Reverse Logistics	91%	92%
	Lot Control	87%	88%
	Store Support/Direct Store Delivery	83%	88%
	Manufacturing Support	83%	84%
	Sub Assembly	87%	84%
	Merge-in-Transit	78%	80%
	Pool Distribution	85%	78%
	Returnable Container Management	72%	76%
	Repair/Refurbish	76%	72%
	KanBan	65%	66%
	Call Centers	46%	62%
	Sequencing/Metering	67%	60%

More detail on each 3PL is available at www.3plogisticsonline.com

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Cold Chain Warehousing

Cold chain warehousing is experiencing a period of unprecedented growth, especially with the rapid expansion of online grocery shopping caused by the pandemic. Temp-controlled warehouses make up a small portion of the overall U.S. industrial market. However, major drivers such as e-commerce, population growth, and evolving consumer behaviors during and post pandemic, have significantly increased the space demand from 3PLs serving the food industry. E-commerce's one-day or even two-hour delivery windows have increased the addition of cold chain facilities near population centers. New or expanding cold chain operations are struggling to localize themselves closer to their customers. Cold chain operations around ocean ports such as Long Beach and Savannah are also in high demand.

While we have some important refrigerated warehouse operators on our list, information on this specialized business segment from the International Association of Refrigerated Warehouses (IARW), based on their warehouse capacity, is particularly useful. The top three Refrigerated Warehousing operators stayed the same as the 2020 list: Lineage Logistics, Americold Logistics, and United States Cold Storage, Inc. All top three 3PLs on the list have had substantial growth since 2020. In the meantime, 3PLs in the cold storage space are continually investing in technologies ranging from temperature tracking to warehouse management systems to maintain optimal visibility.

Table 5. 2022 IARW North American Top 25 List

2022 Rank	Company	Capacity (ft^3)	Capacity (m^3)	Capacity Change 2020-2022	2020 Rank
1	Lineage Logistics	1,830,359,454	51,829,959	31.5%	1
2	Americold Logistics	1,161,403,908	32,887,265	12.5%	2
3	United States Cold Storage, Inc.	423,328,669	11,987,322	13.2%	3
4	Interstate Warehousing, Inc.	115,735,371	3,277,258	0.0%	6
5	VersaCold Logistics Services	105,530,974	2,988,302	-14.2%	4
6	Conestoga Cold Storage	64,313,826	1,821,163	13.6%	10
7	Congebec Logistics, Inc.	60,866,880	1,723,556	5.4%	9
8	RLS Logistics	59,028,604	1,671,502	-	-
9	Burris Logistics	58,887,444	1,667,505	-21.4%	8
10	NewCold Holdings, LLC	47,972,150	1,358,419	0.0%	11
11	Confederation Freezers - Brampton	34,495,000	976,789	-0.2%	14
12	Trenton Cold Storage, Inc.	34,277,373	970,626	0.0%	15
13	Nor-Am Cold Storage	34,071,792	964,805	53.3%	20
14	WOW Logistics	23,406,700	662,803	0.0%	19
15	Enstructure LLC	21,450,000	607,396	-	-
16	Interstate Cold Storage, Inc.	21,403,000	606,065	0.0%	21
17	SnoTemp Cold Storage	19,067,775	539,939	0.0%	23
18	Valley Cold Storage & Transportation	18,002,030	509,760	0.0%	24
19	Central Storage & Warehouse LLC	16,678,389	472,279	-	-
20	MWCold	15,159,000	429,255	-	-
21	Bellingham Cold Storage Co.	15,147,000	428,915	-	-
22	CWI Logistics	13,200,000	373,782	-23.6%	25
23	Innovative Cold Storage Enterprises, Inc.	11,850,000	335,554	-	-
24	Frez-N-Stor, Inc.	11,027,078	312,252	-	-
25	Eskimo Cold Storage, LLC.	10,900,000	308,653	-	-

Source : https://www.gcca.org/about/resources/about-industry/technical-publications/surveys-market-research/2022-iarw-north

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There are 8 new 3PLs on the 2022 Top 25 list. Of the remaining 17 3PLs, which have been on the list since 2020, 6 of them (35%) have increased warehouse capacity by an average of 22%; 4 3PLs (24%) have decreased warehouse capacity by an average of 15%; and 7 (41%) have had the same warehouse capacity since 2020. Total capacity of the Top 25 in 2022 reached 4,227,562,417 cubic feet compared to a total of 3,485,249,525 cubic feet in 2020, representing 21% growth.

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A&A's North American Warehousing Study

In the second and third quarters of 2022, A&A collected information on 181 warehouses and 111 warehouse contracts in North America for our detailed warehousing database. In addition to the General Warehousing Study Form in Appendix A, we expanded and revised our individual warehouse location database, as well as our warehousing fulfillment benchmark data. 85% of the warehouses are located in the U.S., 13% in Mexico, and 2% in Canada. 38% of the 181 warehouses have 2021 revenue of less than $50 million, 31% have revenue over $200 million, and 31% have revenue between $50 million and $200 million.

Figure 2. Contract Warehouses by Region

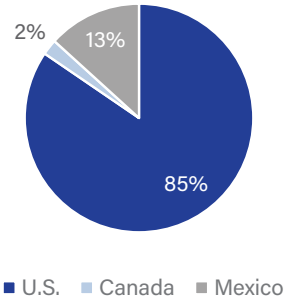
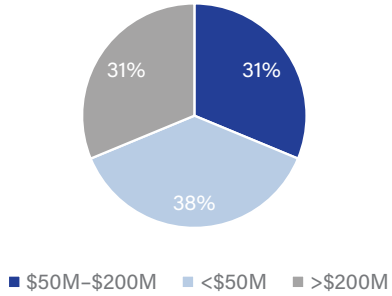


Figure 3. Contract Warehouses by Revenue



Before our 2022 warehousing study, our last warehousing study was completed in the fourth quarter of 2019, right before the COVID-19 pandemic started. It is interesting to examine how the warehousing industry has changed significantly prior to and after the pandemic shutdowns and subsequent demand increases.

Contract Warehousing

Of the 181 contract warehouses in our study, the average annual revenue per warehouse is $4.4 million with revenues ranging from $33,610 to $49 million. Temperature-controlled and frozen warehouses account for 17% of the 181, and 83% are ambient/dry warehouses. In 2022, each contract warehouse had an average of 13 customers, compared to 5 customers in our 2019 study. One warehouse had 140 customers, while the warehouse with the most customers in 2019 had 80. The average employees per warehouse was 68, compared to 75 in 2019. The number of employees for each warehouse varied from 1 to 860 in 2022 and the temporary labor percentage varied from 0-95%, a much wider range than in 2019.

In this section, we have an in-depth analysis of our 2022 warehousing study results in various areas including contract lengths, warehouse sizes, revenues, operating margins, warehouse ownership status, types of warehouses, Key Performance Indicators (KPIs), and Warehouse Management Systems (WMS).

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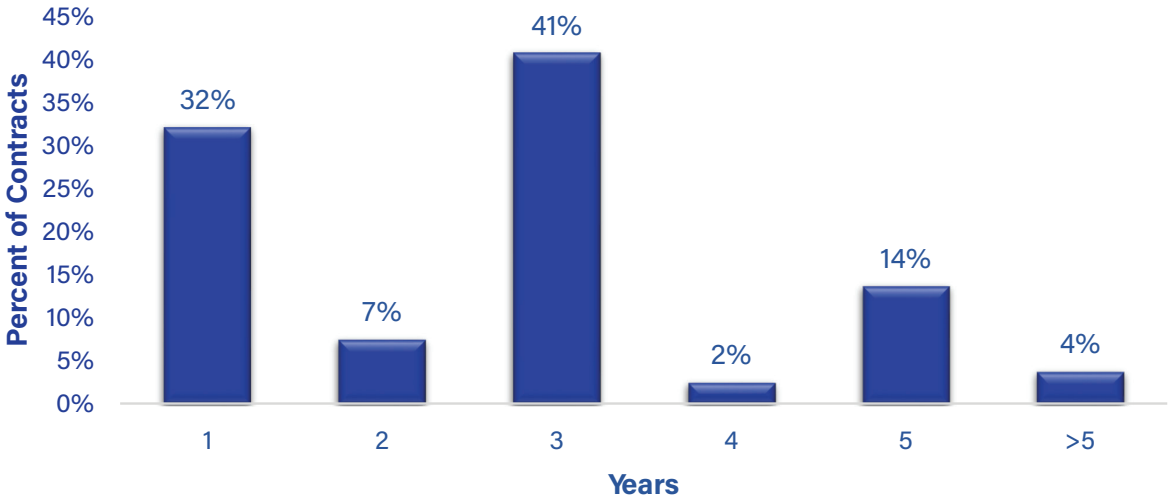
Contract Lengths

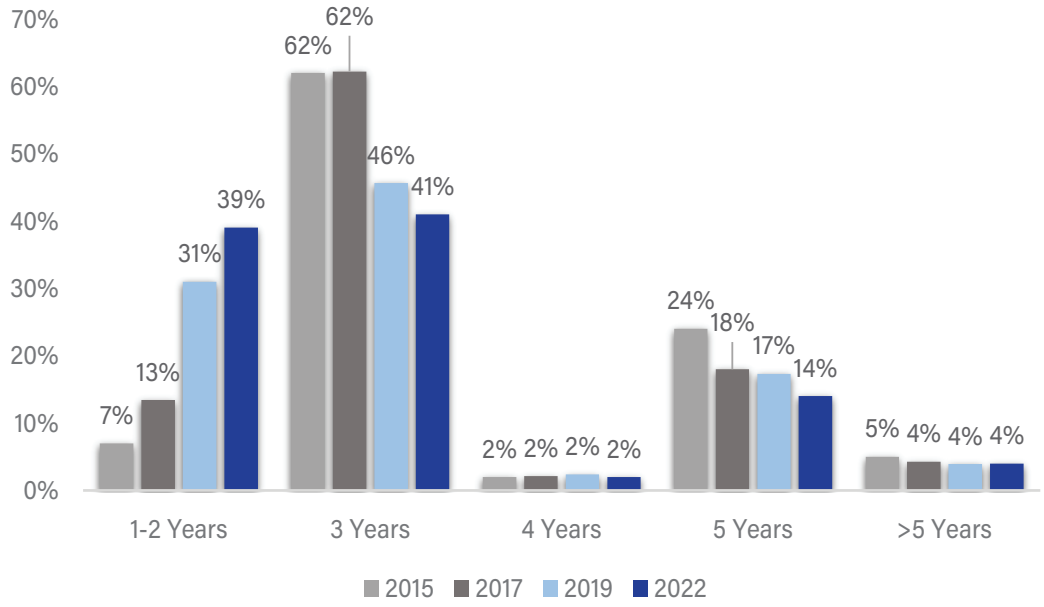
Three-year contractual terms still dominate contract warehousing making up 41% of the total, followed by one-year and five-year contracts with 32% and 14%, respectively. Short-term contracts of one to three years now represent 80% of the total, while longer terms of four years or more, account for only 20%.

Figure 4. Contract Lengths



Combining the results from our last four warehousing studies, Figure 5 shows the trend in contract terms over the past seven years. Short-term contracts of one to two years have the highest growth of 32% compared to 2015, and 3-year and 5-year contracts have been steadily decreasing by 21% and 10%, respectively. With the rapid growth of e-commerce and post-pandemic sharp increase in demand for warehousing space, growth of more multi-client warehouses with shorter-term contracts have provided 3PL customers with increased flexibility. On the other hand, we might also see some increase of the longer contracts soon, due to high inflation, lease rates, and warehousing space pressure.

Figure 5. 2015-2022 Contract Lengths



In general, the warehousing industry has been significantly impacted by the rise of e-commerce fulfillment activities, especially during and post pandemic. Contract lengths have been shortening as the e-commerce warehousing subsegment continues to gain share.

Contract Warehouses by Size

Warehouses are getting smaller in size compared to the 2019 study. This is further evidenced within A&A's Top 50 VAWD 3PLs where the average warehouse size was 9% smaller than in 2019. In our 2019 study, the average warehouse was 30% bigger than 2017 due to the increase of e-commerce fulfillment and its complexities: the increase in Stock Keeping Units (SKUs) sold by e-commerce retailers and labor-intensive pick-and-pack work in e-commerce operations are driving a shift in the footprint of warehouses. In our 2022 study, we saw the turning point that the average warehousing operation was 31% smaller than it was in 2019, and even 10% smaller than in 2017. Out of 181 warehouses, only one warehouse was larger than 1,000,000 square feet.

Figure 6. Average Contract Warehouse Size 2017-2022 (Sq. Ft.)

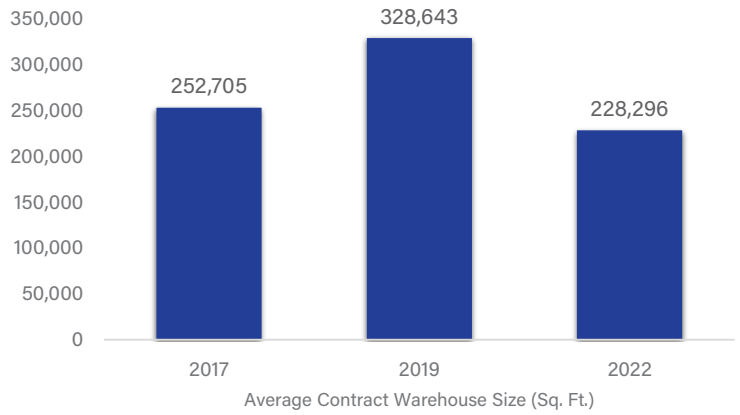


Figure 7 compares the sizes of warehouses, in total square feet groupings, in 2019 versus 2022. In 2022 56% of all warehousing operations were smaller than 200,000 square feet, which is 6% more than in 2019. However, warehouses less than 100,000 square feet only represented 25% of the total - down by 8% compared to 2019. "Big box" warehouses of 600,000 square feet or greater only account for 5% of the total, compared to 16% in 2019. The decrease of "Big box" warehouses might be caused by factors such as more multi-client warehouses, high inflation, high warehouse lease rates, and warehousing demand pressure driving the more use of multi-client space.

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Figure 7. Contract Warehouses Percentage by Size 2019 vs. 2022

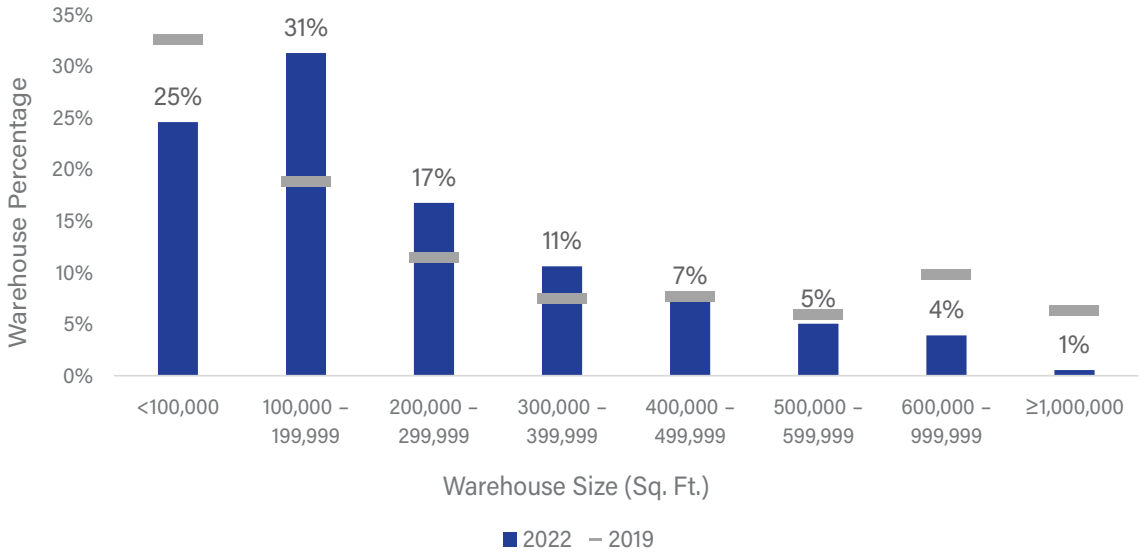

Table 6 shows the smallest, largest, and average size of the warehouses in each group. On average, the warehouses in each group are leaning towards the small end of the size range.

Table 6. Contract Warehouses by Size – Smallest, Largest, and Mean

Warehouse Size (Sq. Ft.)	Percent	Smallest	Largest	Mean
<100,000	25%	10,000	95,500	54,297
100,000 - 199,999	31%	100,000	198,000	140,452
200,000 - 299.999	17%	200,000	292,134	247,619
300,000 - 399,999	11%	300,000	396,000	334,411
400,000 - 499,999	7%	400,000	495,000	439,865
500,000 - 599,999	5%	500,000	597,000	541,889
600,000 - 999,999	4%	605,000	825,000	711,857
> 1,000,000	1%	1,250,000	1,250,000	1,250,000

We also compared the warehouse height, common area, and capacity utilized in 2019 and 2022. The average warehouse ceiling height was 29.1 feet, compared to 29.4 feet in 2019. The average common area was 15.3% of the total warehouse space, compared to 14% in 2019. The warehouse capacity utilized was 89.5%, compared to 86.7% in 2019.

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Table 7. Warehouse Height, Common Area, and Capacity Utilized 2019 vs. 2022

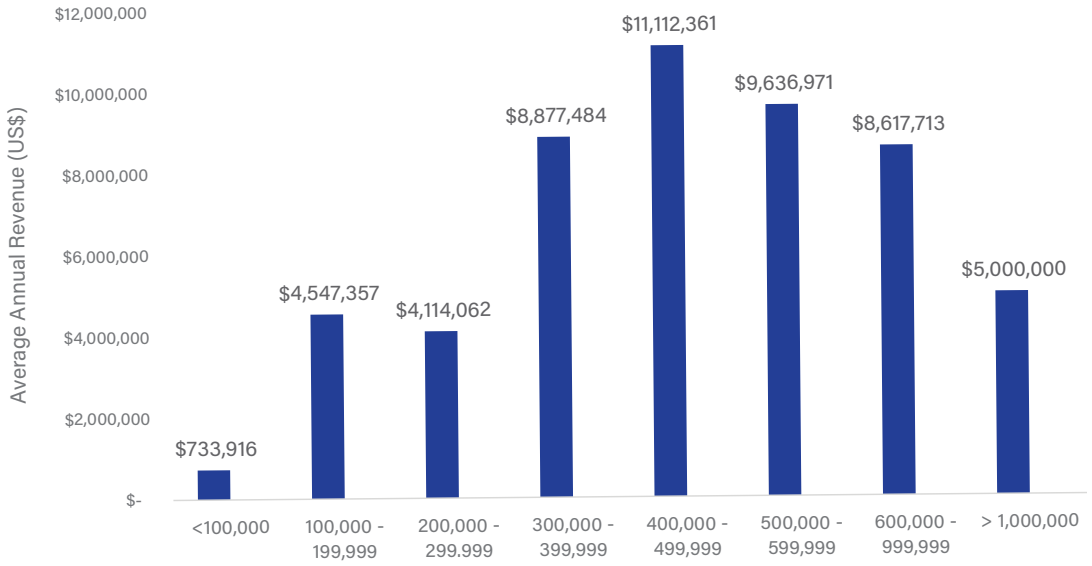
	2019	2022
Average Warehouse Ceiling Height (Feet)	29.4	29.1
Average Common Area (%)	14.0%	15.3%
Average Warehouse Capacity Utilized (%)	86.7%	89.5%

The 3PL warehousing market has demand for more optimized distribution, regional distribution, diversified networks, and localized fulfillment driven by just-in-case inventory need, tight warehousing space, high warehouse lease rates, and a record-breaking low warehouse vacancy rates.

Contract Warehouse Revenue by Size

In this section, we analyzed warehouse size and revenue for the 181 operations. In 2022, the average annual revenue per warehouse was $4,415,959 compared to $7,370,544 in 2019. Warehouses with the highest annual revenues fall in the three medium size groups with square footage of 400,000-499,999, 500,000-599,999, and 300,000-399,999. Warehouses with the lowest average annual revenues are in the <100,000 square feet group.

