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LEVERAGE REAL-TIME DEMAND FORECASTING TO BUILD AN AGILE SUPPLY CHAIN AND OPTIMIZE BUSINESS CONTINUITY

Content

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Pluto7 is the 2019 Google Cloud Specialization Partner of the Year Award for Data and Analytics and is a ML Specialization partner.

Background on the author:

Two decades of global enterprise business transformation from demand forecasting to supply planning across geographies in retail, hi-tech, healthcare, manufacturing and consumer packaged goods with over 50+ companies.

The author is part of the advisory at University of Southern California Marshall School with focus in supply chain management and brings in experience in leveraging various technologies, from traditional rule-based systems and statistical modeling systems to modern machine learning and AI-based analytics.

The author started his career at Cisco's supply chain organization which is known as the top 25 best supply chains in the world. The author has a patent pending on Method and System to Determining Forecasts (Patent Issuer number us 29705696) and has solutions, a demand forecasting open source application on the Google AI Hub, and multiple artifacts posted in public domains.

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CONTEXT SETTING

If you are part of a supply chain in enterprise, mid-size or a small company dealing with COVID-19, you probably feel like most of your colleagues are running into scenarios they thought would not occur in your business. Looking outside your organization it is evident that you are not alone given that most of the companies do not plan for such extreme scenarios.

Your supply chain may now feel like a freight train decelerating at a very fast rate -- and maybe in the near future, after things get better, it might also need to accelerate. Neither of these scenarios look practical or feasible since there are multiple supply chain constraints such as labor, global logistics, borders, compliances and many aspects that need to be managed and aligned to make rapid decisions in your current landscape.

In many enterprises, there have been decades of process optimization and efforts put in place enabling lean manufacturing, six sigma methodologies, TQM, JIT, and more. However, the demand forecasting processes, frameworks, and systems are most likely not designed to help leaders make near real-time decisions when unexpected disruptions happen. On the other hand, rapid decision-making for all possible scenarios is complicated as the COVID-19 impact changes depending on the location and other external forces, affecting your demand and supply at different levels.

In today's world you will often hear experts or colleagues around say it is "not possible" to plan the scenario or to have anticipated this scenario. They are right in the sense that if they did they would be seen as paranoid. However, it was always possible to plan except that they underestimated the probability of such a scenario occurring in their job.

At this point, it really does not matter now who got it right or who got it wrong. We need to pass the blame game and start solving for more accurate demand and supply planning.

Demand forecasting happens to be the heart of your entry and planning, it has an upstream and downstream impact of processing data and systems. In simpler words, demand forecasting is predicting the future sales, shipments, and service renewals across various channels and distribution nodes.

To get to a higher demand forecasting accuracy, it is crucial to reduce human bias by leveraging data analytics to run more scenarios with more data.

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BACK TO BASICS

Before getting deeper into solving, let's go back to basics. Demand is the quantity of a commodity or services wanted at a specific price and time. Forecasting a demand is essentially predicting the future of how much you will sell and hence how much money you will make eventually which is the basic reason for the existence of a typical business.

Companies always try to get to a better demand forecast than what they have since it is never good enough, plus achieving a demand forecast 100% right is a tough task as the business environment and conditions change every day. Given these two reasons, demand forecasts are considered "always wrong".

For a large enterprise, 1% forecast accuracy improvement means adding $100M to their top-line. Getting a demand forecast wrong will impact your supply, labor, and capacity planning negatively.

This situation can create bottlenecks across various internal and external nodes of your supply chain. In most business forecasts is what drives the amount of inventory you carry.

In the current market, Pluto7 is actively working with many enterprises who are dealing with unusual order patterns with extreme spikes in demand across different product lines.

Currently, we are helping a hi-tech enterprise, manufacturer of networking hardware, overcome their demand forecast accuracy challenges which are aggravated by COVID-19.

Our customer is also experiencing a demand drop in some product lines which are impacted by the supply chain disruptions their reseller and distributors are experiencing.

On the other product lines, the same customer has a reverse trend, where they are experiencing a higher demand from distributors and resellers. Moreover, their demand forecast was amplified, disrupting the supply chain all the way to the supplier.

This effect commonly known has a bullwhip effect , also known as the "whiplash" or the "whipsaw" effect.

Not only is this playing a significant role now at this customer, but it will also have a reverse swing in the coming months or quarters when the opposite effect may occur.

