



Dropbox

Supply Chain Awareness
& Continuation of Policy/AI Integration



Dropbox x Ascend Consulting



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01

Recap of Midpoint Deliverable Concepts

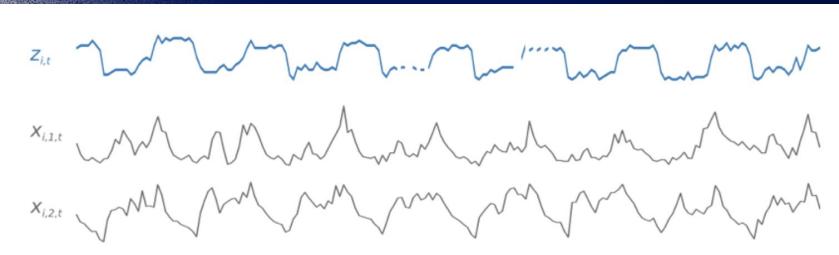
Recap of AI Integration Solutions:

Time-Series Forecasting Meets Spatial Data Analysis

DeepAR+

- **Time-Series Forecasting:** Predicts future trends based on historical data using RNNs
- **Multi-Series Learning:** Groups related time-series data into buckets to improve accuracy across diverse datasets
- **Context Length and Forecast Horizon:** Analyzes past data (e.g., 30 days) and predicts future outcomes (e.g., next 14 days)
- **Handles Uncertainty:** Accounts for factors like seasonality, holidays, weather, and promotions to provide robust forecasts
- **Applications in Supply Chain:** Optimizes inventory management and demand forecasting across multiple regions

Recurrent Neural Network-based algorithm



CNN-QR

- **Spatial Data Analysis:** Processes spatial patterns in data using convolutional layers
- **Feature Extraction:** Identifies key attributes in images or geographic data for decision-making
- **Versatility:** Adapted for tasks like route optimization or identifying delivery clusters
- **Robustness:** Handles variations in spatial attributes effectively (e.g., object positioning or regional differences)
- **Applications in Supply Chain:** Enhances logistics planning and warehouse optimization through spatial insights

Convolutional Neural Network based algorithm



Enhancing Dropbox's Supply Chain with Google Vertex

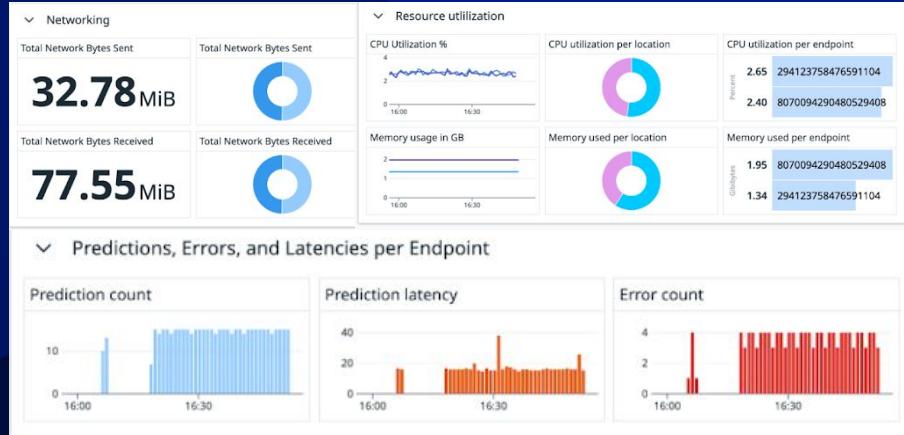


Vertex AI Features for Supply Chain

- TiDE uses a simplified **MLP architecture** for faster training and better predictions than traditional transformers.
- Vertex AI's AutoML enables **easy model building**, helping Google apply it to supply chain management without deep ML expertise.
- Google directly offers **Vertex AI Forecast** through Google Cloud, adding predictive tools that attract businesses and boost revenue.
- Vertex AI provides an easy-to-use **AI workbench** with **customizable templates** and **GPU settings**, simplifying ML model creation on Google Cloud.

Implementation Benefits

- **740 existing brands** use Vertex AI proving reliability, scalability, and a consistent developing model.
- **Offline and online storing** and modeling to train/experiment models.
- Mainly **ran on Google's data centers**, saving time, materials, and long term cost.
- Vertex AI enhances security and reliability through **centralized logging, transparent operations, and streamlined tracking of data/algorithms**.
- Pre-built tools and templates available on Vertex such as **Model Garden** and **Agent Builder** enable quicker model training and deployment.