Figure 8. Contract Warehouses by Average Size and Revenue



Expected and Actual Operating Margins

We compared the expected "priced" and actual "realized" operating margins in 2022 versus 2019. In 2022, the group with actual operating margins of 10-14.9% was the most frequent with 36.5% of total warehouses. Actual operating margins of <0%, 0-4.9%, and 5-9.9% only account for 15.4% of total sample warehouses. 36% and 22.5% of the total warehouses have expected operating margin ranges of 15-19.9% and 20-24.9%, respectively, while only 16.3% and 10.6% of the sample warehouses have the

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actual operating margins that fall in these two groups.

In 2022, 4.8% of total warehouses averaged negative actual margins, compared to 5.4% in 2019. In contrast, 12.5% warehouses achieved the average operating margins of 30% or greater, compared to 9% in 2019. 5.8% and 4.8% of total warehouses averaged operating margins of 0-4.9% and 5-9.9%, respectively, which is much lower than our 2019 results. Overall, there were more warehouses with actual operating margins of 10% and above compared to 2019.

Figure 9. Contract Warehouses by Expected and Actual Margins Group – 2022 vs. 2019

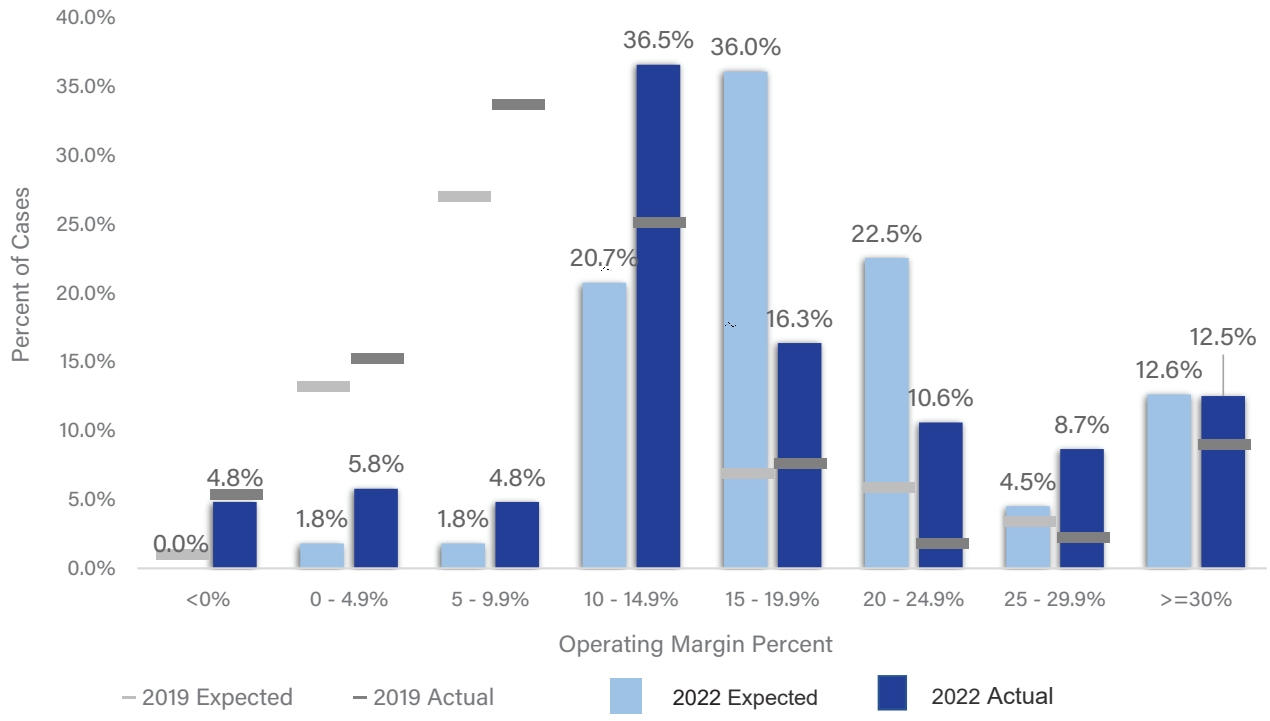

Table 8 provides the range, mean, and median values of expected/priced and actual/realized operating margins. The median priced expected operating margin was 15% for 2022. The median actual operating margin was 14%, 1% lower than the expected priced margin. The mean actual margin was 15%, 3% lower than the expected priced margin of 18%. 5% of the 2022 warehousing operations lost money. The actual margin range was -78% – 50% for our 2022 study. The mean and median values of the actual operating margins have grown 3% and 5%, respectively, since 2019.

Table 8. Contract Warehouses by Expected and Actual Operating Margins – 2022

	Range	Mean	Median
Expected margin, priced	2% – 50%	18%	15%
Actual margin, P&L	-78% – 50%	15%	14%

Contract warehouses with less than $100,000 in annual revenue have an average expected operating margin of 14.6% and represent 9.2% of the warehouses, compared to 1.5% in 2019. Besides warehouses with less than $100K annual revenue, there are more warehouses in the revenue groups of $100K–$499K,

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$500K–$999K, $2.0M–$2.9M, $4.0M–$5.9M, and $12.0M–$14.9M in 2022, compared to 2019. In total, 80% of the warehouses had an expected revenue smaller than $5.9M in 2022, while this percentage was only 65.4% in 2019. The other notable finding was the average expected margin of each revenue group was overall much higher than in 2019. The average priced expected margin almost tripled for the $4-$5.9M and $15-$19.9M revenue groups compared to 2019.

Table 9. Contract Warehouse and Average Expected Margin by Revenue Group

% of Contract Warehouses	Revenue Range	Average Expected Margin, Priced
9.2%	<$100K	14.6%
13.8%	$100K–$499K	17.6%
14.7%	$500K–$999K	18.5%
9.2%	$1.0M–$1.9M	18.8%
13.8%	$2.0M–$2.9M	21.0%
5.5%	$3.0M–$3.9M	16.8%
13.8%	$4.0M–$5.9M	20.9%
4.6%	$6.0M–$7.9M	16.2%
3.7%	$8.0M–$11.9M	14.9%
4.6%	$12.0M–$14.9M	20.2%
2.8%	$15.0M–$19.9M	21.5%
4.6%	≥$20.0M	14.0%

Owned vs. Leased

By comparing the ownership of the contract warehouses from the 2019 and 2022 studies, 22% of the contract warehouses in 2022 were 3PL owned, a 16% increase over 2019. 61% were 3PL leased, which increased 8% over 2019. Customer owned/leased warehouses only accounted for 17% of the total logging a substantial decrease of 24% versus 2019. From our study, leasing versus owning warehouses is an ongoing trend for 3PLs. With the high demand of industrial space, leasing a warehouse provides a more flexible option for growth. Financially, leasing allows 3PLs to avoid the substantial upfront costs. Owning a warehouse comes with greater financial risks but can be a benefit when the facilities are fully depreciated; especially in areas such as the Inland Empire of California where lease rates have been rising exponentially.

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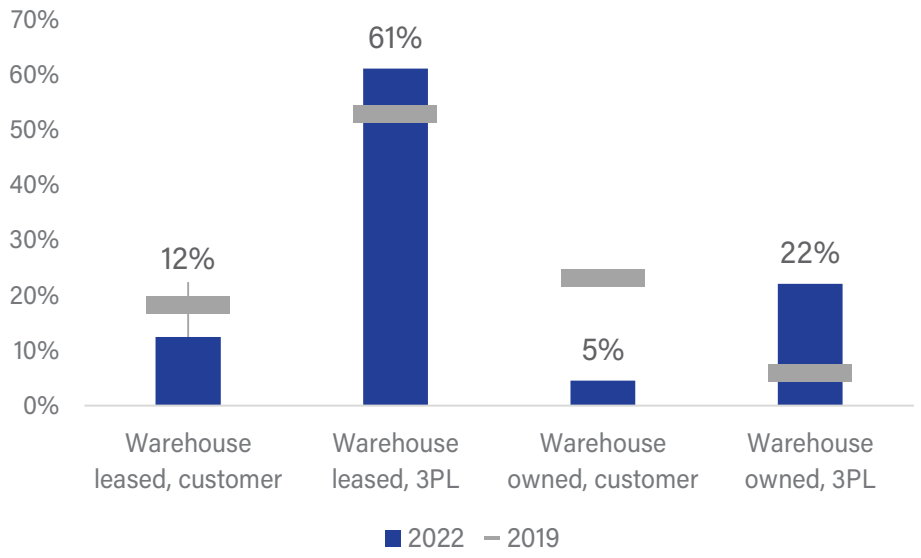
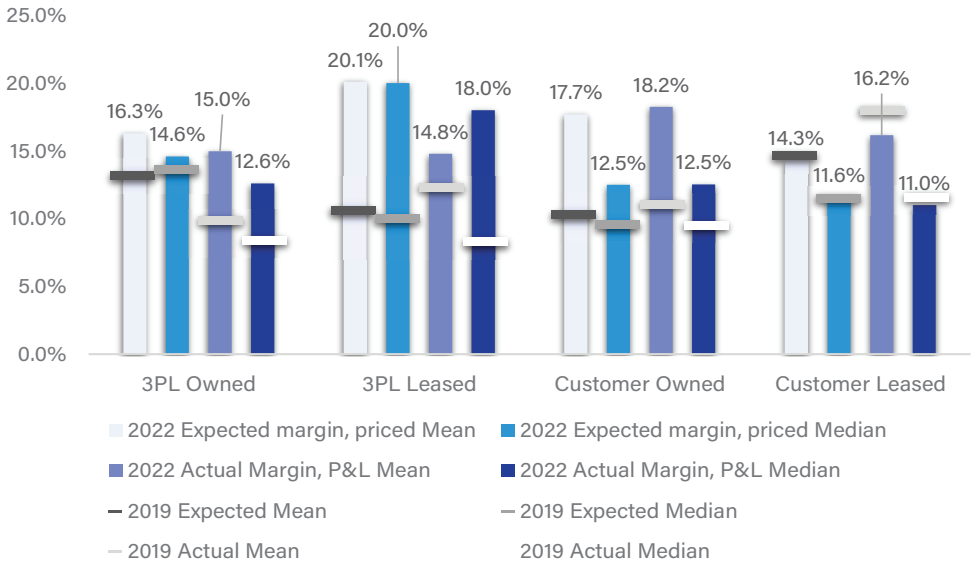
Figure 10. Contract Warehouses – Ownership 2019 vs. 2022



The next comparison details the expected "priced" and actual operating margins in 2019 and 2022 by four warehouse ownership types: 3PL Owned, 3PL Leased, Customer Owned, and Customer Leased. For 3PL owned and leased warehouses, both mean and median actual margins are lower than the expected margins. For customer owned and leased warehouses, the median and mean actual margins are in line with the expected margins. 3PL leased contract warehouses have the highest medium actual margin of 18%. Customer owned warehouses have the highest average actual margin at 18.2%. In 2022, customer leased warehouses had the lowest median actual margin of 11%. 3PL owned/leased and customer owned contract warehouses have higher expected and actual operating margins compared to 2019, while the expected and actual margins decreased for customer leased warehouses since 2019.

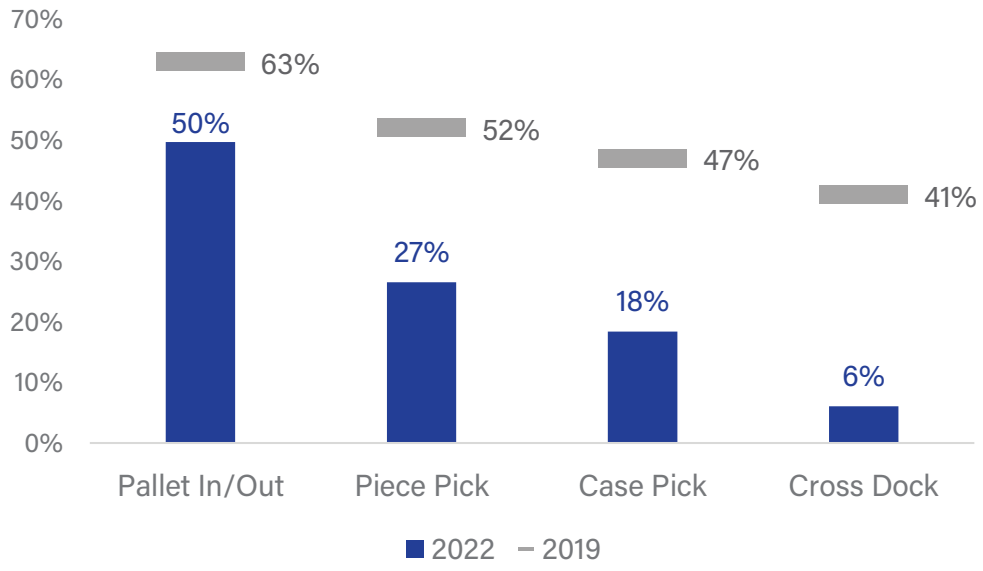
Figure 11. Contract Warehouses – Expected and Actual Operating Margins by Ownership 2019 vs. 2022



Primary Warehouse Handling Types

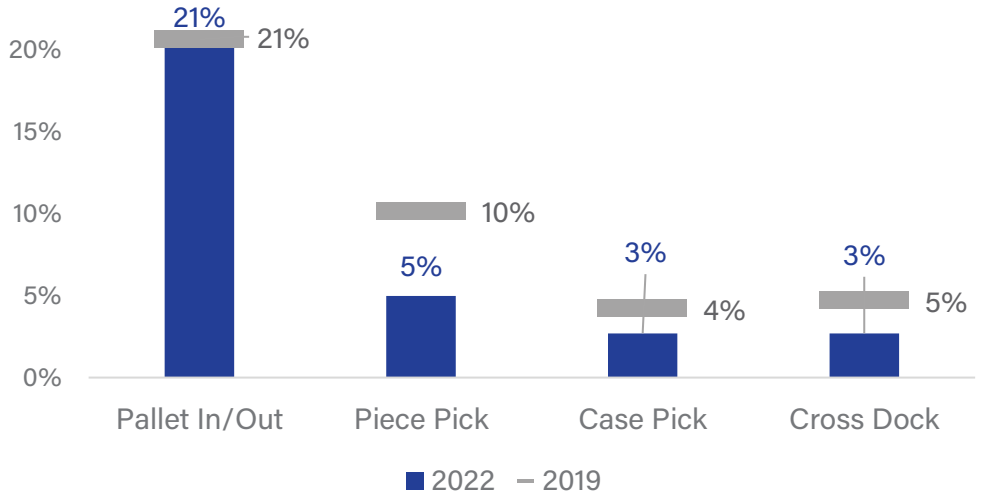
The following analysis shows the utilization of four main warehouse handling types within operations: Pallet In/Out, Case Pick, Piece Pick, and Cross Dock. The average/mean percentage of the warehousing handling types used by our sample 3PLs from high to low are Pallet In/Out - 50%, Piece Pick - 27%, Case Pick - 18%, and Cross Docks - 6%. The average percentages of these four types are overall substantially lower than in 2019. In 2019, 63% of warehouses were primarily pallet in/pallet out, 52% were piece picking, and case picking, and cross docks were 47% and 41%, respectively.

Figure 12. Average/Mean Percent by Warehousing Handling Type - 2019 vs. 2022



We also compared the primary warehousing handling types in 2019 and 2022. Here we refer the primary handling type as the only type used by the 3PL. Compared to 2019, Pallet In/Out stayed the same at 21%; Piece Pick, Case Pick, and Cross Dock warehouses decreased by 5%, 1%, and 2%, respectively. It shows that less 3PLs are using only one warehousing handling type compared to several years ago. There are more mixed handling type operations.

Figure 13. Primary Warehouse Handling Type 2019 vs. 2022



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We combined both sources of warehouse handling types in our 2022 study to generate the following information. Table 10 shows the summary of our 2022 study with the average/mean percent, median percent, and the percentage of the only handling type used by the 3PLs.

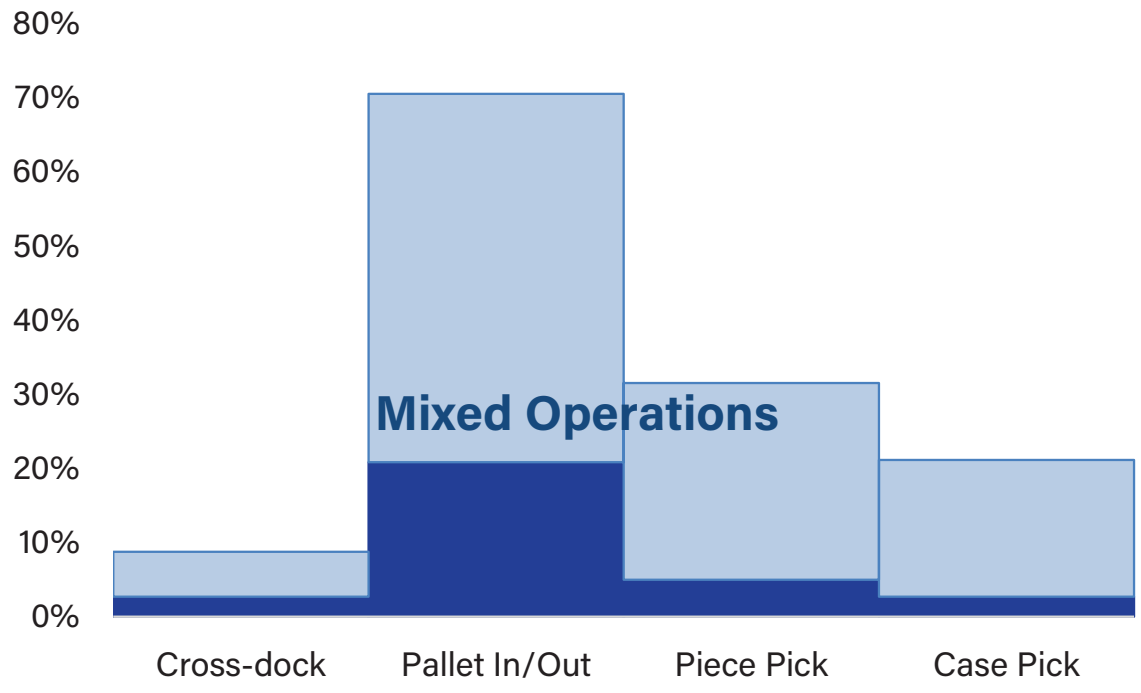
Table 10. 2022 Contract Warehouses by Primary Warehouse Handling Types

	Pallet In/Out	Case Pick	Piece Pick	Cross Dock
COUNT	178	150	112	60
Average (MEAN) Percent[1]	50%	18%	27%	6%
MEDIAN Percent[1]	55%	10%	2%	0%
COUNT of 100% of Type	46	6	11	6
PERCENT of 100% of Type[1]	21%	3%	5%	3%

[1] The percent shows the warehouses involved in the activities in each column.

Figure 14 shows the four handling types as mixed operations (light blue area) vs. pure operation (dark blue area) with the majority of contract warehouses still operating with mixed handling types.

Figure 14. Contract Warehouses by Primary Warehouse Handling Types



Metrics & KPIs

There is a base set of KPIs used by most 3PLs. These KPIs include on-time shipments, order picking accuracy, average warehouse capacity used, annual workforce turnover, and inventory count accuracy. Table 11 shows the KPI ranges of our 2022 study. While in a range, KPIs tend to be customer specific.