Both of the scenarios described above lead to excess and shortage of inventory, disrupting market demand, reducing working capital, and creating significant financial losses.

The "Bullwhip" Effect

Customers
(Demand)

Manufacturer
(Forecast)
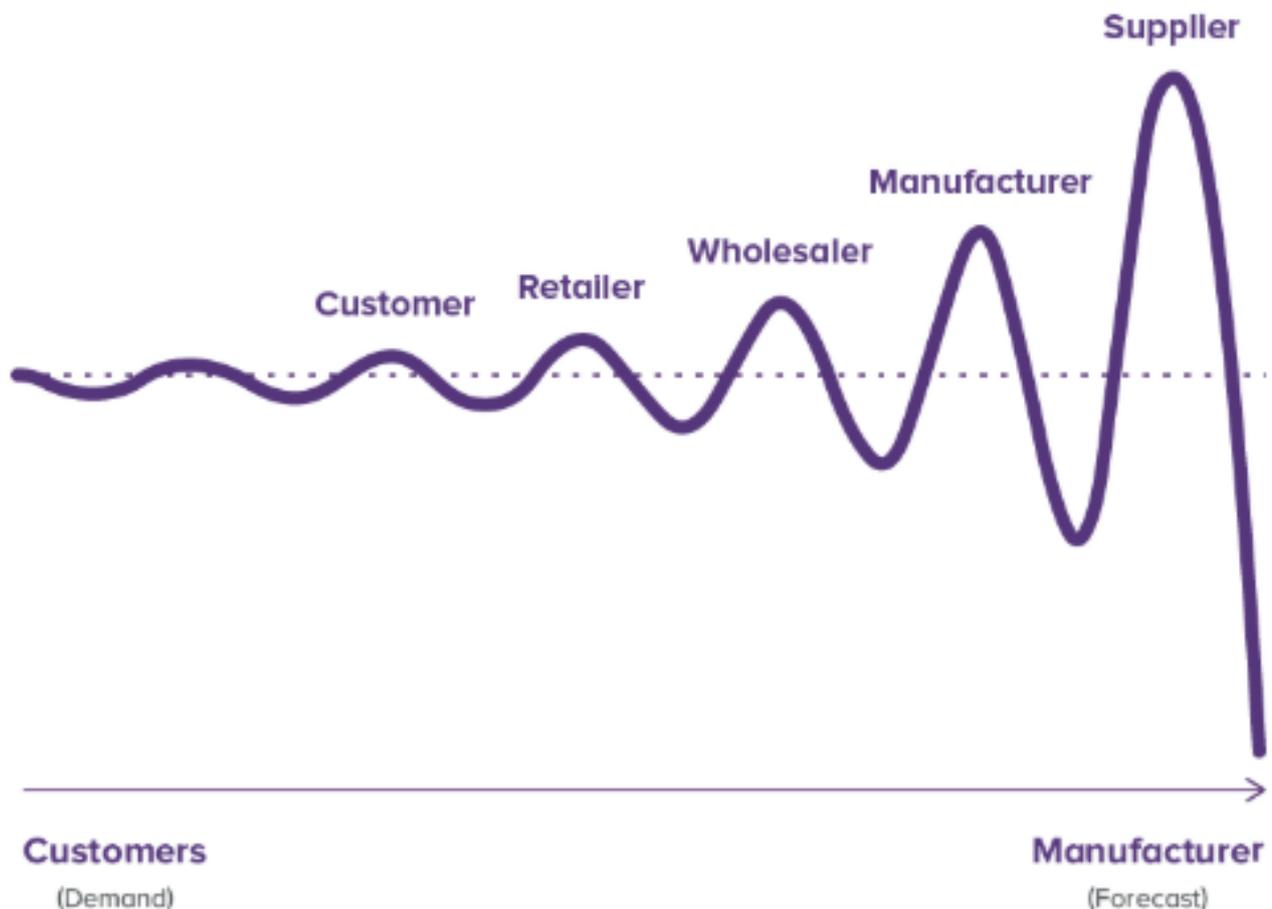
DEMAND FORECASTING: HOW TO INCREASE ACCURACY DURING UNCERTAIN TIMES?

Pluto7 works with a wide spectrum of companies who have an annual revenue ranging from $10+ million to $100+ billion and their traditional methods to forecast ranges from simple moving average to running forecasting softwares on ERP like SAP, Oracle, etc. In many cases, these sophisticated systems eventually lead to one common behavior: "manual overrides" of forecast numbers.