Easy Tracking of Metrics in Google Cloud

- Prediction count - rate of predictions per second
- Prediction latency - time spent computing each request
- Error count - rate of errors in model

Troubleshooting

Vertex AI exports metrics to **Cloud Monitoring** included in Google's service. Cloud Monitoring can also be used to create dashboards or configure alerts based on the metrics. For example, Dropbox can receive alerts if a model's prediction latency in Vertex AI gets too high. This interface makes troubleshooting or model development easier.



02

AI Integration Solutions and Demos cont.



Q. If you know total capacity available vs. total market demand, how confident can the model be on predicting future pricing and accuracy?

Understanding the relationship between **total available capacity** and **total market demand** is fundamental to **forecasting pricing dynamics**, but several factors influence how confident predictive models can be in their accuracy.

- **Total Capacity** : The infrastructure Dropbox can provide (e.g., server storage, compute resources)
- **Total Market Demand** : The forecasted user/storage demand based on historical patterns, events, and trends

The relationship between **these two directly influences pricing** (supply & demand dynamics, infrastructure planning, service reliability and speed)



Questions Dropbox can answer from using DeepAR+

- How **likely** is Dropbox to **hit** or **exceed** capacity **during a future campaign**?
- Should Dropbox **raise** or **lower prices** based on **forecasted usage**?
- Where should Dropbox **allocate infrastructure** to **avoid service bottlenecks**?

Questions Dropbox can answer from using CNN-QR

- Assess “**worst case**” and “**best case**” **demand** to set **pricing thresholds** accordingly
- Build in **margin buffers** for **pricing** when launching **untested services**
- **Avoid** service disruption by **aligning pricing strategy** with probabilistic usage **forecasts**



DeepAR+: Confidence in Predicting Pricing with Known Capacity and Demand

With total infrastructure capacity and expected market demand...

▶ Learns from Time Series

Forecasts **aggregate demand** across user segments (e.g., free vs enterprise) and **regions**, helping Dropbox understand how total demand evolves

▶ Contextual Forecasting

Incorporates known events like **product launches** or promotions to **improve accuracy** in demand spikes or slumps

▶ Capacity Alignment

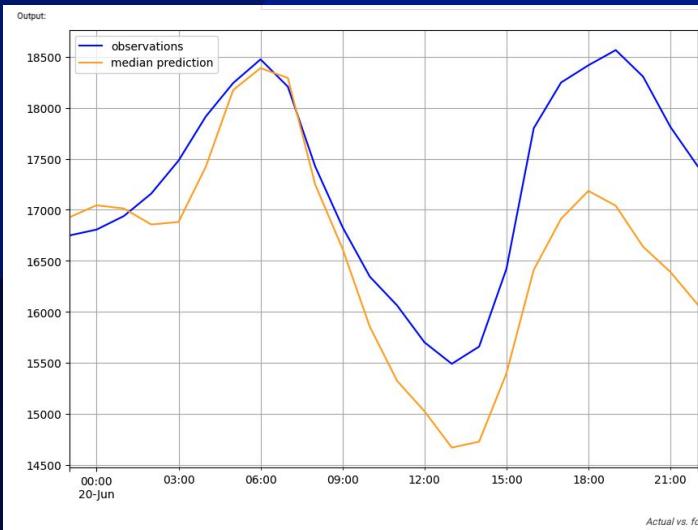
Enables Dropbox to **simulate demand** against total available server/storage capacity and proactively set pricing to **balance usage**

▶ External Variables

Incorporates external variables (e.g., economic trends, holidays) to **enhance real-world relevance of forecasts**

▶ Predictive Precision

Especially **reliable** in environments with **recurring patterns** (e.g., school semesters, holiday surges)



- X axis represents time
- Y axis represents the value being forecasted
- Median predictions (yellow) follow the actual observed values (blue)

The [GeeksforGeeks](#) team loaded two time-series datasets, slice them for equal distribution into training and testing sets.

- DeepAR is an effective deep learning model for forecasting problems
- With more fine tuning, the model prediction will closely resemble the blue line

CNN-QR: Confidence in Pricing Under Uncertainty

When future conditions are uncertain or volatile...

Quantile Based Forecasts

Predicts demand **ranges** (e.g., "90% chance usage stays below X"), giving Dropbox **flexibility** in **pricing** under risk