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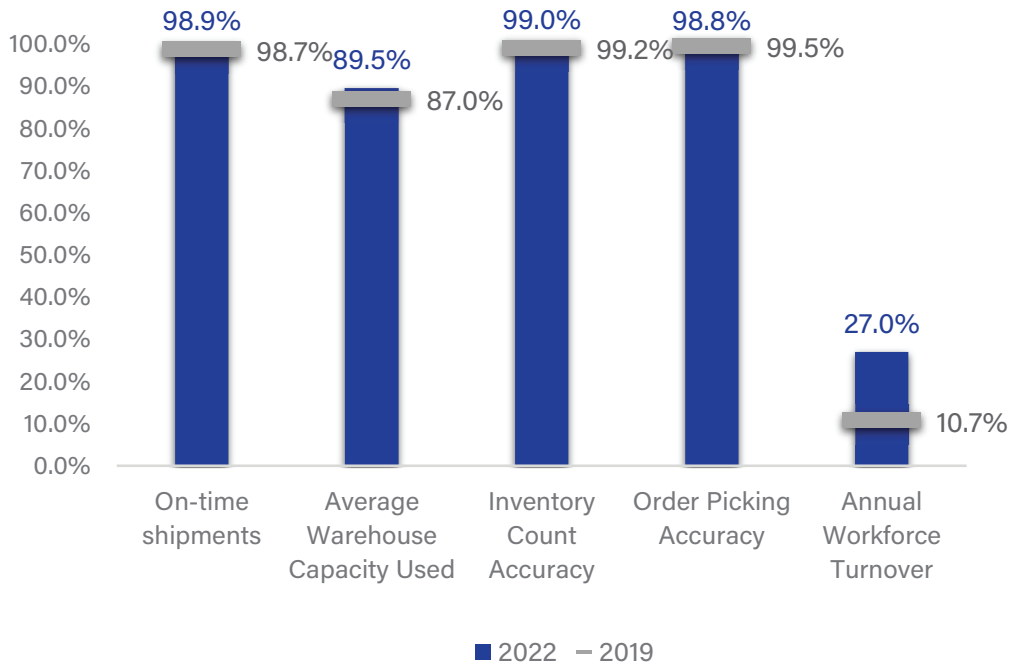
Table 11. 2022 KPI Ranges

KPI	Range
On-time shipments	91.4 – 100%
Order Picking Accuracy	85.0 – 100%
Average Warehouse Capacity Used	43.3 – 100%
Annual Workforce Turnover	0 – 64.4%
Inventory Count Accuracy	92.0 – 100%

Figure 15 compares the average per KPI in 2022 versus our 2019 study. Most of the 2022 KPI averages are in line with our 2019 results, except for Annual Workforce Turnover. The average annual workforce turnover of 27% was 16.3% higher than in 2019. Recruiting and retaining warehouse labor is a growing challenge and was frequently mentioned in the open-ended survey questions.

Figure 15. KPI Averages 2019 vs. 2022



Warehouse Management Systems (WMS)

In the 3PL business, a wide variety of WMS are being used and play a key role in warehouse operations management. The WMS has long served as a cornerstone of most VAWD operations. The increasing growth in e-commerce, especially time-critical shipments, the emergence of multi-channel distribution networks, the globalization of supply chain networks, and the increasing adoption of cloud-based WMS solutions are driving more and more e-commerce centric and traditional warehousing 3PLs to invest in robust WMS. Figure 16 includes 21 different brands of WMS deployed by 710 3PLs in our Who's Who 3PL Guide as of April 2022. 273 3PLs (38%) were using their proprietary WMS and some were using several WMS brands.

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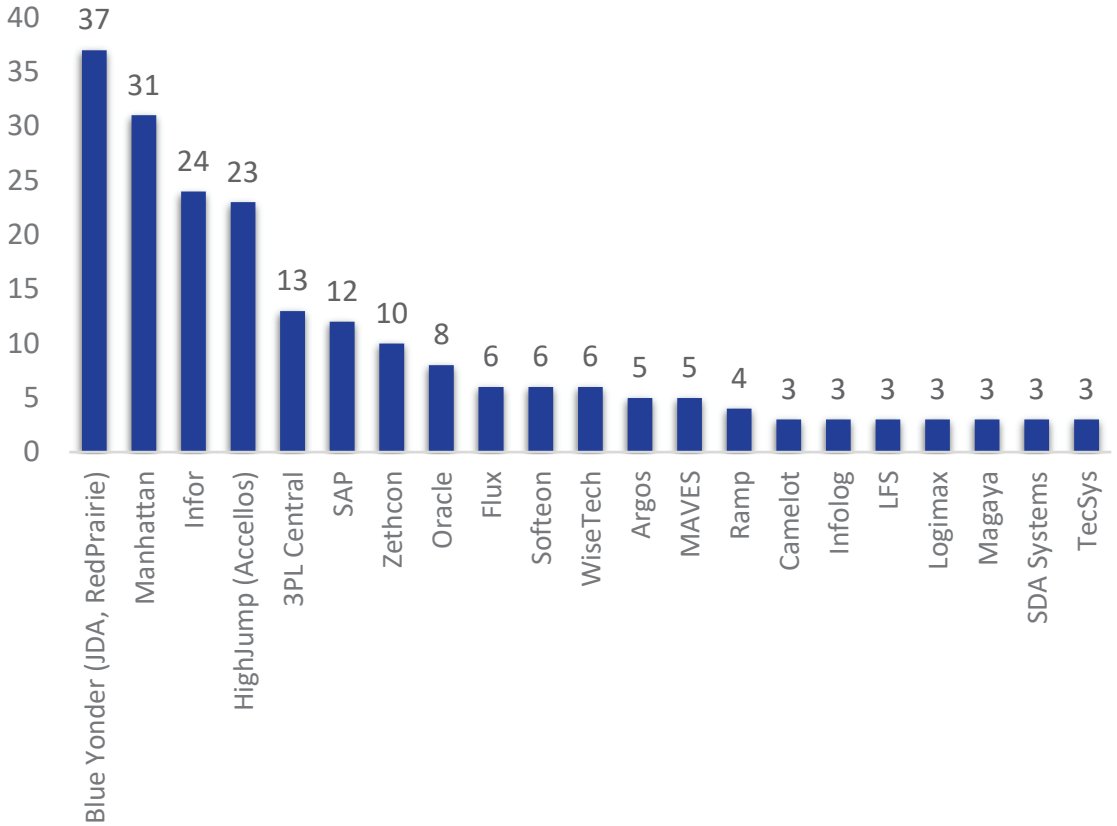
Figure 16. Contract Warehouses by WMS Deployed



VAWD 3PL Customer Contracts

VAWD 3PL Customer Contracts Overview

In addition to the 181 contract warehouses in our 2022 warehousing study, we also collected additional information on 111 customer contracts for VAWD 3PLs. The 3PL participants provided the information including their yearly 3PL contract value, number of warehouses and warehouse space assigned to the 3PL contract, and number of employees assigned to the contract. We will also discuss open book, closed book, payment terms, gainsharing relationships, and contract lengths in customer contracts in this section.

We compared the yearly contract value per warehousing contract, number of assigned warehouses to the contract, warehouse size, and total employees for contracts in 2019 and 2022.

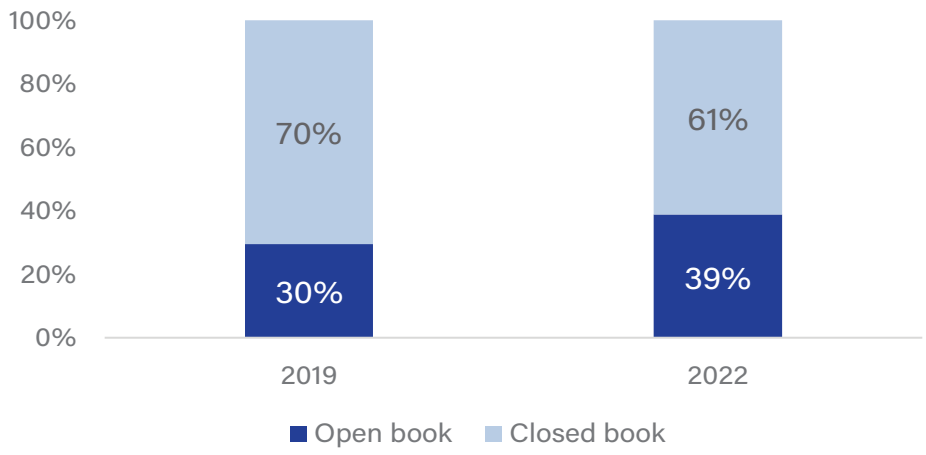
Table 12. VAWD 3PL Customer Contracts Overview

		2019	2022
Yearly Contract Value per Warehousing Contract (US$)	Average/Mean	$2,981,046	$3,554,311
	Median	$792,500	$1,823,859
	Min	$40,000	$3,345
	Max	$27,160,000	$37,700,000
Assigned Number of Warehouses to Contract	Average/Mean	1.32	2
	Max	10	27
Assigned Warehouse Space to Contract (Sq. Ft.)	Average/Mean	202,410	245,880
	Median	39,915	75,000
	Min	3	20
	Max	4,504,000	7,700,000
Total Employees Assigned to Contract	Average/Mean	33	66
	Median	15	12
	Min	2	2
	Max	220	2,240

In 2022, the average yearly value per warehousing contract was $3,554,311, 19% higher than 2019. It also has a much wider range of $3,345 to $37,700,000, especially on the lower end. The maximum assigned number of warehouses to a contract in 2022 reached 27, compared to 10 warehouses in 2019. The average assigned warehouse space in 2022 was 245,880 square feet, 21% higher than in 2019. The average total employees assigned to contract in 2022 was 66, exactly double the number in 2019. The maximum number of employees for one contract reached 2,240.

In 2022, 23% of the warehousing operations in our study use "Evergreen" contracts with ongoing renewals; 7% have gainshare, pain share provisions. Open book and closed book relationships are 39% and 61%, respectively. 9% more VAWD contracts had open book pricing in 2022 compared to 2019.

Figure 17. Open Book, Closed Book 2019 vs. 2022



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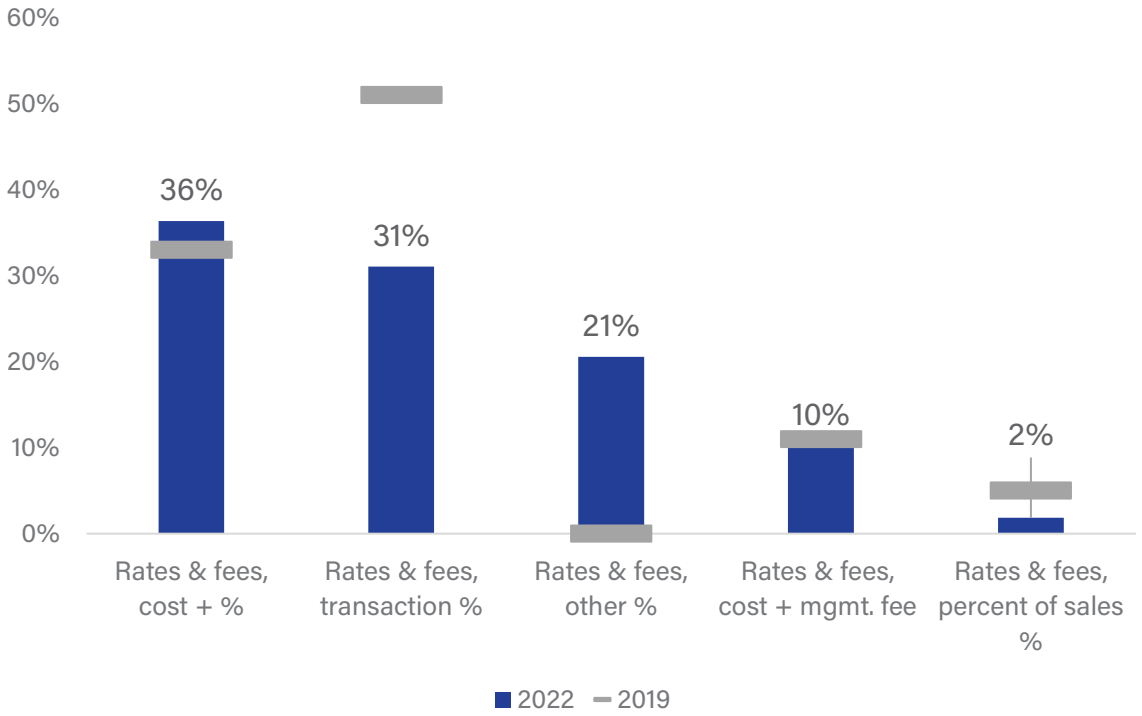
In 2022, more closed-book VAWD contracts were using Rates & fees, cost + % and Rates & fees, other %. VAWD contracts that use Rates & fees, transaction % was 31%, a 20% decrease compared to 2019.

Figure 18. Closed Book Type 2019 vs. 2022



Only 7% of contracts had gainsharing provisions in 2022, compared 27% and 12% in 2017 and 2019, respectively.

Figure 19. Gainsharing 2017-2022

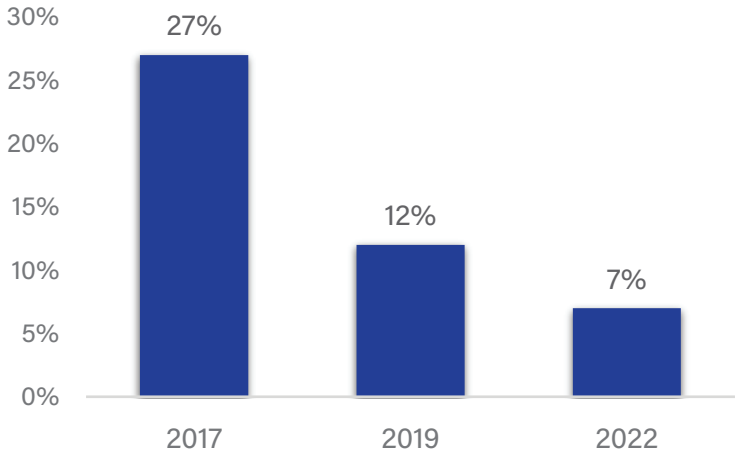


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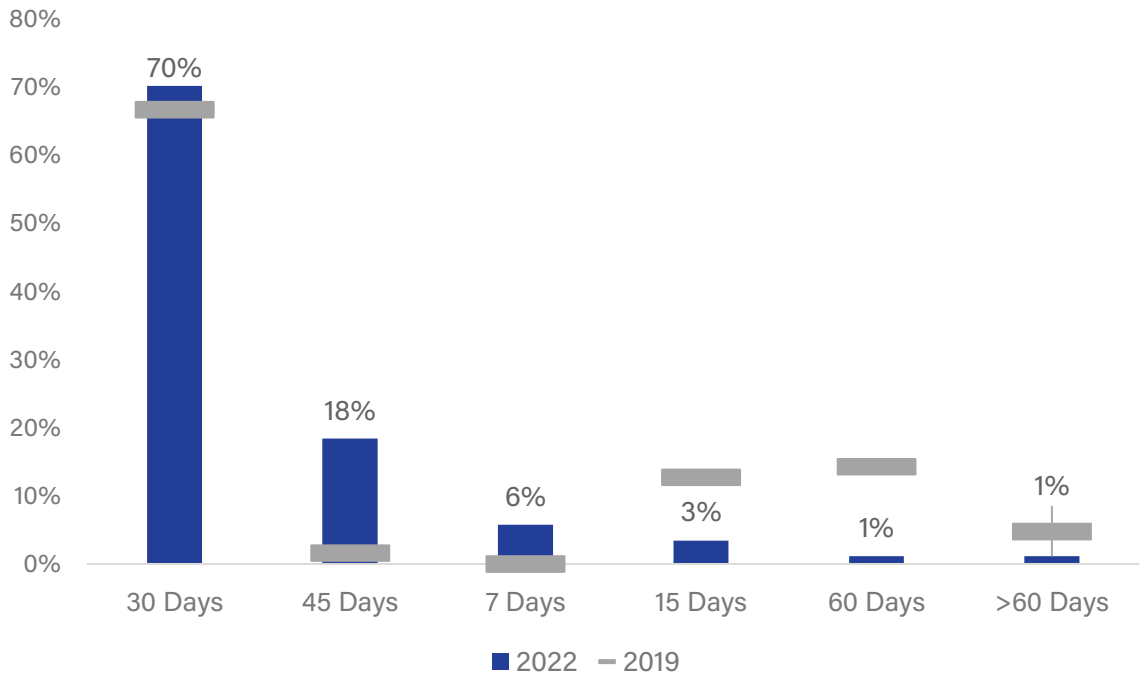
Figure 20 shows the payment terms of our 2022 warehousing contracts compared to 2019. The regular payment terms include: 7 Days, 15 Days, 30 Days, 45 Days, 60 Days, and >60 Days. 30 Day payment terms were the most frequent and applied to 70% of the total contract samples, followed by 45 Days, 7, Days, 15 Days, 60 Days, and >60 Days. Payment terms of 7 days and 45 days have increased by 6% and 16%, respectively, since 2019. Longer payment terms of 60 Days and >60 days have decreased by 17% since 2019. Overall, shorter payment terms of 45 Days and <45 Days increased from 81% to 98% since 2019. Strong demand has driven customers to pay 3PLs quicker.

Figure 20. VAWD Contract Payment Terms 2019 vs. 2022



Contract and Contract Lengths by Yearly Contract Value

Figure 21 details the number of 3PL warehouse contracts by yearly contract value in 2022 versus 2019. In 2022, yearly contract value groups of $2M-3.9M, <$100K, and $1M-1.9M are the three groups with the most contracts. In our 2019 study, the <$100K, $100K-$499K, and $500K-$999K groups had the most contracts. Yearly contracts value groups of $8M and above have the least contracts. Yearly contract value groups of $2M-3.9M, $4M-7.9M, and $1M-1.9M, grew the most, with 14%, 8.5%, and 5.2%, respectively, compared to 2019.

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Figure 21. Contract Percentage by Yearly Contract Value 2019 vs. 2022

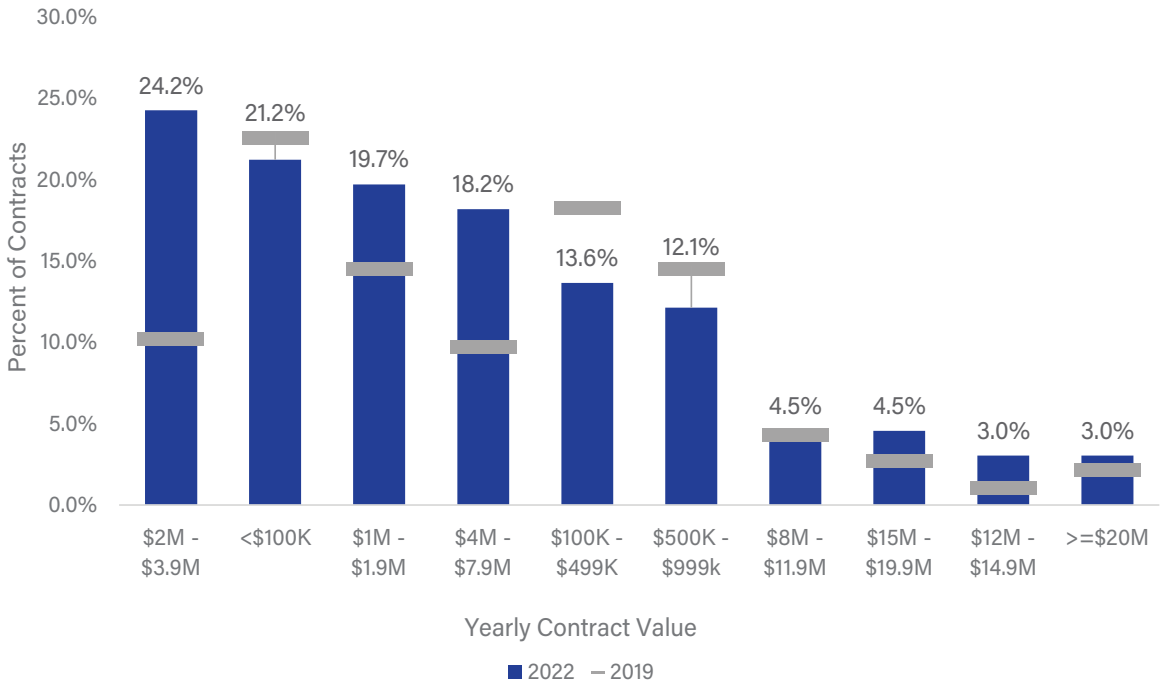

Figure 22 shows the relationship between average contract length and yearly contract value. In 2022, warehouse contracts between $8.0M and $11.9M had the longest average contract length of 4.5 years. In 2019, warehouse contracts between $12M and $14.9M had the longest average contract length of 6 years. The overall average contract lengths in our 2022 study are shorter than in 2019, except for contracts of $2.0M-$3.9M and $8.0M-$11.9M.