Manual overrides happen when humans do not agree with the demand forecast number a system has generated mostly because there is no explanation or business insights not reflected in the system. Another common element we see is that a large portion of enterprises are using rule-based systems for forecasting.

By definition, human bias is embedded in a rule. The other important element to keep in mind is that humans in general are great with linear problems or smaller volumes of data for analysis, however, we struggle to deal with exponential problems or data analysis with exponential scenarios.

The struggle to deal with exponential data (non-linear) is the very reason why most people, including country leaders, have challenges understanding the seriousness of COVID-19.

Pluto7 has time and again proven that forecast accuracy can be optimized if data patterns are closely watched rather than

relying on human judgements and overrides. Pluto7 with the domain knowledge and deep expertise working on Google Cloud Platform have been able to drive forecast accuracy by 95%+ in some cases which was considered not possible.

Our customer's range from traditional brick-and-mortar retail, omni-channel retailers, CPG, automobile, grocery chains, oil and gas, jewelry manufacturers, pharmaceuticals, and many more.

THE CRISIS MANAGEMENT JOURNEY

With the COVID-19 outbreak, companies are moving from the initial response phase into recovery. Shortly, they will have to pass through all the phases shown in the Gartner visual and seriously consider innovation to help drive demand forecast accuracy improvements. These curves can last anywhere from 6 months to 2 years for many enterprises.

Demand forecasting in many of these cases may end up with a bullwhip effect that lasts for many quarters depending on the product lead times.

The cascading impact - which has already started in most cases - has its tentacles into supply planning (the lack of mobility among workers is leading to lesser supply in supply chain nodes), labor planning (excess demand of consumer goods cannot be fulfilled due to labor shutdown), capacity planning (E.g. Oil and Gas cannot store more than capacity).

On top of this, there is a projection that COVID-19 might come back again in the fall. Therefore, it is important to be aware that a demand curve has mean, trend, seasonality and randomness, all of which needs to be understood to make an impactful judgment on the quality of the forecast.

Demand Forecasting innovation is going up the list of top priority innovation across enterprises as we work with customers in the US, Canada, India and Japan to name a few. In times like these when employees in these organizations are emotionally impacted and constrained, technology accessibility and cloud computing are enabling them to keep progressing. Enabling innovation a this stage is no longer an option, it is a necessity.

The Crisis Management Journey
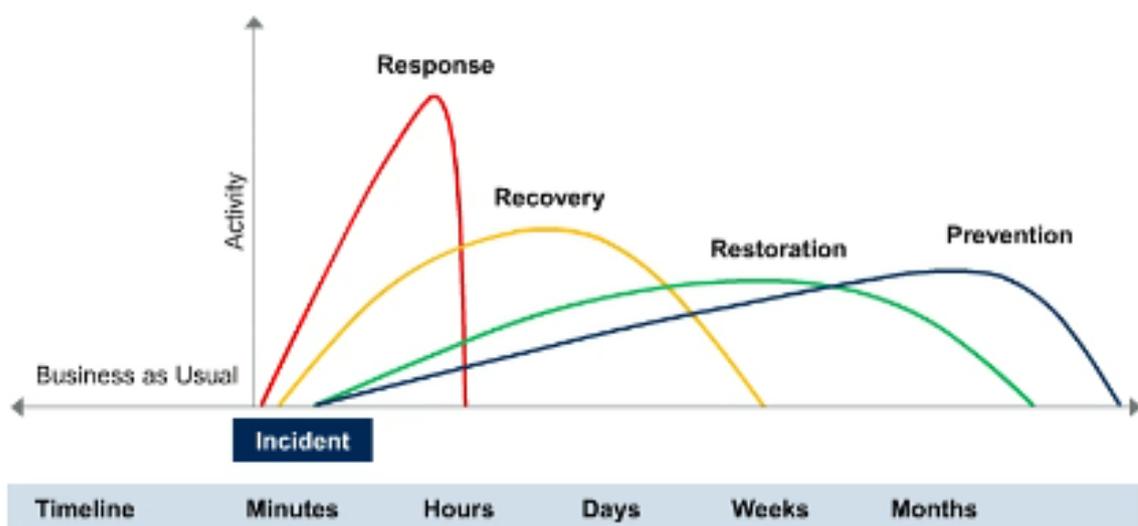
Source: Gartner