No need for Future Inputs

Works well even when **future events** are **unknown**

Pattern Recognition from Historical Data

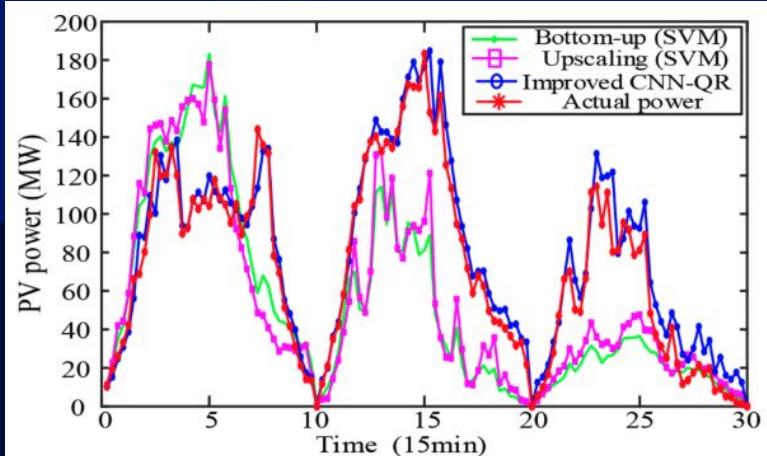
Detects recurring **spikes**, **drops**, or **anomalies** in usage using past-only **inputs**

Ideal for Early Stage Markets

Supports **pricing** and **scaling decisions** when launching **new** products or entering **unpredictable** regions

Enables Conservative Plans

Helps avoid over- or under-provisioning infrastructure by **preparing** for a **range of outcomes**, not just an average



- X axis represents time in 5 min intervals
- Y axis represents PV power output in megawatts
- CNN-QR (blue) follow the actual observed values (red)

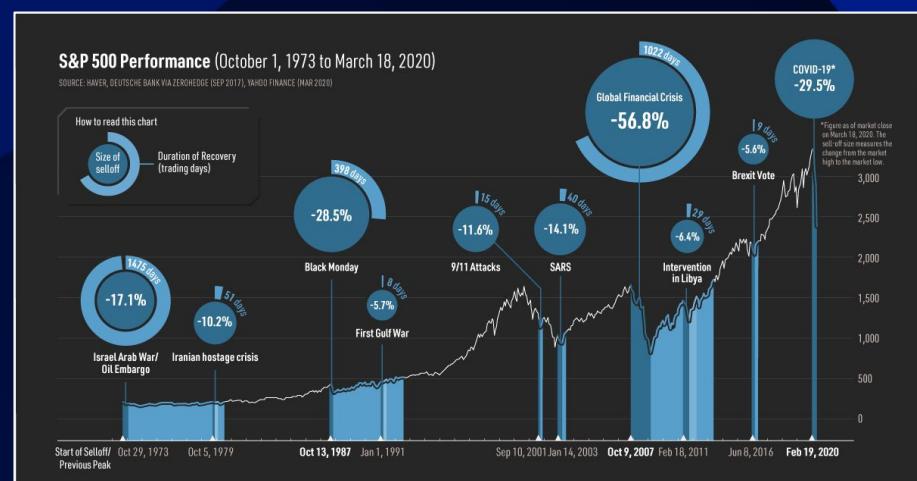
The Institute of Engineering and Technology tested CNN-QR in PV power forecasting

- CNN-QR generally outperform traditional methods
- With more fine tuning, the model prediction will closely resemble the red line

Q. Address optimal supply chain design during black swan events and how Dropbox could use forecasting models to test, compare, and improve planning processes.

Black Swan Events - like sudden tariffs, geopolitical shocks, or unexpected pandemics that create abrupt disruptions that makes traditional methods struggle

- **Scalable infrastructure:** Server and storage **allocation** should be **flexible** across regions, allowing Dropbox to find **different options instantly** based on demand spikes, etc
- **Multi source procurement:** Reduce dependency on any one supplier or data center vendor. Use geographic and supplier **diversification** to de-risk the supply chain
- **Expect the worst case:** Use models like **CNN-QR** to **estimate** the worst case demand, **building in surplus capacity** during high risk periods
- **Scenario Planning:** Use models like **DeepAR+** to simulate 'what if' cases to **test** the impact of **known** future **disruptions**



How Dropbox can begin testing and deploying these models?

Testing with Historical Data

Feed historical data (e.g., from COVID-19 or sudden regional outages into DeepAR+ and CNN-QR) to evaluate **model reliability** against **past disruptions**

Compare the models' forecasts to **actual outcomes** and previous planning assumptions to identify where **planning deviated from reality**

Parallel Forecasting Benchmarks

Run both DeepAR+ and CNN-QR in parallel with Dropbox's internal planning systems to **compare AI generated forecasts** to current supply & demand planning

Analyze discrepancies and blind spots without committing to a full deployment

Scenario Testing

Use DeepAR+ to **simulate tariff impacts, promotional events, or supply shortages** to assess how supply chain reacts under **extreme, artificial scenarios**

This will help Dropbox understand potential tipping points and pre plan mitigation strategies like **rerouting infrastructure or dynamic pricing**

Incremental Deployment

Slowly integrate forecasts into live decision making environments

Start with one region or product line (Dropbox Pro subscriptions) and evaluate real world performance to **build confidence** internally and interactively scale across the business

Vertex AI Experiments

Tool to assist in tracking and analyzing different model architectures

Performance Monitoring

Experiments enables **continuous monitoring** of performance to help teams evaluate whether models are **strong/weak** and how **trustworthy** predictions could be under **volatile** conditions.