Figure 22. Contract Length by Yearly Contract Value 2019 vs. 2022

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In general, more warehouse contracts could be shortening as the e-commerce market matures. 3PLs, especially small providers, are in a tight spot with decreasing contract lengths and tight real estate availability.

Table 13 explores the relationship of yearly contract revenue, number of contracts, contract lengths, and average revenue per square foot. Contracts between $15M and $19.9M averaging 3.3 years have the highest revenue of $47.50 per square foot and account for 4% of total 3PL contracts. Surprisingly contracts less than $100K with an average length of 1.4 years have the lowest revenue of $13.40 per square foot for 2022, while this group of contracts had the highest revenue of $56.43 per square foot in 2019. 3PLs had a very wide range of revenue per square foot in 2022.

Table 13. VAWD Contracts and Revenue by Yearly Contract Value and Length

Yearly Contract Value	Total Contracts	Contract Length (Year)			Avg. Revenue per Sq. Ft. ($)
		Avg.	Min.	Max.	
<100K	18%	1.4	1	3	$ 13.4
$100K–$499K	11%	2.2	1	3	$ 40.1
$500K–$999K	9%	1.9	1	3	$ 28.5
$1.0M–$1.9M	16%	2.6	1	5	$ 25.6
$2.0M–$3.9M	18%	3.6	1	10	$ 36.2
$4.0M–$7.9M	15%	3.3	1	10	$ 22.7
$8.0M–$11.9M	4%	4.5	3	5.5	$ 28.3
$12.0M–$14.9M	3%	4.0	3	5	$ 41.8
$15.0M–$19.9M	4%	3.3	3	4	$ 47.5
≥$20.0M	3%	4.0	3	5	$ 22.0

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Advanced Breakdown – Contract Warehouses

In this section, we will discuss the warehousing data related to commodities/industries and regions served over the years in the United States, as well as the forecast, which includes VAWD revenue and space by commodities, Dedicated vs. Multi-client warehouse space by regions, and Warehouse Case/Pallets by commodities and by regions.

We split the commodities into 13 industries: Aerospace, Apparel/Clothing, Automotive, Building Materials, Chemicals, Food/Beverage, Hardgoods/Appliances, Healthcare/Cosmetics, High-tech/Computers, Industrial (non-automotive), Mixed Commodities, Retail/Consumer Goods, Telecommunications. We define the four regions in the U.S. as Northeast, Midwest, West, and South.

VAWD Revenue and Space by Regions

Warehousing has grown rapidly over the past 10 years primarily from increased outsourcing and the rapidly growing e-commerce fulfillment subsegment. E-commerce fulfillment activities surged during the COVID-19 pandemic in 2020. Now most 3PL warehouses are full as customers have rebuilt inventories to meet strong consumer demand. We forecast that overall warehousing industry revenue will have a growth of 3% in 2023 as warehouse capacity remains tight and consumer demand slackens due to a Fed driven economic slowdown or recession. U.S. VAWD space had a CAGR of 5.4% from 2016 to 2022 and is expected to have a growth of 5% from 2023 to 2024.

The revenue per square foot for U.S. VAWD per region from low to high runs South, Midwest, West, and Northeast with the highest. The South has strong population growth and low warehousing labor costs. It will continue to grow in manufacturing. The Northeast and West have large populations with more e-commerce purchases offsetting manufacturing operations exodus. The Midwest has strong business-to-business warehousing growth and e-commerce growth.

For U.S. VAWD gross revenue, the Midwest had the highest CAGRs of 10.1% from 2016 to 2022. The West had the lowest CAGR of 9.1%. We estimate that the Northeast will have the highest growth of 5.5% from 2023 to 2024. For U.S. VAWD space, the Midwest had the highest CAGR of 6.1% from 2016 to 2022, and the West had the lowest CAGR of 5.1%. We estimate that the Northeast will have the highest growth of 5.2% from 2023 to 2024. The significant boom in e-commerce, a robust infrastructure and new construction, and a strong connection to coastal ports, all contribute to the future growth of the Midwest.

The U.S. VAWD Market (gross revenue) was $39.1 billion in 2016 and is expected to reach $72.7 billion in 2024E. The South accounts for the most VAWD gross revenue of $21.5 billion in 2022, and the Northeast has the least at $14.1 billion. The South has grown significantly over the past 40 years as its population and industrial base expanded to the detriment of other regions including the Northeast and Midwest. E-commerce activity over the past ten years has added significantly to the growth around major population centers in each region.

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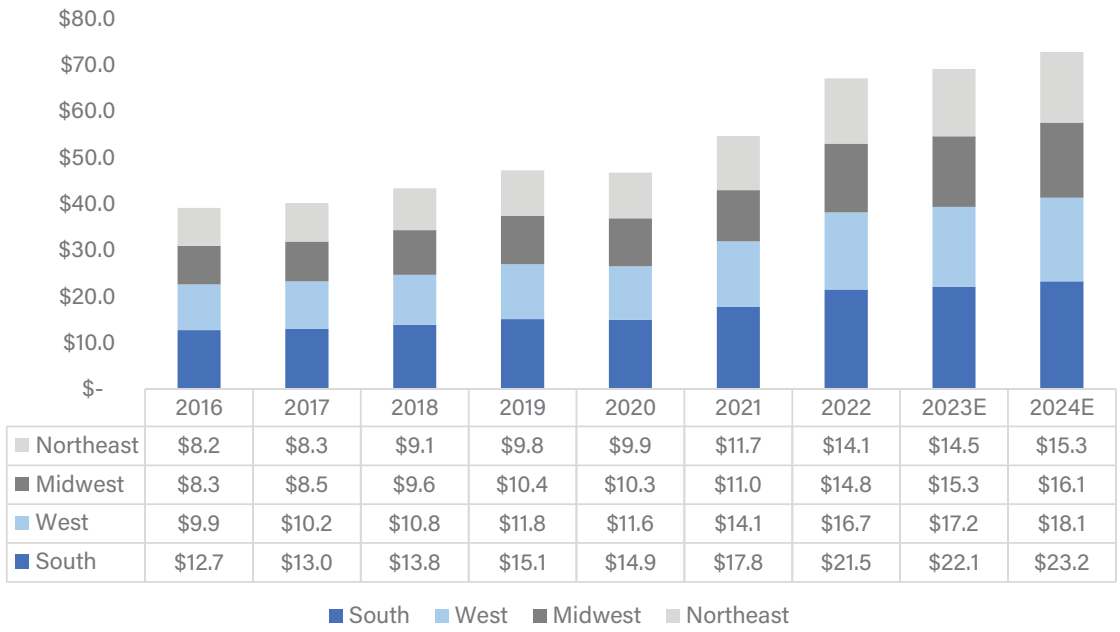
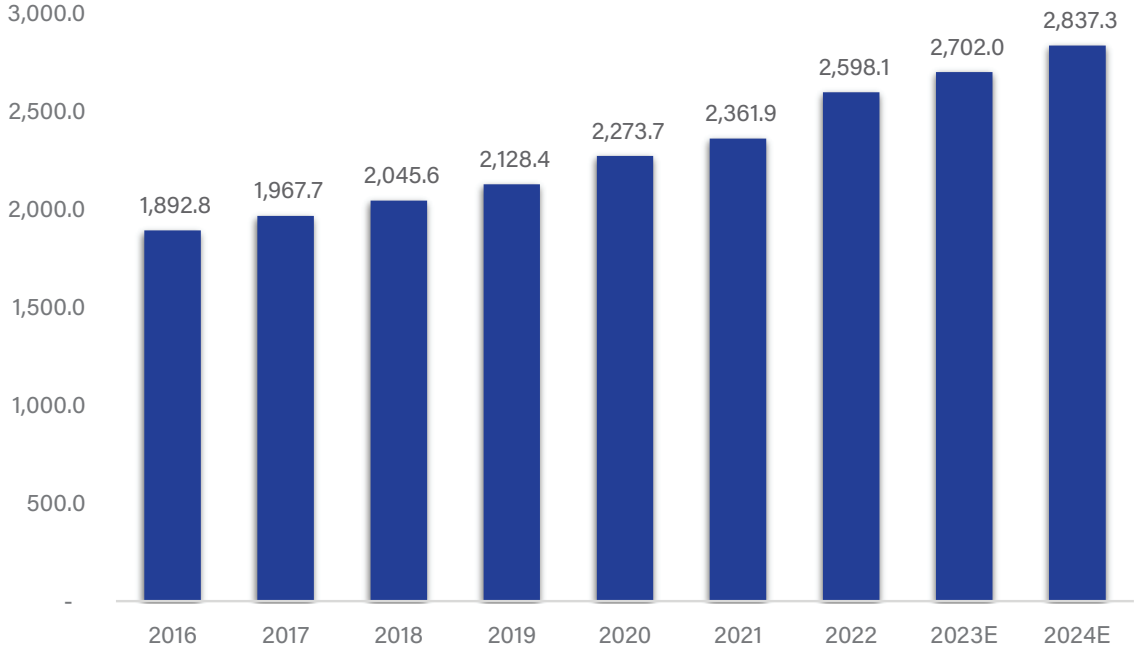
Figure 23. U.S. VAWD Gross Revenue/Market Sizing by Region (US$ Billions): 2016-2024E



	2016	2017	2018	2019	2020	2021	2022	2023E	2024E
Northeast	$8.2	$8.3	$9.1	$9.8	$9.9	$11.7	$14.1	$14.5	$15.3
Midwest	$8.3	$8.5	$9.6	$10.4	$10.3	$11.0	$14.8	$15.3	$16.1
West	$9.9	$10.2	$10.8	$11.8	$11.6	$14.1	$16.7	$17.2	$18.1
South	$12.7	$13.0	$13.8	$15.1	$14.9	$17.8	$21.5	$22.1	$23.2

The U.S. VAWD Market space was 1,892.8 million square feet in 2016 and is expected to reach 2,837.3 million square feet in 2024.

Figure 24. Total U.S. VAWD Space/Storage – 2016-2024E (Sq. Ft. Millions)



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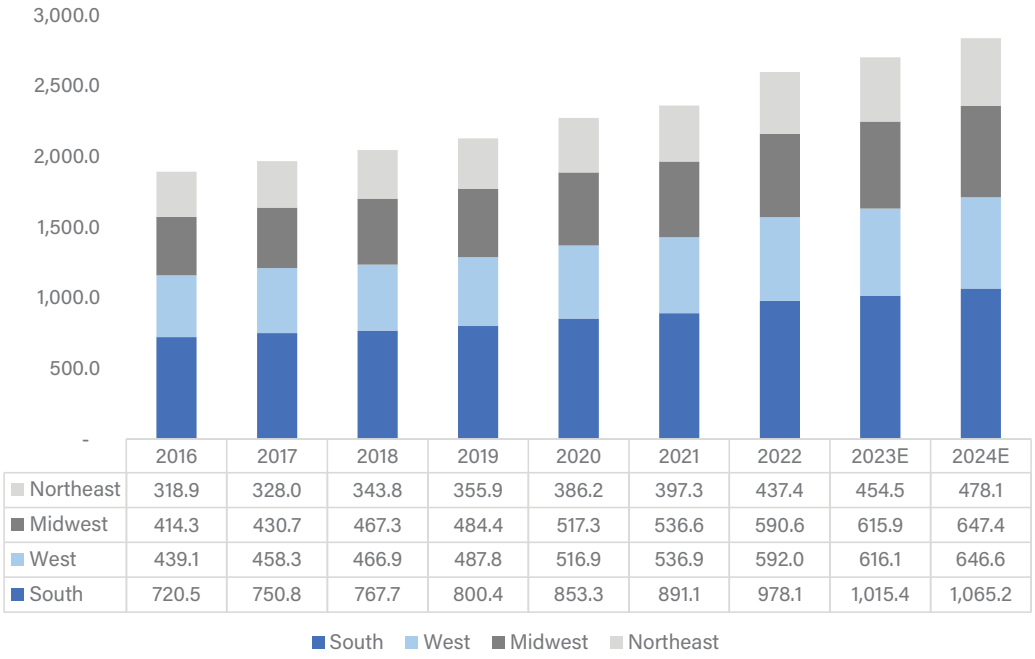
The South has the most space at 978.1 million square feet in 2022, while the Northeast has the least amount of VAWD space of 437.4 million square feet. Increased e-commerce warehousing and fulfillment activity over the past ten years has added significantly to the growth around major population centers in each region.

Figure 25. U.S. VAWD Space/Storage by Region – 2016-2024E (Sq. Ft. Millions)



	2016	2017	2018	2019	2020	2021	2022	2023E	2024E
Northeast	318.9	328.0	343.8	355.9	386.2	397.3	437.4	454.5	478.1
Midwest	414.3	430.7	467.3	484.4	517.3	536.6	590.6	615.9	647.4
West	439.1	458.3	466.9	487.8	516.9	536.9	592.0	616.1	646.6
South	720.5	750.8	767.7	800.4	853.3	891.1	978.1	1,015.4	1,065.2

VAWD Revenue and Space by Commodities

The commodity that had the most growth from 2016 to 2022 was Consumer Goods. We estimate that Technological industry 3PL customers will have the most U.S. VAWD space and highest gross revenue growth from 2023 to 2024.

Retail and Consumer Goods had strong growth through 2022 from e-commerce and COVID demand spikes. Continued growth is expected from 2023 and beyond, mainly from e-commence sales, but at a more normal rate.

We have seen strength in Technology through 2022 especially in consumer and telecommunications products. We are expecting its growth to continue into 2024 with a focus on having more on-hand inventory close to customers. Repair and refurbishment operations in this category also have some of the highest revenues per square foot.

Industrial had increased growth as manufacturing is near and re-shored from Asia. The growth into 2022 slowed down.

Healthcare here covers just the 3PL portion and does not include distributors such as Cardinal Health and McKesson. Healthcare had strong growth to keep up with COVID PPE and other requirements during the pandemic and is returning to more normal growth.

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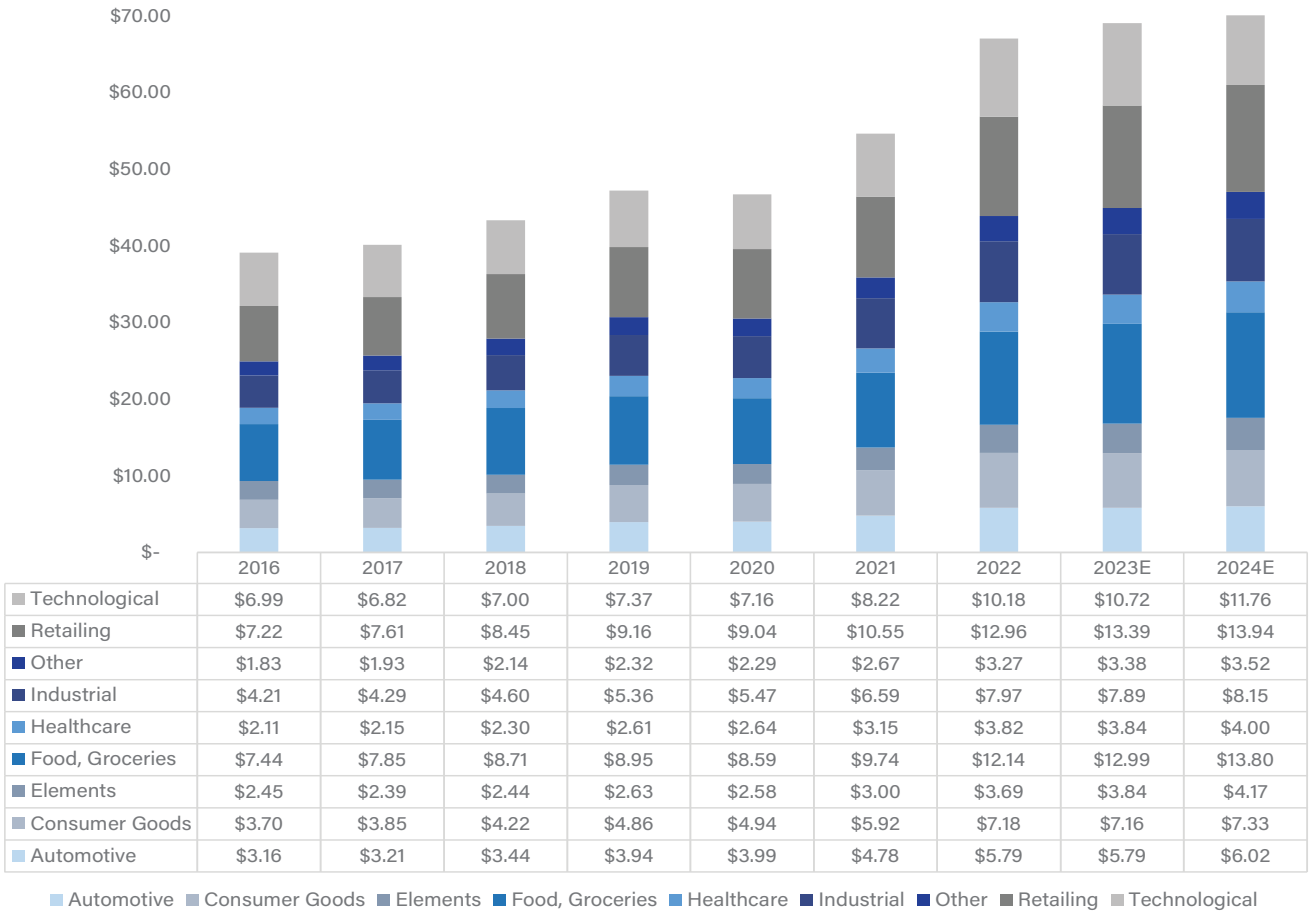
Automotive has heavy value-added operations, manufacturing support, and spare/service parts logistics operations. Operations are still recovering from microchip shortages but are beginning to normalize. Growth will be driven by cyclical demand going into 2023.

Food, Groceries will continue to have strong growth in the next couple years due to increased demand and shorter delivery time requirements, especially for perishable products. The change will include warehouses closer to consumers, more technology and automation used in warehouses, especially in cold chain warehouses, and other operations.

Elements will continue to grow mainly in the areas of hazardous materials, specialty chemicals, and the like.

The three vertical industries with the highest VAWD gross revenue in the U.S. are Retailing; Food, Groceries, and Technological which corelates well with the overall demand for goods in terms of Food, Grocery, and Retail. Technological companies require a lot of value-added services which increases VAWD 3PL revenue. Combined they accounted for 52.7% of the market in 2022. The vertical generating the least amount of gross revenue was Other at $3.27 billion in 2022.

Figure 26. U.S. VAWD Revenue by Commodities (US$ Billions): 2016-2024E



	2016	2017	2018	2019	2020	2021	2022	2023E	2024E
Technological	$6.99	$6.82	$7.00	$7.37	$7.16	$8.22	$10.18	$10.72	$11.76
Retailing	$7.22	$7.61	$8.45	$9.16	$9.04	$10.55	$12.96	$13.39	$13.94
Other	$1.83	$1.93	$2.14	$2.32	$2.29	$2.67	$3.27	$3.38	$3.52
Industrial	$4.21	$4.29	$4.60	$5.36	$5.47	$6.59	$7.97	$7.89	$8.15
Healthcare	$2.11	$2.15	$2.30	$2.61	$2.64	$3.15	$3.82	$3.84	$4.00
Food, Groceries	$7.44	$7.85	$8.71	$8.95	$8.59	$9.74	$12.14	$12.99	$13.80
Elements	$2.45	$2.39	$2.44	$2.63	$2.58	$3.00	$3.69	$3.84	$4.17
Consumer Goods	$3.70	$3.85	$4.22	$4.86	$4.94	$5.92	$7.18	$7.16	$7.33
Automotive	$3.16	$3.21	$3.44	$3.94	$3.99	$4.78	$5.79	$5.79	$6.02

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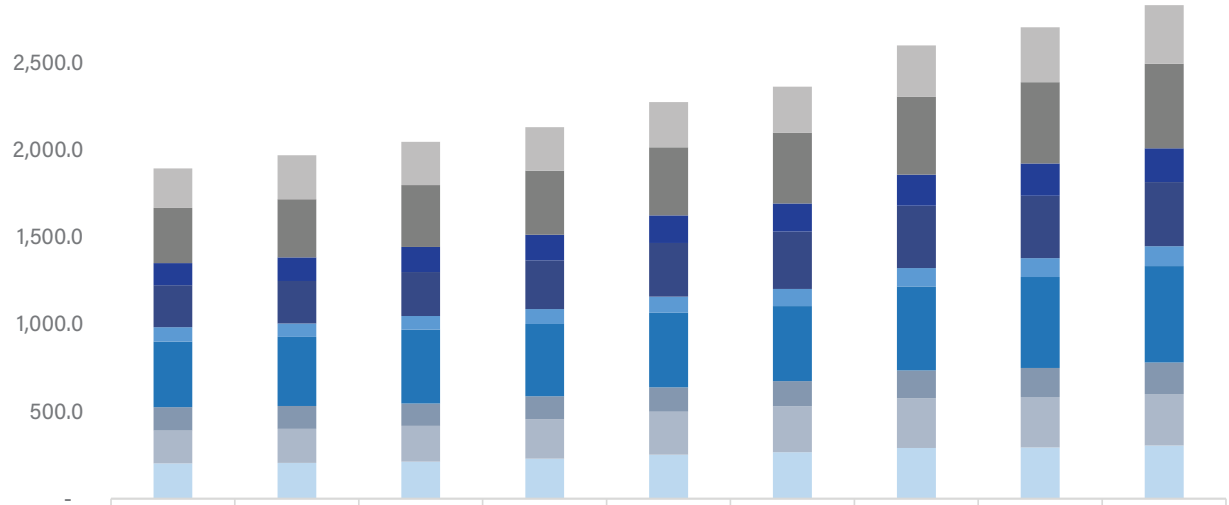
The three vertical industries with the most VAWD space in the U.S. are Food, Groceries; Retailing, and Industrial. Combined they account for 49.4% of the total U.S. VAWD space in 2022.

Figure 27. U.S. VAWD Space/Storage by Commodities (Sq. Ft. Millions): 2016-2024E



	2016	2017	2018	2019	2020	2021	2022	2023E	2024E
Technological	225.4	251.9	248.3	248.7	260.6	265.4	294.9	314.2	344.1
Retailing	316.4	333.3	355.3	366.9	390.4	404.0	445.3	465.3	483.9
Other	127.1	133.9	142.7	147.2	156.7	162.1	178.7	186.7	194.3
Industrial	240.8	245.0	252.6	279.8	307.9	329.2	357.0	357.9	368.8
Healthcare	82.9	76.1	78.4	84.8	92.3	97.6	106.4	108.2	112.5
Food, groceries	376.0	396.3	422.7	413.7	428.0	430.3	481.2	521.0	552.7
Elements	134.5	130.9	128.8	131.8	139.6	143.8	158.9	166.9	181.5
Consumer Goods	187.8	195.4	205.9	225.7	247.1	262.9	285.8	288.3	295.1
Automotive	201.8	205.0	210.9	229.9	251.1	266.5	290.0	293.4	304.5

Dedicated vs. Multi-Client Warehouse Space by Regions

The figures below show Dedicated versus Multi-client storage space for contract warehouses in the U.S. from 2016 to 2024. In 2016, Dedicated contract warehouses dominated at 79% of total space versus multi-client warehouses at only 20.7% of the total. We saw a CAGR growth of 24% for multi-client VAWD space from 2016 to 2022. In 2022, Multi-client VAWD space accounted for 54% of total space in the U.S. We estimate a 15.6% growth for multi-client warehouses from 2023 to 2024. Most e-commerce fulfillment warehouses are multi-client.

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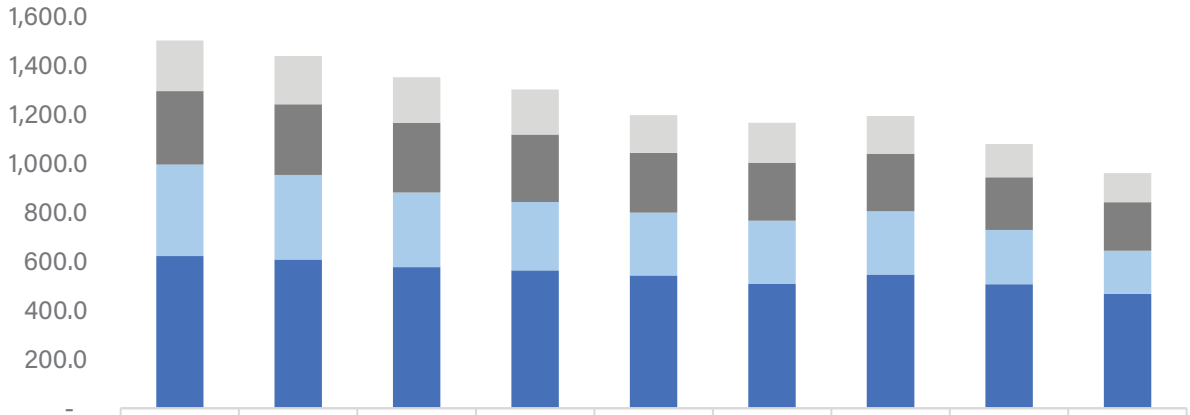
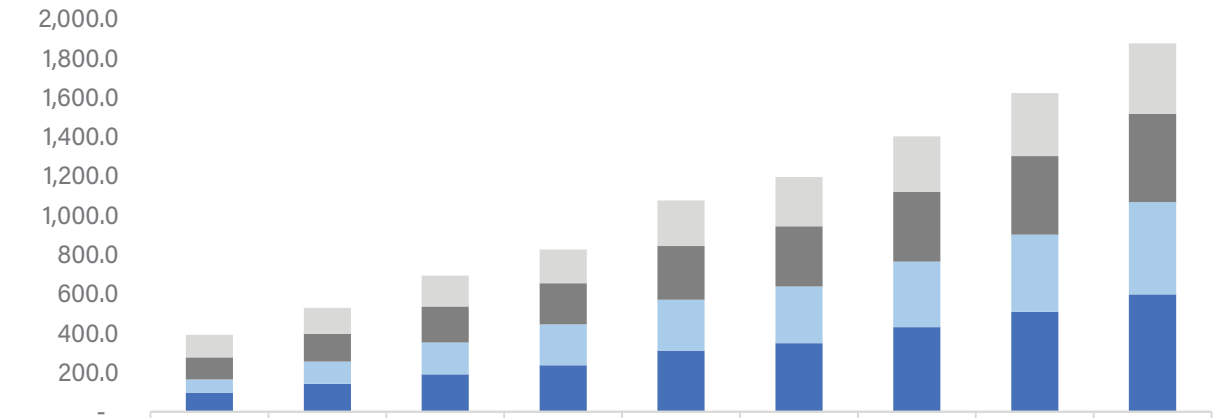
Figure 28. U.S. VAWD Space by Region – Dedicated (Sq. Ft. Millions): 2016-2024E



	2016	2017	2018	2019	2020	2021	2022	2023E	2024E
Northeast	205.0	195.9	186.6	183.7	154.4	163.0	153.5	134.8	119.5
Midwest	301.3	289.4	284.9	275.2	244.4	236.3	235.9	215.3	197.3
West	372.4	345.6	305.3	279.9	256.4	258.2	258.1	221.8	176.2
South	622.4	607.3	575.8	563.0	542.5	508.6	546.1	506.9	467.7

South West Midwest Northeast

Figure 29. U.S. VAWD Space by Region – Multi-client (Sq. Ft. Millions): 2016-2024E



	2016	2017	2018	2019	2020	2021	2022	2023E	2024E
Northeast	113.9	132.1	157.2	172.2	231.8	251.3	283.9	319.8	358.6
Midwest	113.0	141.3	182.3	209.2	272.9	306.5	354.7	400.6	450.1
West	66.7	112.6	161.6	207.9	260.5	288.0	333.9	394.3	470.5
South	98.1	143.5	191.9	237.3	310.7	350.1	431.9	508.5	597.5

South West Midwest Northeast

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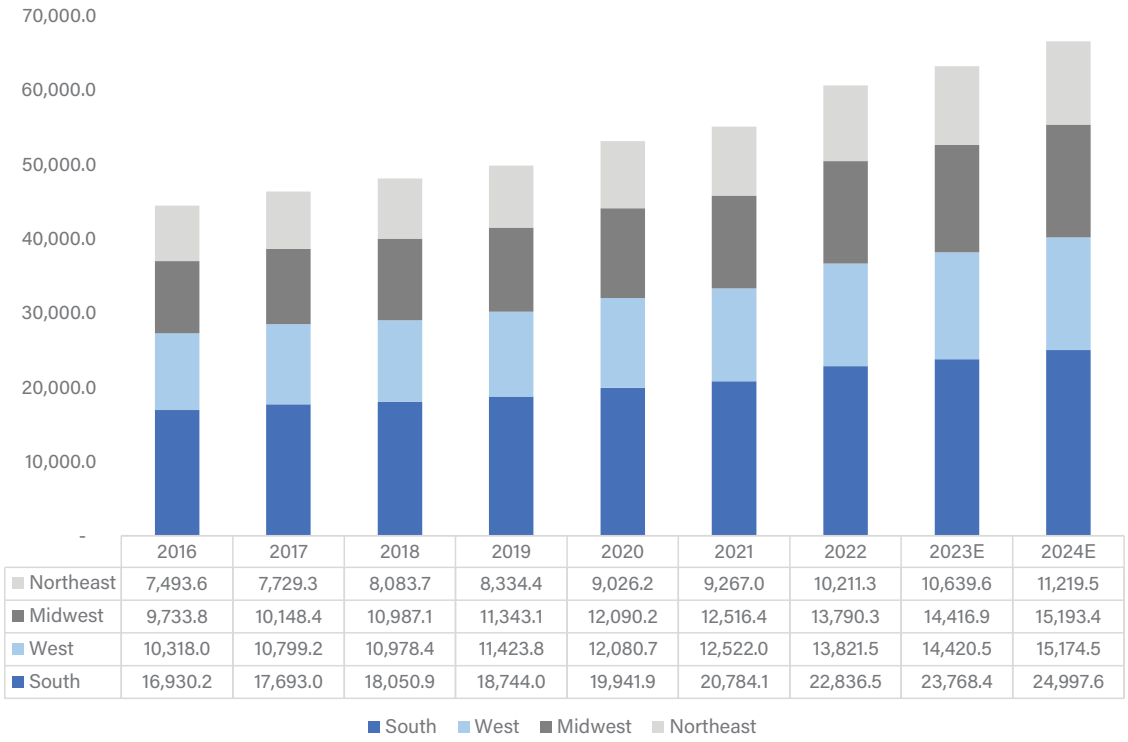
Warehouse Case Inventory Throughput by Regions

Figure 30 trends the annual case inventory throughput by regions from 2016 to 2024. In 2022, the South had the most VAWD annual case inventory, while the Northeast had the least VAWD annual case inventory. We expect to see a 5.3% growth in total U.S. VAWD annual case inventory from 2023 to 2024.

Figure 30. U.S. VAWD Annual Case Inventory Throughput by Regions (Millions): 2016-2024E



	2016	2017	2018	2019	2020	2021	2022	2023E	2024E
Northeast	7,493.6	7,729.3	8,083.7	8,334.4	9,026.2	9,267.0	10,211.3	10,639.6	11,219.5
Midwest	9,733.8	10,148.4	10,987.1	11,343.1	12,090.2	12,516.4	13,790.3	14,416.9	15,193.4
West	10,318.0	10,799.2	10,978.4	11,423.8	12,080.7	12,522.0	13,821.5	14,420.5	15,174.5
South	16,930.2	17,693.0	18,050.9	18,744.0	19,941.9	20,784.1	22,836.5	23,768.4	24,997.6

Warehouse Case Inventory Throughput by Commodities

We estimate total U.S. VAWD annual case inventory was 44,475.6 million cases in 2016 and is expected to reach 66,585.0 million cases in 2024. Our method for calculating inventory cases involves analyzing VAWD growth, each commodity as a percent of VAWD, standard case sizes by commodity, and benchmark inventory turns by commodity. The three vertical industries with the highest annual case inventory in 2022 were Food, Groceries; Technological, and Automotive. The vertical with the lowest annual case inventory was Elements.

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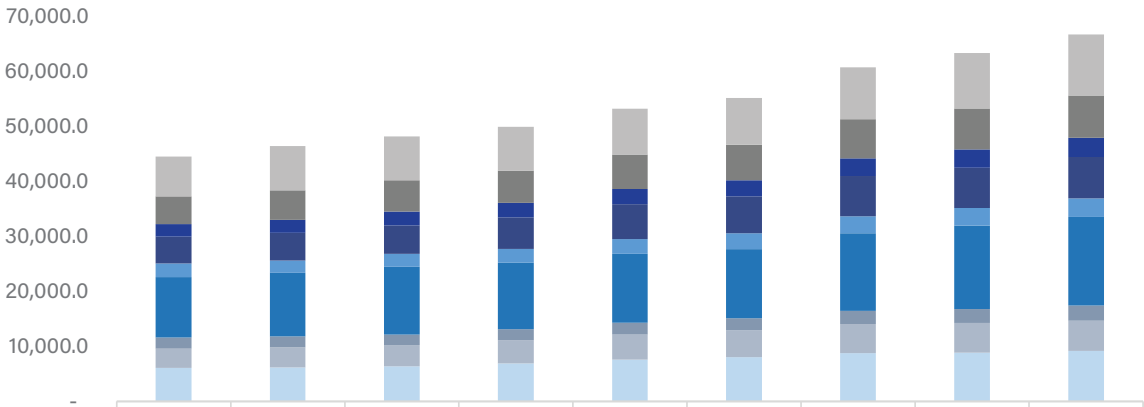
Figure 31. U.S. VAWD Annual Case Inventory Throughput by Commodities (Millions): 2016-2024E



	2016	2017	2018	2019	2020	2021	2022	2023E	2024E
Technological	7,210.2	8,055.3	7,941.6	7,955.5	8,334.7	8,488.7	9,430.7	10,050.6	11,006.0
Retailing	5,053.5	5,322.4	5,674.2	5,859.0	6,234.9	6,452.1	7,110.9	7,430.8	7,727.6
Other	2,263.0	2,382.7	2,539.4	2,621.2	2,788.8	2,885.5	3,180.4	3,324.2	3,457.9
Industrial	4,928.6	5,015.5	5,169.8	5,726.3	6,301.7	6,737.5	7,306.1	7,324.3	7,548.7
Healthcare	2,438.8	2,237.4	2,306.2	2,493.4	2,713.5	2,870.5	3,129.1	3,180.2	3,306.3
Food, groceries	10,962.2	11,552.3	12,322.4	12,059.8	12,477.8	12,542.6	14,027.3	15,189.2	16,112.4
Elements	2,038.7	1,984.8	1,952.1	1,997.9	2,116.6	2,180.5	2,408.5	2,531.1	2,751.3
Consumer Goods	3,492.1	3,634.1	3,829.9	4,196.3	4,595.0	4,889.8	5,314.7	5,360.5	5,487.8
Automotive	6,088.5	6,185.3	6,364.6	6,935.8	7,575.9	8,042.6	8,751.9	8,854.5	9,187.0

Contract Warehouse Pricing Guidelines

There are many factors that can play a part in the pricing for contract warehousing services. The pricing is mostly tailored by location. The storage fee is usually higher for areas with higher real estate costs. Besides location, costs can vary depending on if the warehouse is owned or leased by the 3PL. The process is driven by customer demands and unique circumstances. Refrigerated or special storage conditions and specialized equipment can increase storage fees. Pricing schemes have become more varied over time, but according to our 2022 warehousing study results, the handling charges, accessorial fees and racked/bulk rate benchmarks shown in Table 14 are reasonable for basic warehousing and value-added services.

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Table 14. Handling Charges

Handling Unit-Load	Average Rate	Range
Pallet in	$6.13	$4.50 - $8.25
Pallet out	$6.77	$4.80 - $10
Pallet in/out	$11.66	$9.60 - $16.50
Slip sheet in	$7.08	$6.40 - $8.00
Slip sheet out	$7.08	$6.40 - $8.00
Slip sheet in/out	$11.32	$12.80 - $16.00
Box car pallet in	$7.72	$6.16 - $9.00
Box car pallet out	$6.82	$6.16 - $8.00
Box car pallet in/out	$15.16	$12.32 - $17.00
Clamp in	$7.75	$6.00 - $10.00
Clamp out	$7.75	$6.00 - $10.00
Clamp in/out	$15.80	$12.00 - $20.00
Small case pick	$0.70	$0.30 - $1.85
Medium case pick	$0.90	$0.35 - $3.00
Large case pick	$1.16	$0.40 - $4.00
Piece pick	$0.60	$0.08 - $1.85

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Table 15. Accessorial Fees

Accessorial Fees	Per	Average Rate	Range
Monthly minimum	Month	$6,461	$250 - $25000
Bill of lading fee, domestic	Each	$7.25	$4.50 - $11.00
Bill of lading fee, international	Each	$11.69	$4.50 - $25.00
Parcel order fee	Each	$2.44	$1.00 - $6.50
Shrink wrap fee	Each	$4.39	$2.50 - $7.00
Labeling fee, pallet	Each	$0.52	$0.20 - $1.00
Labeling fee, case	Each	$0.39	$0.15 - $0.90
Forklift labor	Hour	$35.29	$22.00 - $60.00
Forklift labor, overtime	Hour	$48.79	$33.00 - $85.72
Special projects labor	Hour	$37.11	$20.00 - $57.12
Special projects labor, overtime	Hour	$54.62	$30.00 - $85.72
Clerical labor	Hour	$36.58	$30.00 - $57.12
Clerical labor, overtime	Hour	$57.14	$42.75 - $87.50
I.T. labor rate	Hour	$174.55	$125 - $300
I.T. labor rate, overtime	Hour	$249.44	$125 - $450
EDI fee, per transaction	Each	$0.16	$0.10 - $0.60

Table 16. Racked/Bulk Rate

Racked/Bulk Rate	Average Rate	Range
RACKED: Fully burdened rate per square foot, includes margin	$0.75	$0.35 – $1.35
BULK: Fully burdened rate per square foot, includes operating margin	$0.67	$0.35 – $1.35

Fulfillment Fees

E-commerce is changing the landscape of 3PL warehousing. Nearly every major trend in warehousing—a tight labor market, adoption of new technologies, increased rents, low vacancy rates, and increasing demand, equally affect private and outsourced e-commerce warehousing. 3PLs are adapting to this changing landscape by being agile, flexible, innovative, and resilient.

Statista reports the average e-commerce pick and pack fee for single item orders in the United States from 2017 to 2021. In 2017 the fee was $2.64, in 2018 it was $2.68, in 2019 it was $2.96, and in 2021 it was $3.13. The Statista pick and pack fees include the cost of picking an order from storage and preparing it for shipment. In our study, a single item order ranged from $2.80 to $2.19 for pick, pack and ship based on volume of orders. This does not include the cost for storage. Table 17 shows the fulfillment fees for

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broken case picking with different order ranges, insert fees, as well as other fulfillment fees.

Table 17. Average Rate of Order Fee, Each Pick Fee, and Insert Fee

Orders per Month	0-499	500-999	1,000-1,999	2,000-2,000	3,000-4,999	5,000+
Order fee	$2.35	$2.18	$2.05	$2.02	$1.96	$1.83
Each pick fee	$0.45	$0.42	$0.41	$0.40	$0.38	$0.36
Insert fee	$0.25	$0.25	$0.25	$0.25	$0.25	$0.25

Table 18. Average Rate of Storage

Storage	Average Rate
Pallet storage	$19.46
Bin storage shelf	$4.49
Flow rack storage	$8.20

Table 19. Other Fulfillment Fees

Special Projects	Average Rate
Initial set-up fee	$3,394.33
Labor hourly rate	$46.03
Touch hourly fee	$43.68

Warehousing Study General Questions Overview

Below are the questions from our General Questionnaire and our analysis based on the feedback:
Q: What important changes, trends, and challenges have you seen in the warehousing business in the last 2-3 years?