Offline Experimentation

Offline experimentation allows organizations to **simulate and evaluate** outcomes before deploying models live. For example, a 10% vs. 25% tariff increase could be simulated and analyzed by Experiments.

Model Comparison

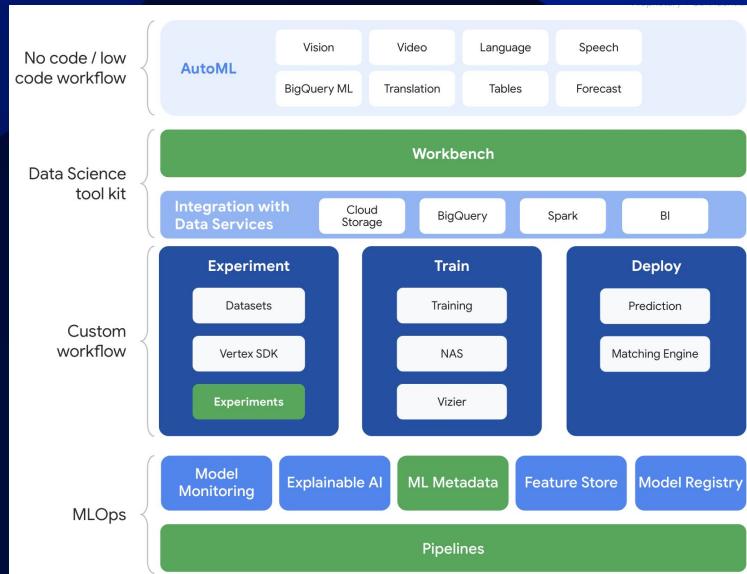
Experiments interface allows for **user-friendly side-by-side comparison** of different models and predictions to accelerate model performance.

Lifecycle Tracking

The platform **tracks every stage of the model lifecycle** to identify key turning points making it easier to identify weak points in models, debug and iterate, and to boost reproducibility.

Collaborative Environment

Experiments stores all experiment details in a **centralized and accessible environment** to enable cross-functional teams to collaborate on the same data-driven foundation for cohesiveness and effectiveness.



Vertex AI Pipeline

Platform to manage, automate, and monitor machine learning systems

Automated Workflow

Pipeline allows for ML models in a fully managed and serverless environment leveraging frameworks like **Kubeflow Pipelines** to automate deployment of processes and experimentation.

Hyperparameter Optimization

Hyperparameters on Pipeline allow for **tracking of various combinations of architectures** to rapidly **test multiple models** and configurations to improve resilience against unpredictable disruptions.

Predefined And Custom Components

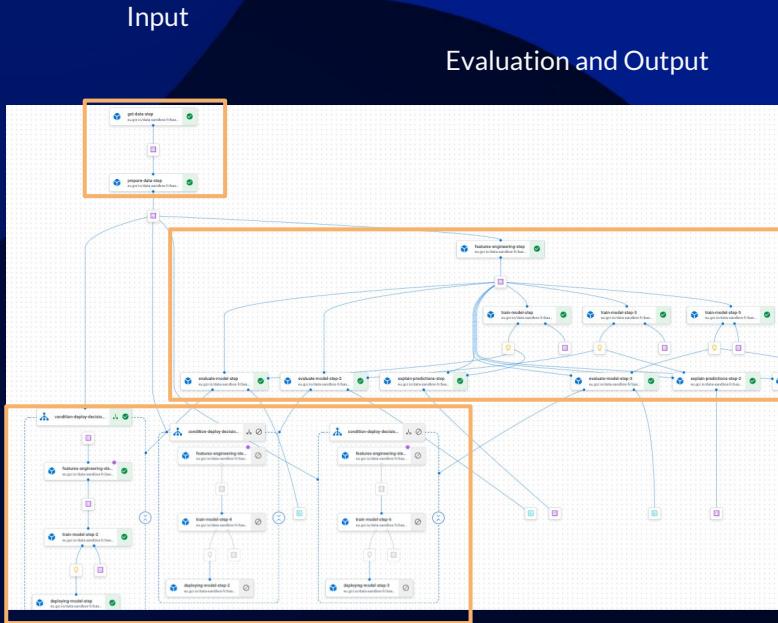
Wide library of predefined components are offered through Pipeline that **streamlines development with options to customize models**.