The top significant changes, trends, and challenges in 2022 include: Labor, Warehousing Space, Automation, and High Cost. Labor and warehouse issues were mentioned by as high as 93% of the participants. Automation and high cost were mentioned by 53% of the 3PL participants.

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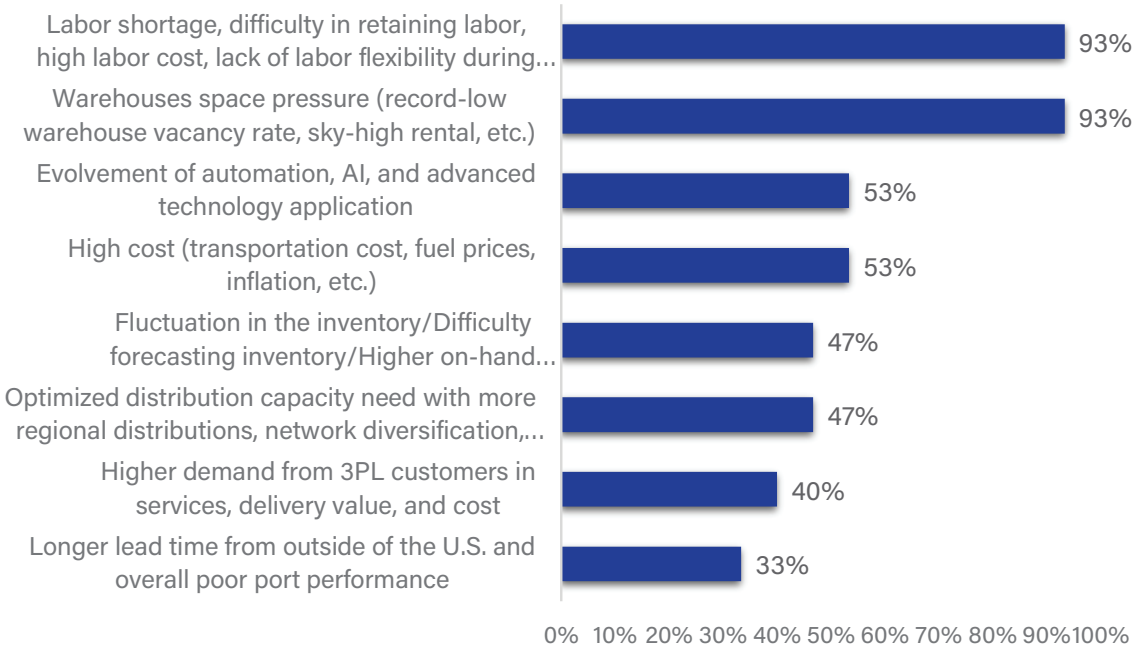
Figure 32. Changes, Trends, Challenges in the Warehousing Business



Below are some of the 3PLs' comments:

"The primary change in the last 3 years has been labor cost and sustainment. This issue has caused symptom effects on numerous other areas of the business. This is driving lots of retentions challenging in labor due to continually increasing pay rates."

"Capacity, labor, pushing technology where it is not needed but flashy. Technology for the sake of technology driving up cost in certain commodities. Ability to provide cost savings to clients as costs increase. Challenged with ability to pass on cost increases commensurate with inflation even though the client is experiencing the same challenge with their supply chain and upstream costs. Warehousing capacity is very tight in our networks and extremely expensive to expand in the short term. Labor is transient. The ability to move from provider to provider with pay increases and bonuses is a game. Building your core team is difficult. Hire ten keep one. Labor sustainability is a competitive advantage."

"Perhaps more significant is the challenge to find quality labor. Hourly warehouse workers and truck drivers are in high demand, and we continue to see a resignation in the overall quantity of the labor pool across the board. While recruiting and attracting new talent is a challenge, retention and high turnover rates continue to plague the industry."

"Attracting & retaining quality labor now requires higher than before wages; often above the 75th percentile and coupled with sign-on bonuses and seasonal incentives to mitigate attrition."
"This trend is driving many customers to seek automation alternatives to mitigate the labor challenges and continued cost in labor. Also being generated by this is a need for creative scheduling for these associates."

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"Another change is related to the decrease in available warehouse space in some areas of the country, resulting in very high cost per square foot. In the last few years, we have seen a significant increase in the demand for warehousing and less supply."

"E-commerce is clearly growing but so is the competition for fulfillment options and warehousing. Cost of warehousing has skyrocketed as has cost of labor. Customers are expecting free shipping and the Amazon 2 day has continued to raise expectations even for orders outside Amazon."

"Warehousing availability has been a big challenge for us. Due to growth in e-commerce, vacancy rates for industrial properties are near an all-time low, while utilization is up, and prices are at record levels."

"Rent per sq. ft. has increased in this market by 50% in 3 years. Industrial occupancy is at 96-97% and the buildings under construction are for the most part already leased. This market averages 92-94% occupancy and there are no trends we see that will get us to the historic occupancy rate without a significant economic downturn or developers going speculative. Capacity is returning to the transportation markets for the first time in 2.5 years, but the port situation (any of the big container ports) fluctuates between poor and barely "OK"."

"Just In Case Inventory-consumers want choices-buy online, pick up in store, same day fulfillment for e-commerce. Consumers want product when they want it. Higher percentage of e-commerce sales, more use of Robotics, Automation, and AI due to labor challenges. Use of non-port cities for lower real estate and labor costs, use of middle of the country facilities for ecommerce transit time and costs to consumer and lower real estate and labor costs vs. port cities."

"We have faced challenges surrounding same day delivery expectations. We also continue to work with the challenges Covid has caused and are able to offer flexible work schedules to our employees. Another challenge has been the rising costs in all categories across the board."

"Balancing cost-to-serve requirements is a challenge. Businesses, especially those with lower cost/lower margin products, face significant challenges being able to fulfill demand within a 1–3-day service window at a low-to-zero shipping cost to the consumer. In addition to distribution constraints, volatility in both price and capacity for international and domestic transportation, as well as erratic service capability from last mile & parcel carriers is causing significant supply chain challenges."

"More customers are utilizing regional or hybrid regional distribution models to offset the cost of transportation and distance from port of entry (for import customers) based on the availability of transportation capacity. This has been most notable for customers who use sea containers to land product at their warehouse."

"Increased need for overflow space to support supply chain disruptions and customers holding more on-hand inventory to avoid shortages. Rather than keeping their inventory as lean as possible to minimize extra costs, vendors are planning for the unexpected and making upfront investments in more stock to secure their operations in the long term from logistical and supply chain disruptions."

"A notable change in the warehousing business is the lack of RFP's or changes clients are making. Clients are tending to stay with their current 3PL providers. We believe they are afraid to upset the apple cart as that may lead to increasing costs above inflation. If they are not making a critical change or

have a major gap in storage needs, they are staying put, not adding cost to the legacy business. In the healthcare space the U.S. Government has taken up significant space or required additional space built to shore up the strategic national stockpiles. This has applied stress to the extremely limited amount of refrigerated and frozen facilities."

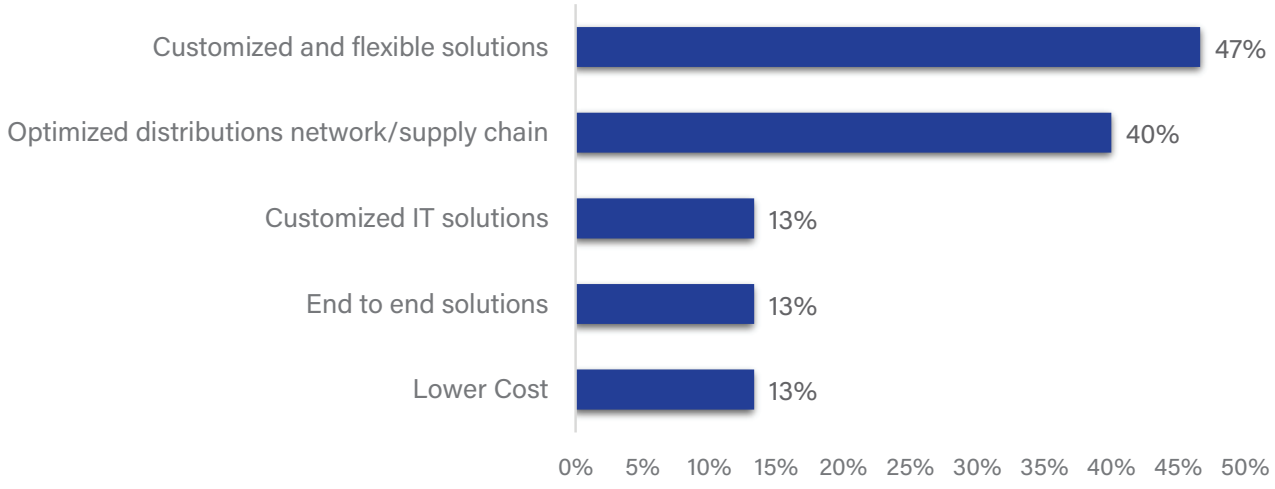
"Demand for e-commerce fulfilment continues to grow, exponentially during the pandemic. Also, companies focus on supply chain including higher supply chain decision makers at the C-level as Chief Supply Chain Officer and Chief Logistics Officer."

"Customers have been more willing to spend money to evaluate their current operations. This has been an "eye opener" for many and given them full transparency into exactly how efficient (or not) their fulfillment operations actually are, and allows them to shift and relocate production/warehouse operations when necessary."

"One of our challenges is cargo shipment delays. Port congestion and delays have led to a variety of issues throughout the supply chain industry. Some challenges include goods piling up at inland warehouses, vacancies disappearing, and rent drastically increasing."

Q: Based upon feedback from your customers, what differentiates your service offering from the competition?
47% of the study participants think that customized and flexible solutions differentiate their service offerings from their competitors, followed by optimized distributions network/supply chain (40%), customized IT solutions, end to end solutions, and lower cost.

Figure 33. Differentiations in 3PL's Warehousing Service



Below are some of the 3PLs' comments:

"We are most differentiated in our ability to optimize North American supply chains and integrate discrete services to lower total landed cost. We deploy a combination of best-of-breed off-the-shelf products with proprietary solutions to maximize customer value. All are supported by in-house IT subject-matter-experts who have the knowledge and expertise to customize operational systems regardless of customer industry or nuances."

"We deliver experience, efficiency and excellence in a full-service, flexible distribution center management solution. We customize and flex to fit precisely what the clients need to streamline and optimize distribution."

"Our company is willing to customize our service offerings to meet our customers logistics needs. We assign customer service teams to specific accounts with similar requirements so we can flex that labor/support across our network. Our large, nationwide network allows us to flex space and labor as needed and allows us to share our learnings and apply solutions on a system level."

"We bring the advantages of a mid-size 3PL provider: breadth and depth of service offerings and supply chain capability with a more personalized, high touch and accessible brand of service. This position also allows us to do things from a customized solutions perspective that smaller providers cannot do, and larger providers in some cases will not do. We also place a higher value on leadership development, cultural development and retention that many providers to in our space which allows us to continually drive more value through people."

"The strength of our business model as the leading global logistics provider enables our customers grow their overall business by executing a clear supply chain strategy that aligns key cost and service metrics. We also help optimize their supply chains via network design and routing, consolidation, switching transport modes/intermodal, and technology to increase productivity, control, forecasting ability and flexibility."

"We own our facilities and equipment. In the 3PL space the overwhelming majority of larger competitors are leasing facilities, material handling equipment, IT systems, robotics, etc. This has allowed us to control some of our costs better than those who are subject to the 10+% rental/leasing rate hikes."

"We are a mid-tier provider offering the high level of dedicated engineering, automation, capital investment, onboarding sophistication, and client services support in our category. This has driven our growth and success and cultivated unusually long-lasting relationships with our clients. We are nimble but have a highly SOP-driven culture of excellence. We are process-driven but highly responsive and flexible."

"Transparency and end to end provider. Always full transparency on cost, as it is very different from most 3PL models. We offer our fully customizable and implemented Oracle WMS and offer an end-to-end solution."

"Our large warehouse square feet in a regional area allows us to have the ability to flex space, while offering tailored salutations to meeting our customers' requirements, as well as offering services for asset truck loads."

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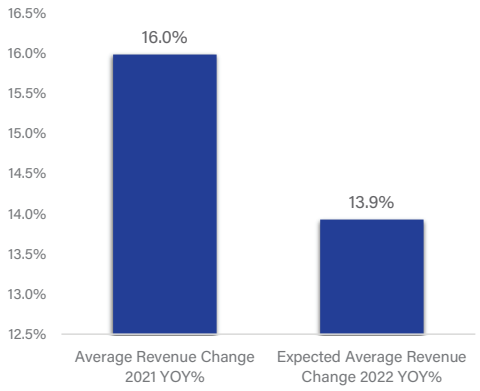
Q: How much did your business change from 2020 to 2021? What's your expected warehousing revenue for 2022?

94% of the 3PL participants had positive revenue growth in 2021 with average Year-Over-Year (YOY) growth of 16%. One 3PL realized the highest comparative YOY growth of 51.9%; the lowest growth was -3.2%. For 2022, the average expected revenue growth was 13.9%, with the highest expected YOY% growth for 2022 of 37.8%, and the lowest growth of -16.8%.

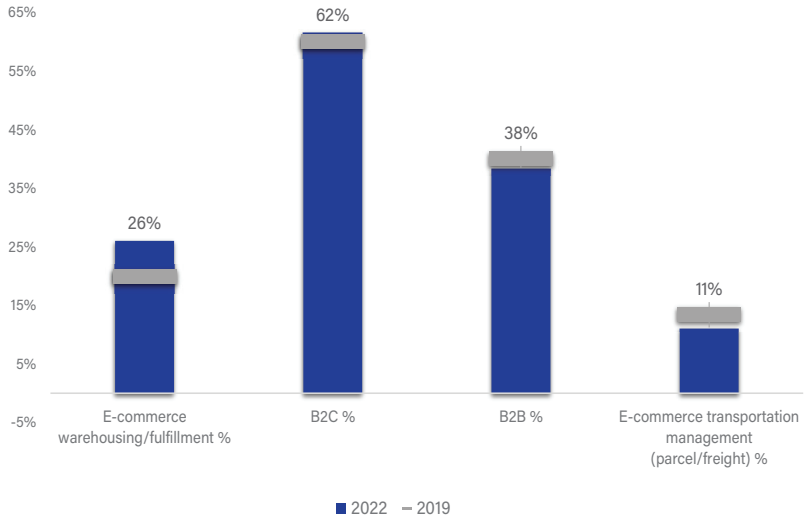
Figure 34. Average YOY Revenue Changes 2021 & 2022



Q: What percent of your total warehousing revenue in 2021 is from e-commerce warehousing/fulfillment? What percent of your total revenue is from e-commerce transportation management (parcel/freight)?

Figure 35 shows the comparison of our 2019 and 2022 e-commerce analyses in the contract warehousing space. In 2022, an average of 26% of total warehousing revenue was from e-commerce warehousing/fulfillment. Of that, Business-to-Consumer (B2C) revenue averaged 62% and Business-to-Business (B2B) averaged 38%. An average of 11% of total revenue was from e-commerce transportation management (parcel/freight). In 2022, e-commerce warehousing revenue was 6% higher than in 2019 and B2C e-commerce revenue was 2% higher. E-commerce transportation management (parcel/freight) revenue decreased by 2.3% since 2019.

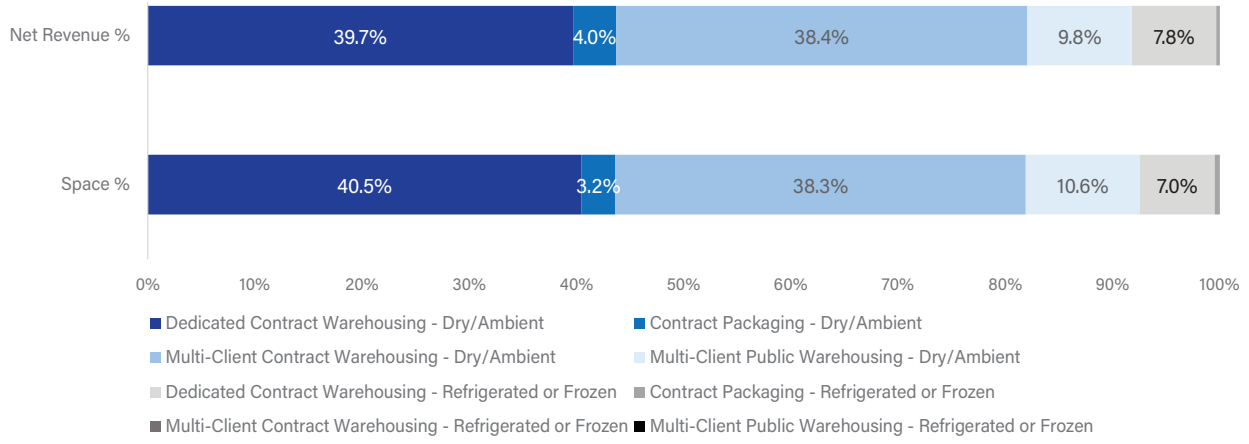
Figure 35. E-commerce Fulfillment of Warehousing Revenue 2019 vs. 2022



Q: What percent of your total net revenue (without purchased transportation) and space came from the following functions? Dedicated Contract warehousing, Contract Packaging, Multi-Client Contract warehousing or Multi-Client Public warehousing for Dry/Ambient and Refrigerated/Frozen?
We separated the warehouses to eight types for this question to analyze trends in net revenue and space percentage. The warehouse types are: Multi-Client Contract Warehousing - Dry/Ambient, Multi-Client Public Warehousing - Dry/Ambient, Dedicated Contract Warehousing - Refrigerated or Frozen, Contract Packaging - Refrigerated or Frozen, Multi-Client Contract Warehousing - Refrigerated or Frozen, Multi-Client Public Warehousing - Refrigerated or Frozen.

Dedicated Contract Warehousing - Dry/Ambient was the largest warehouse type with 39.7% of the net revenue and 40.5% of the space, closely followed by Multi-Client Contract Warehousing - Dry/Ambient which has 38.4% of the net revenue and 38.3% of the space. None of the study respondents had Refrigerated or Frozen Multi-Client Public Warehousing net revenue or space.

Figure 36. Net Revenue and Space Percentage of 8 Types of Warehousing



Q: What is your overall I.T. cost as a percent of total warehousing costs?
Information Technology (I.T.) costs run from 1% to 8% of total 3PL costs. The average I.T. cost was 3.6% of total costs, which was 0.3% higher than in our 2019 study. I.T. costs had average YOY growth of 10% in 2021. One 3PL's I.T. cost grew 25% in 2021, marking the highest comparative increase. Robotic/automation cost was 8% of total I.T. cost, with one 3PL logging 47% of its total I.T. cost for robotic/automation.

Table 20. I.T. Cost Percentage

	Overall I.T. Cost Percentage	I.T. Cost Growth - 2020 to 2021	Estimated Robotic/Automation Cost Percentage
Average	3.6%	10%	8%
Min	1.0%	0%	0%
Max	8.0%	25%	47%

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Over the last ten years, technology has changed dramatically in logistics and warehousing. The labor-intensive piece-picking work characteristic of e-commerce fulfillment requires three times as many employees per square foot as a traditional contract warehouse. As labor demand grows, high wages are exacerbated by increasing local competition. In addition, in today's fast-paced climate, 3PL operations require better use of planning, talent, and real-time data to meet the two-day and even two-hour delivery windows. As a result, investment in technology and automated solutions has become more attractive, both as a cost-saving measure and an opportunity to drive efficiency. 3PLs will need to digitalize operations deploying best-in-breed technology solutions and innovate to keep pace with changing customer demands and increased competition within the industry.

In the past decade, automation, advanced technologies, robotics, and Artificial Intelligence (AI) have been increasing deployed in warehousing operations. VAWD 3PLs have also seen an increase in the level of functional sophistication provided by their warehouse management systems for managing inventories, order picking, labor, warehouse utilities, and managing shipping and replenishment.