Prediction Accuracy

Vertex AI Pipeline **retrains models** as long as data is inputted and automatically maintains relevance and accuracy valuable for market signals, demand fluctuations, or external shocks to supply chain.

Decision Making

Vertex AI Pipelines empowers organizations to simulate, analyze, and respond to complex supply chain disruptions using scalable ML infrastructure



Analysis and Model Development



How can Dropbox use Google Vertex AI to address supply chain concerns?

Getting Started

Simulating Hypothetical Scenarios

Develop Tools and Templates

Compare Results

Getting Started

Collect and centralize supply chain data (shipping times, supplier performance, etc.) and input into BigQuery.

Define key variables influencing decision-making and focus points for supply chain.

Set up your **initial forecasting models** either by using templates or written code to lay the groundwork for experimentation and automation.

Simulating Hypothetical Scenarios

Use Vertex AI Experiments to **create simulations to model the impact of unexpected events** such as tariff changes, supplier outages, or logistic route closures.

Modify inputs in your forecasting models to reflect potential situations.

Adjust Vertex AI Pipeline hyperparameters to better evaluate and analyze inputs and potential solutions.

Develop Tools and Templates

Identify weak/focus points in ML model using continuous monitoring.

Build reusable templates for scenario-based forecasting that teams can deploy quickly during crises.

Create interactive tools that allow planners to enter assumptions (like sudden cost spikes) and get optimized decisions from deployed models using Vertex AI endpoints.

Compare Results

Compare the output from ML models with both original supply chain plans and actual historical outcomes.

Use Vertex AI's continuous tracking, visualization, and experiment management features to evaluate forecast.

Identify which strategies performed best and input those insights back into operational planning to strengthen resilience and accuracy over time.



03

Analysis of Server Manufacturing and the Hard Drive Sector

Google's Server Manufacturers

Foxconn Technology Group

- Started **manufacturing key components** for Google's servers during 2021's first quarter, **bringing manufacturing back to the US**.
- The **only manufacturer** capable of establishing a surface-mount technology line on American soil.

Google Developed Axion / Neoverse V2 Server CPU

- **Designed a custom Arm-based CPU** that is **widely deployed** inside the data centers **powering Google Cloud**.
- Axion/Neoverse V2 purpose is to **provide solid performance** and **exceptional energy efficiency**.
- Axion processors: capable of providing up to **50% greater performance** and **60% better energy efficiency** than virtual servers powered by x86 CPUs from Intel and AMD.

Google Unveiled its New Quantum Chip, Willow

- **Significantly reduced errors** as it scaled up, **outperforming** current computer benchmarks.
- **Solved a 30-year hurdle** and advances quantum computing for commercial uses.
- **Terminated the Willow quantum chip** with no explanation, with speculations of **technical glitches** to quantum consciousness, and ethical concerns.

Server Manufacturer Market and Competitors



Dell Technologies

Dell's PowerEdge XE servers are renowned for their **robust build and reliable performance**. They come equipped with **advanced security features** such as **secure boot and system lockdown**, which helps protect against cyber threats and ensure data integrity.

- Market Cap: 65.56B
- Stock Price: 93.95
- Market Share: 13.25%
- Products: laptops, desktops, monitors, servers, data storage solutions, networking equipment, accessories and services for their products, gaming laptops, and desktops

DELL Technologies

Hewlett-Packard Enterprise

HP's servers, specifically the ProLiant DL380 Gen10, are built with high-quality components and are rigorously tested to ensure **maximum uptime and dependability**. Whether you're running a small business or large enterprise, HP servers offer flexible scalability to grow with your needs.

- Market Cap: 21.66B
- Stock Price: 16.49
- Market Share: 7.01%
- Products: personal computers/systems, software services, printers, business IT solutions, servers, storage devices, networking equipment



Hewlett Packard Enterprise

Lenovo

Lenovo's ThinkSystems and ThinkServers offer **reliability, versatility, and performance**, which makes them perfect for small businesses with limited space or remote working environments.

- Market Cap: 14.92B
- Stock Price: 24.20
- Market Share: 25.5%
- Products: smartphones, servers, smart televisions, laptops, desktops, tablets, PCs, storage, monitors, electronics

Lenovo

Key Players of the Hard Drive Sector



Toshiba

Toshiba's hard drive is known for their performance, delivering a fast **7200 RPM speed and large cache size** that helps shorten response time.

- Market Cap: 139.79B
- Stock Price: Private company purchased by Japan Industrial Partners
- Market Share: 10.5%
- Products: air conditioners, consumer electronics, control systems, TVs, laptops, storage devices, HDDs, recorders, printers, copiers.