Many 3PLs invested in cloud robotics last year like Locus, Fetch, Six Rivers, and inVia for a few simple reasons. Cloud robots can improve efficiency, accuracy, and speed of picking. By accessing real-time data and analytics from the cloud, these robots can optimize their routes, reduce idle time, reduce human transport/travel time, and prioritize tasks based on demand. These autonomous mobile robots (AMRs) are robots that use sensors, cameras, and mapping software to navigate the warehouse and perform tasks such as transporting items. Cloud robots are quickly deployed, in some cases as quick as two weeks. Leasing robots can offer warehouses greater flexibility in terms of scaling their operations up or down as demand fluctuates.

Below are some additional examples of emerging technologies and automation used in warehouse operations.

- Automated Storage and Retrieval Systems (AS/RS) use a combination of robotics, software, and sensors to automatically store and retrieve products from a warehouse racking system. They can be used to increase storage density and reduce the time and labor required to retrieve products.
- Layer picking robots are specialized robotic systems that can be used to efficiently pick layers of products from pallets, improving speed over manual operations.
- Automated palletizers and de-palletizers can be used to automatically stack and unstack goods to and from pallets. An automated machine palletizer takes products from a conveyor and arranges them on a pre-programmed patter on the pallet. An automated machine de-palletizer is a machine used to remove products from a pallet. Robotic palletizers use robotic arms to stack/unstack goods on pallets. Hybrid palletizers combine the benefits of robotic and conventional palletizers to create a highly efficient and flexible palletizing system.
- Pallet conveyors can be used to transport pallets from one location to another within the warehouse, reducing the need for manual labor.
- Conveyor Systems use a network of belts or rollers to transport products throughout a warehouse or distribution center. Conveyor systems can be used to automate the process of moving products from one location to another, reducing labor costs and improving efficiency.
- Pick-to-Light Systems, reduce the time and errors associated with manual picking via lights or displays which guide workers through the picking process.
- Voice picking technology uses voice commands and responses to guide workers through the picking process. Workers wear a headset and are directed to the location of the item and given the quantity

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to pick.
- Automated Guided Vehicles (AGVs) are mobile robots which can be programmed to transport products within a warehouse or distribution center. They are often used to transport heavy items or reduce the time and labor required to move products between different areas of the warehouse.
- Augmented Reality (AR) picking technology uses wearable devices like smart-glasses or mobile devices to display digital images or information about the item to be picked. This can include location information, images, or instructions on how to pick the item.
- Drones are used in some warehouse environments to move small items from one location to another and perform cycle counting.

Arguably, there is a higher ROI for advanced technologies and automation, like AS/RS. The drawback for 3PLs is that this is a long-term play with significant up-front and long-term capital costs. The 3PLs are reluctant to invest in technologies and automation beyond the length of the client contract. Our study shows that 3PLs rank technology the lowest on its level of maturity and ability to execute.

The five critical areas below are attributes of leading 3PL VAWD operations.
Safety: In almost all VAWD 3PL operations, safety expectations are communicated throughout the entire organization. Safety standards are set and measured. There is a safety committee and regular training for all associates. Housekeeping, cleanliness, and Lean process management are all part of the safety program. Equipment is checked before usage and lock out tag out processes are set in place. There are safety audits and random safety sweeps. Accidents and near misses are discussed and a root cause analysis is conducted to prevent future near misses or accidents. Good behavior is rewarded.

Continuous Improvement: Leading 3PLs, clearly communicate their vision, mission, and values to all associates. The associates understand the vision, mission, and values and how they can contribute to the purpose. There is a formal Lean/Six Sigma program where there are green belt, black belt and master black belt associates available to all facilities. The visual management is standardized with active metrics used to management the day-to-day business. Lean/Six Sigma tools are easily available to all associates. There is a process in place to manage defects, corrective, and preventative action reports. All employees understand how to perform root cause analysis such as fish bone diagrams, SIPOC (Suppliers, Inputs, Process, Outputs, and Customers), 5-why's, DMAIC (Define, Measure, Analyze, Improve and Control), and A4s. KPI management is standardized. The business scorecard is aligned with the business vision and mission. All associates understand the metrics that drive success in their department. The employee suggestion program is formalized. The standard work sheets are posted at workstations to include Leadership Standard work. The leaders are trained on Lean/Six Sigma to include certification.

Quality: There is a formal Quality Program with centralized access to the program. The sites are audited on compliance and there are Quality Sweeps on the effectiveness of the program. Standard Operating Procedures (SOPs) are audited and up to date. There are SOPs for all processes.
Common features of a quality management system are:

1. Document Control (SOPs, job descriptions, standard work, RACI matrix, training matrix...)
2. Change Control
3. Corrective Action and Preventative Action (CAPA)
4. Audit Management
5. Compliance Management

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6. Risk Management
7. Statistical Process Control
8. Supplier Quality Management
9. Employee Training and Management

People, Talent Management: Job descriptions are formalized, and all associates know what is expected of them. The employees have the tools they need to effectively do their job. Performance reviews are conducted for all associates. There is a formal mentorship program in place and the associates actively participate in the program. There is an employee development program where they can grow and learn skills beyond the day-to-day work. Roles and responsibilities are somewhat personalized to meet the strengths of the associates.

Technology: The Business Intelligence (BI) system is easy to use. The BI tool is used for data analytics, information, reporting, data and process mining, benchmarking, predictive and prescriptive analytics, and strategic decision making. All sites use a Tier-1 WMS. The Learning Management System (LMS) is integrated with the WMS. The Customer relationship Management (CRM) starts with sales and is maintained throughout the tenure of the customer relationship. Customers have access to the data through an online portal that includes real-time inquiries and reporting. The portal is a self-serve tool to view and manage the account. Automation of processes are appropriately used (examples are carousels, conveyors, automatic stacker cranes, robots, pick-to-light, pick-to-voice and automated storage and retrieval systems). There is a digital strategy that includes digital optimization and digital monetization.

Q: Please rank the level of your organization's maturity in each area below (A. Safety, B. People, Talent Management, C. Technology, D. Continuous Improvement, E. Quality Program) with 1 being the lowest and 5 being highest.

In each study we ask 3PLs to rank their level of maturity on a scale of 1 to 5, with 5 being the highest and 1 being the lowest in five critical operational areas. Each year Safety is the top scoring area. No one could argue that Safety shouldn't be at the top of the list and it seems to be the most operationally mature. While 94% of the respondents pointed to labor management as a top challenge; labor shortages, difficulty in retaining labor, labor costs, and lack of labor flexibility during the pandemic where key areas mentioned. Even so, People, Talent Management ranks low on the 3PLs execution scale. Compared to 2019, we did see a jump in I.T. costs as a percent of total costs from 3.3% to 3.6%, with some 3PLS hitting 6% to 8% of total operating costs. Still, 3PLs as a group are not satisfied with the level of their technological abilities.

The overall rankings from high to low in our 2022 study are: Safety, Quality Program, Continuous Improvement, People, Talent Management, and lastly Technology. The only difference in the overall rankings versus the 2019 study was that People, Talent Management ranked No. 5 and Technology ranked No. 4.

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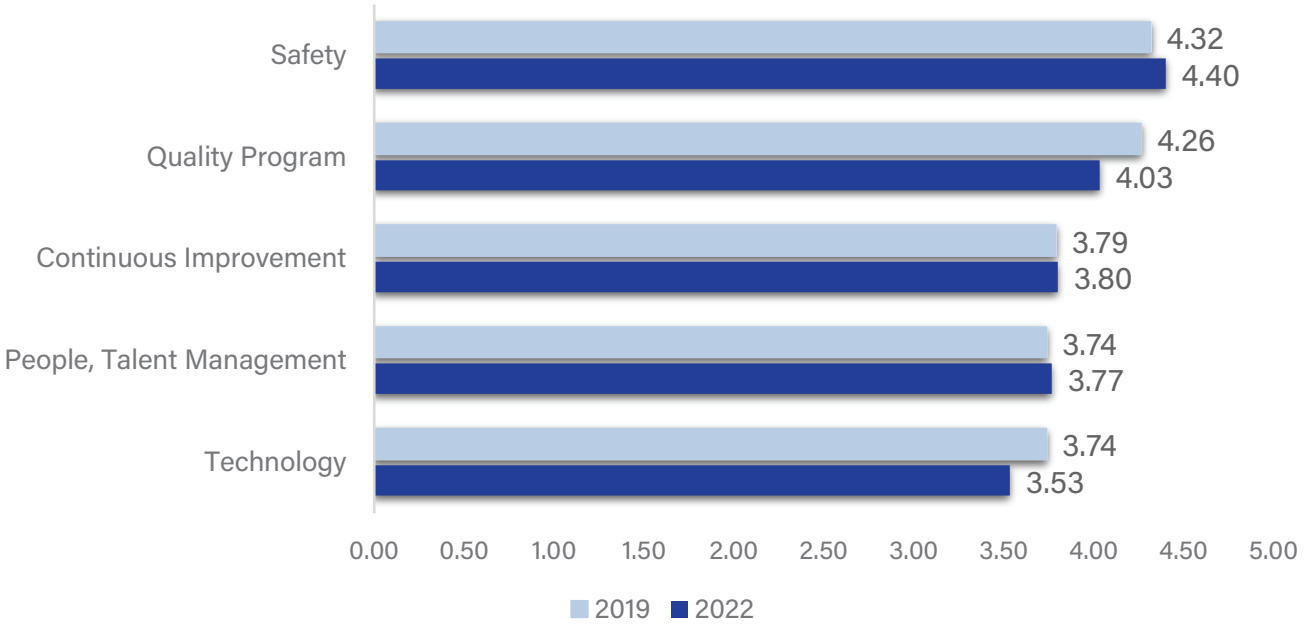
Figure 37. Level of Maturity in Five Critical Areas of VAWD



Q: Are you planning on adding warehousing operations to your network over the next 3 years?
71% of 3PL participants have the plan to add warehousing operations to their current network in the next three years. 14% said No and 14% were "Not Sure".

Figure 38. Plan on Adding Warehouses Over the Next 3 Years

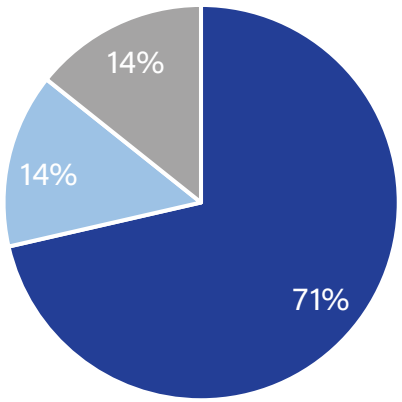


Table 21 shows the average and maximum number of warehouses and total square footage estimates provided by the participants for the next three years. The average expanded number of dry/ambient warehouses was six and the average expanded number of refrigerated/frozen warehouses was one. Dry/ambient storage space is expected to expand to 838,000 square feet on average, and refrigerated/frozen space is anticipated to expand 51,981 square feet on average.

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Table 21. Expanded Warehousing Number and Square Footage Estimates Over the Next 3 Years

	Number of Warehouses Estimate-Dry/Ambient	Number of Warehouses Estimate-Refrigerated/Frozen	Total Square Footage Estimate-Dry/Ambient (Sq. Ft.)	Total Square Footage Estimate-Refrigerated/Frozen (Sq. Ft.)
Average	6	1	838,000	51,981
Max	26	10	3,000,000	292,814

Current Warehouse Rental and Vacancy Rates

In total, the Top 50 VAWD 3PLs grew their networks from 3,821 warehouses in 2019 to 4,272 in 2022. The average warehouse size of these 50 decreased by 19% from 167,984 to 141,533 square feet. Our past several warehouse studies show the average VAWD warehouse size was 246,024 sq. ft. in 2016, 328,643 sq. ft. in 2019, and 228,296 sq. ft. in 2022. In our 2022 study, 56% of the warehouses were smaller than 200,000 square feet and "big box" warehouses (at 600,000 square feet or greater) are less than 5%. Year-over-year dedicated warehousing is decreasing as multi-client warehousing increases. Nearly 55% of the distribution centers are multi-client compared to 21% in 2017. In this study we also found there was a 62% increase in the number of clients per warehouse.

The top areas for distribution warehouses in the United States are typically regions that have strong transportation infrastructure, access to major shipping ports, and a large population or customer base. Here are a few examples:

- Southern California - Southern California is a major hub for logistics and has one of the largest ports in the US, the Port of Los Angeles. The region's extensive transportation infrastructure, including highways, rail lines, and airports, makes it an ideal location for 3PL warehouses.
- Dallas-Fort Worth, Texas - Dallas-Fort Worth is a central location that offers easy access to major shipping ports, including the Port of Houston and the Port of New Orleans. The region's central location also makes it an ideal location for companies that need to distribute products to both coasts.
- Chicago, Illinois - Chicago is a major transportation hub, with access to multiple major highways, rail lines, and airports. Its central location in the U.S. makes it an ideal location for companies that need to distribute products to the East Coast, Midwest, and West Coast.
- Atlanta, Georgia - Atlanta is a major transportation hub in the Southeast, with easy access to the Port of Savannah and the Port of Charleston. Its proximity to major highways and rail lines also makes it an ideal location for distribution warehouses.
- New York/New Jersey - The New York/New Jersey region is a major hub for logistics and has access to the Port of New York and New Jersey, one of the largest ports in the U.S. Its location on the East Coast also makes it an ideal location for companies that need to distribute products to the Northeast and Mid-Atlantic regions.
- Phoenix, Arizona – Phoenix has seen significant growth in the distribution warehouse industry in recent years. The region's proximity to major transportation routes, and access to major ports in Southern California and Mexico, make it an attractive location for companies looking to establish distribution centers.

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These are just a few examples of the top areas for 3PL warehouses in the U.S. Other factors, such as labor costs and availability, real estate prices, and taxes, can also play a role in companies' decisions on where to locate their distribution warehouses.

Table 22. Top 5 Locations Under Construction

Under construction	Average Sq. Ft.	Average Rent	Average Vacancy
Dallas-Fort Worth	69,258,460	$7.34	5.20%
Atlanta	45,150,729	$6.93	3.86%
Inland Empire	38,943,339	$17.12	1.30%
Phoenix	38,683,259	$11.05	4.24%
Chicago	38,074,913	$6.63	3.76%

Table 23. Top 5 Locations with Inventory

Inventory	Average Sq. Ft.	Average Rent	Average Vacancy
Chicago	1,341,818,439	$6.63	3.76%
Los Angeles	1,139,782,154	$19.76	1.30%
Dallas/Ft. Worth	1,004,963,119	$7.34	5.20%
New York City Metro	872,174,527	$15.75	2.80%
Harrisburg	863,693,166	$7.32	2.70%

Table 24. Price Per Square Foot, Vacancy Rate, and Inventory by Market

REGION	STATE	RATE (USD$)	VACANCY	INVENTORY (Sq. Ft.)
TOTAL MIDWEST	**MIDWEST**	**$5.82**	**3.5%**	**5,874,552,993**
Chicago	IL	$6.63	3.8%	1,341,818,439
Cincinnati	OH	$5.98	2.4%	476,834,870
Cleveland	OH	$5.19	3.6%	334,484,509
Columbus	OH	$5.96	3.4%	302,298,574
Dayton	OH	$5.19	3.4%	99,521,303
Detroit	MI	$7.13	3.1%	566,131,387
Grand Rapids	MI	$5.59	3.1%	68,949,089
Indianapolis	IN	$5.49	4.9%	360,869,810
Kansas City	MO	$4.99	3.7%	304,161,706
Louisville	KY	$5.04	3.9%	178,028,568
Milwaukee	WI	$5.09	3.8%	268,679,782
Minneapolis/St. Paul	MN	$6.76	3.1%	399,151,794
Omaha	NE	$6.90	2.1%	94,599,319
St. Louis	MO	$5.74	3.5%	273,549,149
Minneapolis	MN	$7.56	3.0%	405,628,976
SaintLouis	MO	$6.60	4.1%	326,319,604
Madison	WI	$7.08	2.8%	73,526,115

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REGION	STATE	RATE (USD$)	VACANCY	INVENTORY (Sq. Ft.)
TOTAL NORTHEAST	**NORTHEAST**	**$11.03**	**3.6%**	**5,407,617,705**
Baltimore	MD	$8.31	4.8%	248,127,506
Boston	MA	$13.67	4.1%	252,761,216
Central New Jersey	NJ	$14.97	3.1%	345,863,185
Hartford	CT	$5.48	4.6%	113,917,023
Long Island	NY	$16.28	3.4%	163,869,463
New Hampshire Markets	NH	$11.31	2.8%	71,283,627
New York City Metro	NY	$15.75	2.8%	872,174,527
Northern New Jersey	NJ	$15.55	2.6%	352,230,832
PA I-81/I-78 Distribution Corridor	PA	$7.34	3.6%	277,080,751
Philadelphia	PA	$10.30	3.5%	397,227,187
Pittsburgh	PA	$7.15	4.7%	161,843,920
Washington, DC	DC	$12.25	4.5%	293,105,879
Washington	DC	$14.76	4.1%	292,689,007
Atlantic City	NJ	$9.60	3.5%	9,415,620
Trenton	NJ	$9.24	5.3%	248,331,983
Vineland	NJ	$6.72	4.3%	42,974,678
Long Island	NY	$17.16	4.1%	109,297,561
Harrisburg	PA	$7.32	2.7%	863,693,166
New York	NY	$18.12	4.0%	182,482,147
Lehigh Valley	PA	$7.92	4.1%	109,248,428
TOTAL SOUTH	**SOUTH**	**$7.67**	**4.1%**	**7,057,703,780**
Atlanta	GA	$6.93	3.9%	767,846,221
Austin	TX	$12.01	5.3%	93,814,418
Birmingham	AL	$5.51	4.9%	141,594,329
Broward County, FL	FL	$13.09	5.2%	114,080,355
Charleston	SC	$8.69	1.9%	248,094,789
Charlotte	NC	$6.70	3.9%	290,988,080
Columbia	SC	$4.62	3.7%	67,988,805
Dallas/Ft. Worth	TX	$7.34	5.2%	1,004,963,119
Florence Myrtle Beach	FL	$5.30	3.3%	35,570,744
Fort Lauderdale	FL	$13.86	3.9%	119,669,517
Greenville Spartanburg	SC	$4.78	3.1%	226,535,565
Houston	TX	$7.76	5.2%	805,826,620
Huntsville	AL	$6.59	9.4%	42,767,308
Jacksonville	FL	$6.80	2.4%	136,137,479
Memphis	TN	$4.35	5.2%	298,451,001
Miami	FL	$14.70	2.5%	239,029,857
Nashville	TN	$8.15	2.8%	195,741,775
Norfolk	VA	$7.57	0.9%	84,721,598
Orlando	FL	$9.44	3.2%	187,038,692
Palm Beach	FL	$13.47	3.8%	53,573,349
Raleigh/Durham	NC	$10.55	4.1%	97,108,225
Richmond	VA	$6.01	3.0%	111,336,124
San Antonia	TX	$7.60	3.9%	149,911,501
Savannah	GA	$6.43	1.2%	103,945,669
Shenandoah Valley/I-81 Corridor	VA	$5.49	4.9%	60,832,177
South Florida	FL	$13.73	3.0%	403,634,483
Tampa/St. Petersburg	FL	$8.24	4.6%	284,049,623
Fort Myers	FL	$10.80	1.5%	36,838,206
Naples	FL	$14.28	1.3%	13,528,072
Durham	NC	$10.20	4.4%	47,491,505
Raleigh	NC	$10.44	3.4%	96,861,360
Greenville	SC	$6.12	3.5%	97,986,071
Spartanburg	SC	$5.76	3.9%	137,214,564
Dallas-FortWorth	TX	$8.76	5.3%	262,532,582

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REGION	STATE	RATE (USD$)	VACANCY	INVENTORY (Sq. Ft.)
TOTAL WEST	**WEST**	**$6.71**	**3.1%**	**6,645,945,668**
Albuquerque	NM	$11.50	0.6%	42,855,587
Bakersfield	CA	$10.50	2.6%	44,125,121
Boise	ID	$10.02	2.8%	48,009,769
Central Idaho	ID	$9.42	1.1%	14,019,578
Denver	CO	$9.46	6.7%	257,145,675
East Bay	CA	$14.03	3.8%	229,294,205
Eastern Idaho	ID	$7.57	6.7%	10,176,872
Fairfield, CA	CA	$8.98	0.9%	56,264,397
Fresno	CA	$7.54	2.8%	54,585,705
Honolulu	HI	$17.75	0.8%	41,471,447
Inland Empire	CA	$17.12	1.3%	664,329,515
Las Vegas	NV	$13.00	1.8%	150,041,807
Los Angeles	CA	$19.76	1.3%	1,139,782,154
Oakland/East Bay	CA	$16.75	3.4%	255,720,629
Orange County	CA	$19.24	1.2%	267,707,541
Phoenix	AZ	$11.05	4.2%	378,132,320
Portland	OR	$10.62	2.8%	231,659,472
Reno/Sparks	NV	$10.54	1.4%	112,482,531
Sacramento	CA	$9.01	3.2%	172,536,097
Salt Lake City	UT	$6.46	2.7%	205,799,062
San Diego	CA	$17.26	2.9%	190,565,431
San Francisco Bay Area	CA	$14.06	4.5%	551,490,265
San Francisco Peninsula	CA	$21.43	2.7%	60,089,592
Santa Fe	NM	$12.49	0.0%	1,485,788
Seattle	WA	$12.57	3.7%	538,720,398
Seattle/Puget Sound	WA	$9.88	3.1%	331,207,836
Stockton	CA	$8.76	6.2%	135,298,446
Utah County	UT	$0.87	1.9%	44,569,387
San Jose (Silicon Valley)	CA	$18.38	4.3%	201,575,831
Ventura	CA	$13.68	2.7%	73,801,154
Reno	NV	$8.76	2.8%	18,041,109
San Francisco	CA	$26.52	6.5%	95,901,018
San Luis Obispo	CA	$15.60	2.6%	9,154,109
Santa Barbara	CA	$17.52	3.3%	17,905,822
U.S.	**U.S.**	**$9.91**	**4.0%**	**24,985,820,146**
CANADA	**CANADA**	**$11.16**	**1.5%**	**783,080,080**
Calgary	AB	$7.92	2.6%	176,359,789
Vancouver	BC	$13.20	1.2%	265,138,029
Toronto	ON	$12.36	1.0%	341,582,262

Sources: CBRE, Colliers, Cushman Wakefield, JLL, Lee & Associates, NAI, Newmark

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With the rise of e-commerce and increasing demand for fast and efficient deliveries, the demand for industrial space is expected to continue to grow in the coming years. Prologis estimates e-commerce will require 1.2 million square feet of distribution space for each additional $1 billion in future sales. While CBRE forecasted the incremental demand based on its estimate that every additional $1 billion of e-commerce sales requires 1 million square feet of new distribution space. And JLL concluded that an additional $900 billion in sales would equate to a demand for over 1 billion square feet of industrial space in 2025.