Western Digital

Western Digital's My Passport Ultra has the **largest capacity available among portable drives**, one of the **most affordable drives** with a lot of storage capacity, works with Windows computers and Macs

- Market Cap: 15.39B
- Stock Price: 44.51
- Market Share: 27.36%
- Products: data storage services and solutions, hard disk drives (HDDs), solid-state drives (SSDs) for different applications



SeaGate

SeaGate's hard drive is **one of the least expensive drives per terabyte** and is consistently faster than most of their competition, and they're able to manufacture high-capacity HDDs.

- Market Cap: 17.58B
- Stock Price: 83.04
- Market Share: 14.15%
- Products: hard drives, SSDs, surveillance storage, NAS drives, enterprise systems, cloud solutions



Western Digital SWOT Analysis



STRENGTHS

- **Research and development:**
 - Substantial investment in **R&D**
 - Has **13,000 active patents, focusing on continuous innovation and tech advancements.**
- **Strategic Business Separation:**
 - Separated Flash and HDD business units to optimize company's operations.
 - Allows WD to capitalize on **unique growth, extend leadership positions, and achieve efficient capital structure.**



WEAKNESSES

- **Financial Performance:**
 - Net loss of \$798M in 2024, compared to net income of \$1,546M in 2022.
 - Gross profit margin decreased from 31.3% in 2022 to 22.6% in 2024.
- **Shows challenges faced by WD due to decreased unit shipments and pricing.**
- **High Operating Expenses:**
 - Totaling \$3,262M or 25.1% of net revenue.

OPPORTUNITIES

- **Market Demand for Data Storage:**
 - Demand driven by the **proliferation of digital content, cloud computing, and advancements in AI and IoT.**
 - WD's broad portfolio of HDD and SSD products position them to capitalize on this trend, **meeting storage needs of enterprises.**
- **Technological Advancements:**
 - Presents opportunities for growth in various market segments.
 - WD's ongoing R&D efforts are likely to yield new products that address emerging storage requirements.

THREATS

- **Competitive Industry Landscape:**
 - Seagate, Toshiba, Kioxia, and Micron Technology
- **Global Economic Conditions:**
 - WD's international operations exposes it to risks associated with global economic conditions, volatility in financial markets, trade restrictions, and geopolitical tensions, impacting demand for products, supply chain and manufacturing operations.



04

Tariff Impacts cont.

A Deeper Dive Into Huawei

Effects of Tariffs on Chip Reliance in China

Huawei's Response to U.S. Export Controls

- Huawei has developed its **CloudMatrix 384 AI chip cluster** to provide a viable alternative to Nvidia chips.
- This system uses **384 Ascend 910C processors**, designed to meet the AI hardware demands of Chinese tech firms.

Ascend 910C and CloudMatrix 384

- The Ascend 910C combines two **Ascend 910B processors**, delivering **60–80%** of the performance of Nvidia's H100 GPU at a lower cost.
- The CloudMatrix 384 system, offering **300 petaflops of compute power**, surpasses Nvidia's equivalent in overall performance but has higher energy consumption.

Adoption and Challenges

- Huawei's AI chips have been adopted by Chinese firms like **DeepSeek**, indicating confidence in their reliability.
- However, challenges remain, such as higher power consumption and the need for more mature software support, as Huawei continues to reduce China's reliance on foreign technology.

Recommended Countries for Manufacturing

Vietnam

Vietnam benefits from **free trade agreements** with key regions, including the **EU** and **ASEAN**, reducing trade barriers and boosting low-cost manufacturing. It is also part of **The Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)**, offering favorable terms for tech companies.

Vietnam is positioned to achieve **\$160 billion** in electronics exports in 2025, a **20.8%** increase compared to 2024.

The country's real GDP is projected to grow **6.8%**, supported by its strong manufacturing base and growing export sector.

Attracting **foreign investment** and establishing low-cost production hubs.

It is becoming a leader in smartphones, semiconductors, and consumer electronics, making it an ideal alternative for supply chain diversification.



Taiwan

So far, Taiwan is unaffected by the 2025 tariffs, making it a **stable** and **cost-effective** source.

Taiwan is a key player in the global supply chain, especially in **semiconductors** and **AI components**.

It is home to **TSMC** which is the world's largest independent semiconductor foundry, making it crucial for tech companies, particularly in AI, cloud computing, and electronics.

Taiwan is investing in **sustainable manufacturing** and **next-gen technologies**, aligning with Dropbox's future demand for **energy-efficient** and **high-performance hardware**.



05

Supply Chain Awareness

Revisiting our Successful Info Session



Ascend Consulting x IISE held a VERY successful info session at UC Berkeley for students to learn more about Dropbox and supply chain!

We had over 60 people attend, with dozens of students asking questions during the Q&A and staying for the networking session!

Survey Results

Q: Do you know what Supply Chain is?

goes over suppliers and
distributors and the processes the
go through to get goods and
services

it's resources and goods being transported from one step
of the manufacturing process to the next step

The producer side of the economy

**How to buy things
to 'sell' things
the process of
supply**

**the network of people/ companies
involved in producing a product**

No
chains that companies have
in order to produce their
products, from sourcing,
producing, distribution, etc.

Key Takeaways

1. **Most students do not know what supply chain is.**

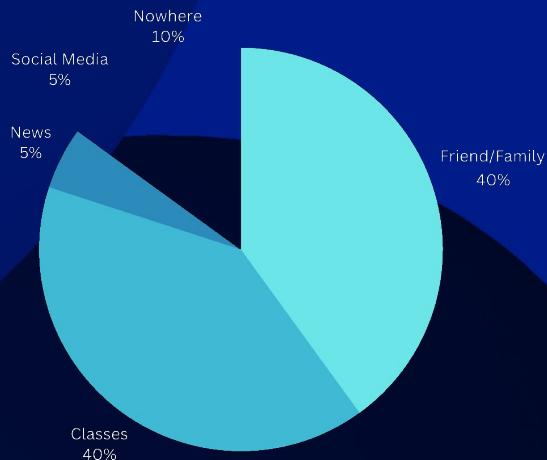
From our survey, most students either do not know what supply chain is, or give very vague responses given their inferences

2. **There are ranges of definitions provided**

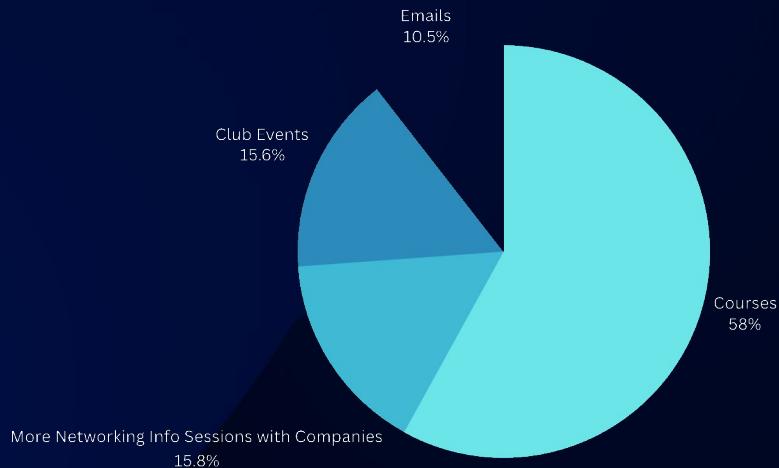
Depending on the students background/interests, their definitions also seem to differ.

Survey Results

Q: How did you hear about supply chain?



Q: What would help you get familiarized with learning about supply chain?



Current Supply Chain Awareness

Effects of COVID-19

- With port slowdowns, manufacturing delays and other pandemic-caused constraints in the past couple of years, **supply chain has gained major attraction**
- Kelly Lynch (Director of Broad College of Business at Michigan State University) said applications to the program are **up by more than 10%**
 - "We're attracting students who may have never thought of supply chain management."*

Awareness Efforts from Different Sectors

- Colleges:** there are around **109** universities **offering Supply Chain Management degrees** (undergraduate and graduate) and courses
- Associations:** Organizations like **the Association for Supply Chain Management** (largest nonprofit association for supply chain) are connecting supply chain professionals and companies around the world to the newest thought leadership on all aspects of supply chain

Example

- ASCM Supply Chain STEM Educational Outreach Program: offers a variety of age-distinct activities for students in grades K-12 that feature key science, technology, engineering and mathematics concepts and their relation to supply chain
 - Delivered by volunteers or teachers and can be hosted in any school, club or community organization

Educational Seminars

Strategic Recommendation: DECALs such as 'Supply Chain 101'

Objective

- Raise **awareness** about the importance of supply chain resilience.
- Equip students with **key concepts** like inventory management, demand forecasting, and the impact of geopolitical factors.

Setup

- Offer a **DECAL course**, '**Supply Chain 101**', to teach students the basics of global supply chains.
- The course will cover **real-world case studies**, such as supply chain disruptions (e.g., global chip shortage, pandemic impacts).
- Students will analyze Dropbox's supply chain data, exploring the impact of these events on operations and proposing solutions.

Significance

- Gain **insights** from students on improving supply chain resilience.
- Compare student solutions with Dropbox's internal benchmarks.
- **Identify potential talent** and **encourage partnerships** between education and the industry.

Dropbox Software Usage

Strategic Recommendation: encouraging college students to familiarize themselves with Dropbox's platform

Club Funding

- Fund clubs or provide exclusive sponsorships in exchange for making Dropbox the **primary cloud collaboration tool** for storage, project planning, and member communication.