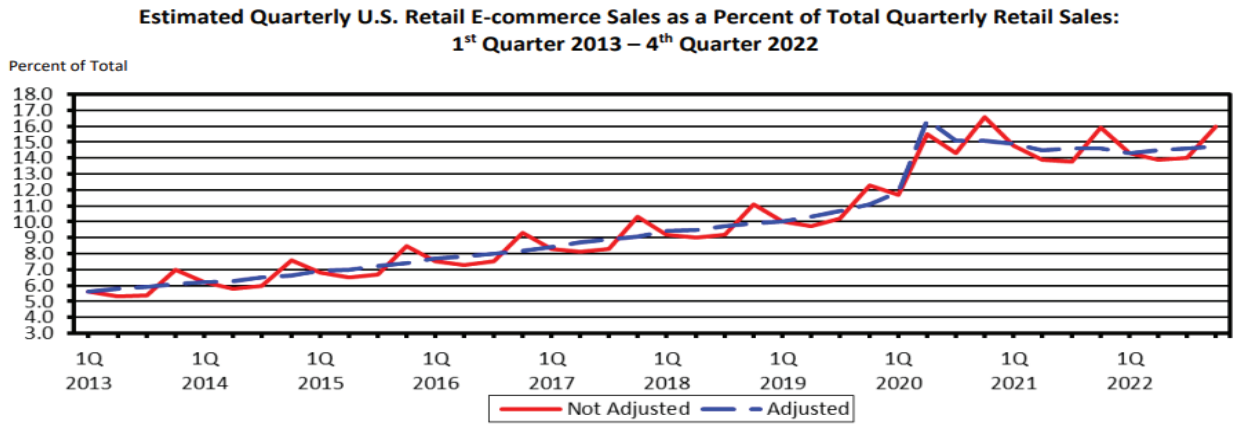
Factors that influenced industrial space rates and vacancy rates include:

- The "Great Supply Chain Disruption": Factory closures and production delays with a surge in demand for essential goods like medical supplies, personal protective equipment, and food. While changes in consumer behavior revealed the fragility of the global supply chain, as the supply chain channels opened, warehouses quickly filled up.
- Economic conditions: Strong economic growth from e-commerce drove up demand for industrial space and lower vacancy rates.
- Location: Industrial space rates and vacancy rates can vary widely based on the location of the property. For example, urban areas with high demand for logistics and transportation may have lower vacancy rates and higher rental rates than rural areas with less demand.
- Property features: Properties with modern amenities, energy-efficient features, and good transportation access may command higher rental rates and lower vacancy rates than older, less well-equipped properties.

E-commerce Fulfillment and Value-Added Warehousing and Distribution (VAWD)

According to the Census Bureau of the U.S. Department of Commerce, U.S. adjusted retail e-commerce sales in the fourth quarter of 2022 were $262 billion, a decrease of 0.1% from the third quarter of 2022. E-commerce sales grew by 6.5% in Q4 2022 compared to Q4 2021, while total retail sales grew by 5.7% in the same period.

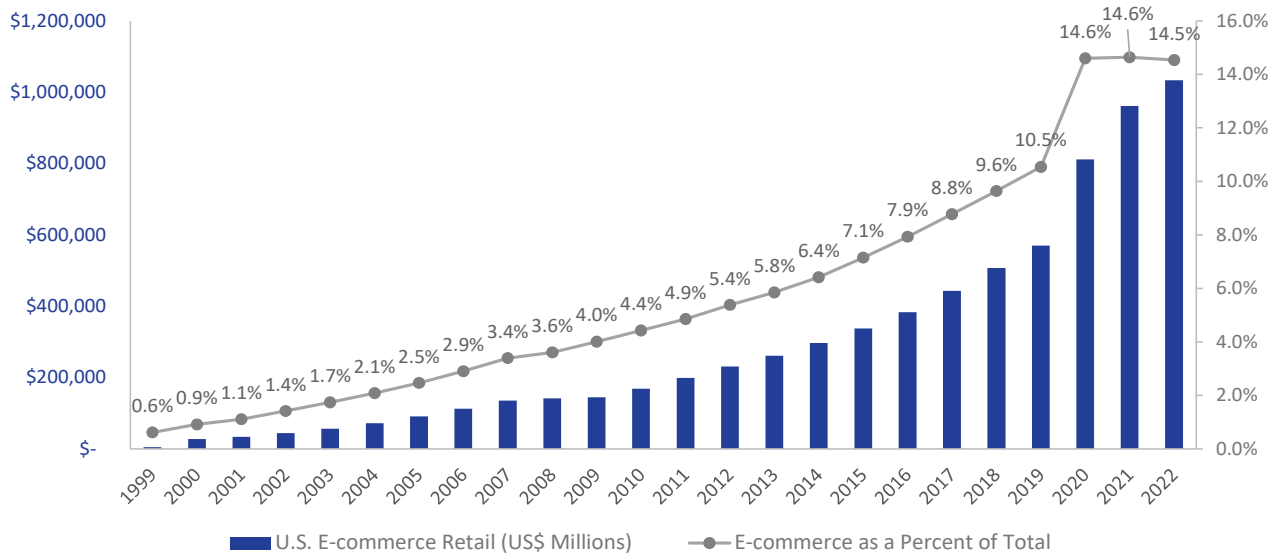
Figure 39. U.S. Retail E-commerce Sales as a Percent of Total Quarterly Retail Sales: 2013-2022



Source: U.S. Census Bureau

The e-commerce segment in the U.S. saw a 26.7% CAGR from 1999 through 2022 and shows no sign of slowing, while the CAGR of total U.S. retail sales from 1999 to 2022 was 10.4%. E-commerce purchases spiked due to the pandemic and shutdowns in 2020, reaching 14.6% of U.S. total retail sales, with unprecedented YOY growth of 4.1%. E-commerce retail represents 14.5% of retail sales in the United States in 2022 and stayed the same level until the end of 2022.

Figure 40. U.S. E-commerce Retail Growth 1999-2022



Source: U.S. Census Bureau

U.S. E-commerce 3PL Market Segment

E-commerce remains a strong growth driver for the 3PL industry and has become a growth driver in all four 3PL segments. E-commerce can result in higher margins for 3PLs providing integrated fulfillment and transportation management operations. Its volatile volumes play well for 3PLs which can flex labor and capacity more quickly than those with more static operations. Thus, e-commerce, along with omni-channel business presents many opportunities for 3PLs. Overall e-commerce logistics costs have risen with e-commerce sales. Major cost drivers include the continued expansion of e-commerce retail (both domestic and cross-border), logistics networks, warehousing development, increasingly complex last-mile delivery, a shift to B2C in the parcel segment, a tight labor market, and the increasing importance of reverse logistics.

With the warehousing space being tight, multi-client warehousing and flexible space options have grown out of need. Shippers want to deploy e-commerce fulfillment parcel shipping out of warehouses as close to the customer as possible to increase service levels. VAWD warehouses are increasingly focused on providing a variety of e-commerce fulfillment services. These fulfillment services include picking, packing, and shipping orders directly to customers. Many provide value-added services like bagging, labeling, bubble wrapping, performing drop-tests, and ensuring the goods are ready-to-ship.

The market has rewarded the competitiveness of VAWD 3PLs. Statista reports that in 2021, the most popular e-commerce fulfillment methods were in-house fulfillment 44%, followed by third-party logistics providers 38%, drop-shipping 13%, and self-fulfillment 5%. In the same year the National Retail Federa-

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tion reported almost identical statistics after adjusting for organizations that use a combination of in-house and outsourced fulfillment. In other words, 3PL fulfillment companies handle at least 40% of U.S. e-commerce shipments and maybe more when considering value-added services.

We estimate that U.S. 3PL E-commerce Revenues reached $35.3 billion in 2022, producing a 5-year CAGR of 29.8%. 2021 saw the highest YOY growth since 2017, reaching as high as 59%, as e-commerce purchases spiked due to the pandemic and shutdowns. For 2022, we estimate 18% growth for U.S. 3PL E-commerce revenue as the market returns to normalcy at pre-pandemic levels.

Figure 41. U.S. 3PL E-commerce Revenues w/o Amazon 2017-2023E (US$ Billions)

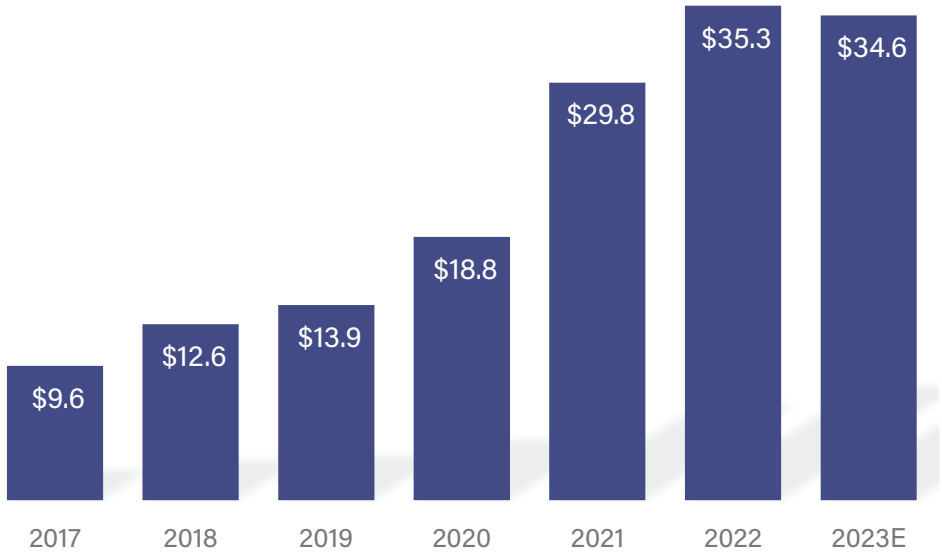

Table 25 lists the leading E-commerce companies in the U.S., and some top 3PL companies they are using.

Table 25. Market Share of Leading E-commerce Companies in the U.S. (As of June 2022)

Company Name	E-commerce Sales Percentage Share of Retail	Top 3PL Competitors Serving Company
Amazon	37.8%	Apex/Kuehne + Nagel, GlobalTranz/WWE, Hub Group, Pilot Freight Services/Maersk Logistics, UPS Supply Chain Solutions
Walmart	6.3%	APL Logistics/KWE, C.H. Robinson, DHL Supply Chain, DSV, Expeditors, GEODIS, K+N, UPS Supply Chain Solutions, GXO
Apple	3.9%	Apex/Kuehne + Nagel, DB Schenker, DHL Supply Chain, GEODIS
eBay	3.5%	CJ Logistics, FIEGE Logistik
Target	2.1%	C.H. Robinson, Expeditors, Hub Group, J.B. Hunt, Knight-Swift, Maersk Logistics
The Home Depot	2.1%	CEVA Logistics, DHL Supply Chain, DSV, GXO Logistics, Kuehne + Nagel, Maersk Logistics
Best Buy	1.6%	C.H. Robinson, GEODIS, GlobalTranz/WWE, Kuehne + Nagel, Ryder Supply Chain
Costco	1.6%	Knight-Swift, VersaCold/Lineage, GXO

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Appendix

ARMSTRONG & ASSOCIATES, INC.

North American Warehousing Study 2022 – General Questionnaire

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We are updating our North American Warehousing database and would appreciate your participation. Your input is critical to developing a realistic picture of the current post-pandemic warehousing market. The reliability of the resulting metrics depends on your accurate responses. The following study includes questions used to build upon our existing database, as well as new questions about the market and your company's experience. Individual company responses are not shared. We combine responses to develop important market benchmarks and insights. Please provide complete responses to the following questions.

1. What important changes, trends, and challenges have you seen in the warehousing business in the last 2-3 years?

Changes:
Trends:
Challenges:

2. How much did your business change from 2020 to 2021? What's your expected warehousing revenue for 2022?

Total warehousing revenue 2020 ($M)	Total warehousing revenue 2021 ($M)	Total expected warehousing revenue 2022 ($M)

3. What percent of your total warehousing revenue in 2021 is from e-commerce warehousing/fulfillment?

a. Percent of total e-commerce warehousing revenue which is business-to-consumer (B2C):

b. Percent of total e-commerce warehousing revenue which is business-to-business (B2B):

4. What percent of your total revenue is from e-commerce transportation management (parcel/freight)?

ARMSTRONG & ASSOCIATES, INC.

North American Warehousing Study 2022 – General Questionnaire

5. What percent of your total net revenue (without purchased transportation) came from the following functions?

Function	Net Revenue %	Space %
Dedicated Contract Warehousing - Dry/Ambient		
Contract Packaging - Dry/Ambient		
Multi-Client Contract Warehousing - Dry/Ambient		
Multi-Client Public Warehousing - Dry/Ambient		
Dedicated Contract Warehousing - Refrigerated or Frozen		
Contract Packaging - Refrigerated or Frozen		
Multi-Client Contract Warehousing - Refrigerated or Frozen		
Multi-Client Public Warehousing - Refrigerated or Frozen		
Total	0.0%	0.0%

6. What is your overall I.T. cost as a percent of total warehousing costs?

What is your estimated I.T. cost growth from 2020 to 2021?

What is your estimated robotic/automation cost as a percentage of total IT cost?

7. Based upon feedback from your customers, what differentiates your service offering from the competition?

8. Are you planning on adding warehousing operations to your network over the next 3 years?

	Dry/Ambient	Refrigerated/Frozen
Number of Warehouses Estimate		
Total Square Footage Estimate		

9. Please rank the level of your organizations maturity in each area below with 1 being the lowest and 5 being highest. (Hover over each box for commentary.)

A. Safety
B. People, Talent Management
C. Technology
D. Continuous Improvement
E. Quality Program

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Market Research

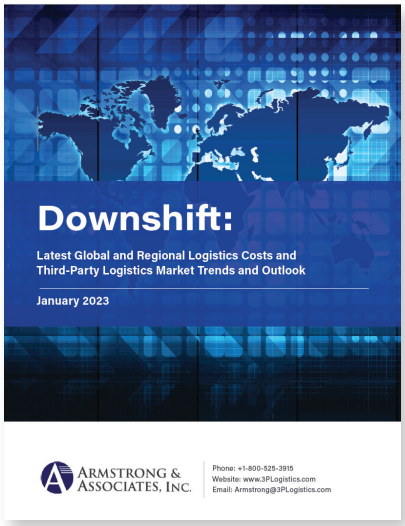
New Releases from Armstrong & Associates, Inc.

ARMSTRONG & ASSOCIATES, INC.

Expert Information Service: A&A's premium market research and online 3PL guide.

[Expert Information Service (E.I.S.)]

Our premium market research and analysis offering includes access to our eight most popular 3PL market research reports and a subscription to our leading 3PL guide, [Who's Who in Logistics Online]. Phone consulting is available.



Downshift:

Latest Global and Regional Logistics Costs and Third-Party Logistics Market Trends and Outlook

This report provides Global Third-Party Logistics Market and Logistics Cost estimates from 2016-2025. Besides that, the report also covers revenues and growth rates by region and country and by 3PL segments including the Global Spare/Service Parts Logistics and Time-Critical Delivery Markets for the same years, the Top 50 Global 3PLs and their competitive differentiation, among other trends and changing 3PL requirements to further minimize supply chain risk.

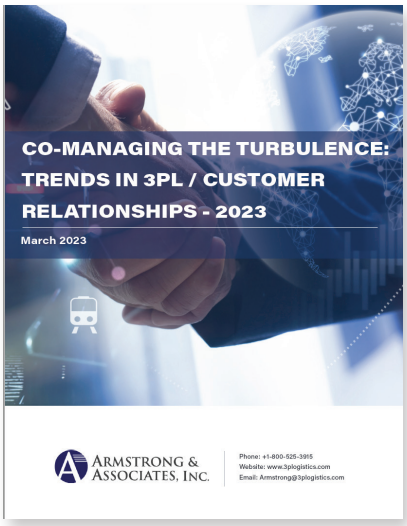
This report is part of A&A's premium market research Expert Information Service (E.I.S.). This report is downloadable as an Adobe PDF file with a single user license.

Making it Count:

Big and Bulky Last-Mile Delivery in the U.S. – 2022

The National Home Delivery Association (NHDA) and Armstrong & Associates, Inc. (A&A) partnered for this study covering the Third-Party Logistics (3PL) Big and Bulky U.S. Last-Mile Delivery Market to identify current market size, historical growth and outlook, key providers, customers and verticals served, e-commerce's role, employment, and other trends. For the study, we utilized two separate surveys and public information. The surveys were sent to NHDA members and other U.S. last-mile delivery third-party logistics providers (3PLs).

This report is part of A&A's premium market research Expert Information Service (E.I.S.). (Note: This report is downloadable as an Adobe PDF file with a single user license.)



Co-Managing the Turbulence:

Trends in 3PL Customer Relationships - 2023

This report is an expanded update of Armstrong & Associates' best-selling report covering the various trends between third-party logistics providers (3PLs) and the customers they serve. From its analysis of over 8,400 current 3PL customer relationships in 44 countries, totaling nearly 22,000 services, the report identifies and details key trends in outsourced "3PL" customer relationships. Armstrong & Associates has been tracking and analyzing customer relationships in the 3PL market for over a decade with ever-increasing detail.

This report is part of A&A's premium market research Expert Information Service (E.I.S.). (Note: This report is downloadable as an Adobe PDF file with a single user license.)

Reports are available for purchase at http://www.3plogistics.com