- Offer annual stipends, event funding, or sponsorships such as Dropbox folders or banners to clubs that **fully adopt Dropbox for internal ops.**

Significance

- Deepens brand loyalty by integrating Dropbox into clubs' core infrastructure and making it the default tool for student leadership teams.
- Allow students to experience premium features such as larger file storage, synced folders, and advanced sharing which **creates dependency** and **encourages conversion post-trial.**

Free Trials

- Distribute **Dropbox Pro free trials** to members of student clubs across categories (Ex: tech, pre-professional, media) to encourage **long-term adoption.**



- Collaborate with clubs to include **trial codes** in welcome kits or offer them as prizes for competitive club events.

Dropbox x SCM Pitch Competition

Strategic Recommendation: Black Swan Pitch Competition

Objective

- Using **data and AI models**, each team must **develop a creative, data-driven solution**
- **Expose** students to **real-world** supply chain complexities
- Benchmark **AI readiness** for **supply chain** use cases
 - Evaluate the maturity and effectiveness of emerging AI technologies

Setup

- Each student group is **assigned a random “black swan” event**
 - Suez Canal blockage, global chip shortage, pandemic outbreak, etc
- Each group will **receive Dropbox supply chain-related data** to analyze the impact of the event
- Students are encouraged to **use any AI or data modeling tools**

Significance

- Gain fresh **insights** and innovative **solutions** from a **college-student perspective**
- **Evaluate** the effectiveness of **different AI models** and approaches by comparing student results with **internal benchmarks**
- Identify **new talent** and foster industry-academic **collaboration** on real-world supply chain resilience



Dropbox x SCM Pitch Competition

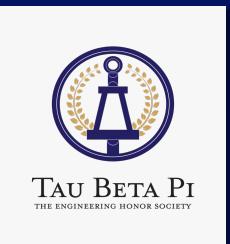
Strategic Recommendation: Black Swan Pitch Competition

Recommended Student Organizations



Institute of Industrial &
Systems Engineers (IISE)

Largest industrial engineering
student organization on campus



Tau Beta Pi

The oldest engineering honor
societies, emphasizing scholarship,
character, and service



Analytics at Berkeley

The organization's mission is to
connect Analytics students with
top employers

Supply Chain Career Panels

Strategic Recommendation: Professional advice & networking events

Objective

- Spreading personal knowledge and experiences **of supply chain**
- **Inform** students **about the different supply chain roles** and different companies that are hiring for certain supply chain internships and full-time roles
- **Network with Gen-Z** to get ideas for **marketing on campus** and what's currently trending within the college community

Setup

- Look into Dropbox's & other company's **supply chain managers or analysts roles**
- Ask them about their **interest in spreading awareness about supply chain** and their **roles at their company**
 - Targeting Alumnis who are willing to give back to their community
- Can **partner with college clubs** on campus to organize career panels with moderators to host events with food/snacks provided with a networking session at end of event

Significance for Dropbox

- **Spread knowledge of what Dropbox does and what supply chain is**
- **Boosts visibility and embeds Dropbox** into professional development experiences that competitive students already value.



Thank you!

Q&A



06

Appendix & Resources



Appendix

Consultant Research Documents:

[Government Regulations, Tariffs, and Macroeconomic Impact](#)

[Integration and Impact of AI within Supply Chain Operations](#)

[Make vs. buy decisions among leading cloud companies, focusing on the strategic considerations behind hybrid and multi-cloud models](#)

[Supply Chain Software Components](#)

[Supply Chain and AI Trends](#)

[AI integration within supply chain strategies](#)

[AI integration in supply chain management](#)

[In depth AI research- Amazon and Deepmind](#)

[In depth AI research - DeepAR+ & CNN- QR](#)

[In-depth AI research on Google's Supply Chain](#)

[Final Deliverable Research Resources](#)



Appendix

External Sources:

- <https://www.reuters.com/technology/trump-tariffs-could-stymie-big-techs-us-data-center-spending-spree-2025-04-03/>
- <https://www.pcmag.com/news/asrock-to-shift-manufacturing-in-response-to-trumps-china-tariffs>
- <https://www.mordorintelligence.com/industry-reports/motherboard-market/companies>
- <https://drivesaversdatarecovery.com/hard-drive-manufacturers-who-makes-hard-drives/>
- <https://www.mordorintelligence.com/industry-reports/graphics-processing-unit-market/companies>
- <https://csmarket.com/stocks/competitionSEG2.php?code=MSI>
- <https://www.msi.com/news/detail/UndoubtedlyMSIdominatestheWorldofGamingNotebookandfaraheadfromitscompetitors11103>
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