DEMAND FORECASTING REIMAGINED

These 5 key elements companies need to consider when planning and addressing demand forecasting innovation :

- **Jump-start innovation** in demand forecasting. Companies need to ignite innovation and combine it with an agile supply chain strategy. It is important to include clear definitions of forecast accuracy and baseline values. Additionally, leaders should set expectations for existing and new products, including the time horizon for forecast and such key guidelines. It is recommended to avoid drawing boundaries on what level or granularity of data to use and allow the team to use external data for experimentation. Allow teams to explore the data patterns from seemingly unrelated products even if the products do not belong in the same group or category. These flexibilities give the data scientists a way to imagine and manage the forecast curve based on the inputs data characteristics.

  For example, large retail customers in the fashion industry implemented new demand forecasting analytics when the SKUs did not have history and the products depended on internal and external data of weather and unemployment rating in the zip code where it is sold. Empower your team start off with small explorations. You can leverage ready-to-deploy solutions to start experimenting. We recently launched a demand forecasting solution on the Google Cloud marketplace. If you want to test Demand ML, we are offering a 2-weeks trial.

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- **Enable real-time visibility into internal business and external data** to make your forecast more accurate. Allow the team to centralize the data into a repository where they do not have to worry about storage costs or computation costs. For a data scientist or a machine learning expert who wants to get the best insights into the data sets, allowing them to explore all relevant business data for the problem to be solved without technical constraints will get them to find signals that are not obvious even to the best management with decades of experience sometimes. Selecting a cloud platform that is optimal for predictive analytics. E.g. Google Cloud named by [Forrester](#), will help you overcome these technology constraints.

- **Iterate with ML and AI technologies** on a long journey. Raise the bar above the current norm for forecast accuracy and yet be realistic. Often we have seen customers get caught up with the ML model that gets used and test it. The ML model identification is the relatively easiest part and relative to the less complex part in the long run, but it will be harder to get the data in, processed and get people buying to adopt ML over their own decision making. Keep the models simpler so that explainability remains manageable to avoid losing human trust or intimidated by the ML models.

  During the exploration period, the company should consider starting with a simple moving average, weighted moving average, exponential smoothing and Holts Winders method to factor in trends and seasonality maybe to start with so that everyone is on the same page and then expand the complexity. There are many such approaches but starting with something that they are in control is more important than just picking the most advanced ML model which is more like fitting a rocket engine into a minivan.

  The ML model you pick has to fit the domain and the company needs, and how the forecast output will eventually be used and ensure that there is no simpler option to get to the same level of forecast accuracy. [Demand ML](#) gives you a framework to enable any model you would like, making it easier for you to jump start your innovation for demand forecasting using ML/AI on google Cloud .

- **Change management** is more important than proving technology. ML/AI based forecast accuracy is proven to be better over and over across industries if you look in the right areas. Stock market, healthcare, space exploration has written thousands of models that are now packaged as ML models and algorithms in many white papers published by Google. The key is to ensure that you prepare your people to adopt the models and to fit into the current working environment.

- Most importantly **blend business processes** with newer ML/Ai technologies by augmenting and not replacing humans as the approach first so that the humans can help achieve extraordinary forecast accuracy not seen as possible before, and run 100s and 1000s of scenarios with ML models to simulate the business forecast in the "New Normal".

CONCLUSION

As COVID-19 evolves the perceived uncertainty will exist in employee's minds including your demand planners. Equipping them with newer initiatives for them to try and explore to get more optimistic is key. Your customers, competitors and partners are all in the same boat and many will try to innovate during these periods and eventually the toughest one survives and gets stronger.

- Companies of all sizes need to have an ability to plan for various scenarios with full visibility across the supply chain and Rapid decision-making bringing agility into their supply chain.

- Current systems and processes and policies and methodologies such as lean manufacturing, Six Sigma, Total Quality Management, integrated business planning, and enterprise resource planning business tools have a role to play and will continue to do so. However what is required now is the next level of innovation that brings agility into planning and revisits the KPIs that were taken for granted before.

- Demand forecasting accuracy boils down to make simple improvements. The first step is to provide more internal and external relevant data to train the model. Secondly, it is important to enable more mathematical computation for planning scenarios. Lastly, the model should attractively self learn and correct errors from the previous cycle reducing human bias. All of this is possible with ML on Google Cloud.

- COVID-19 appears to be a unique scenario that is bound to generate a bullwhip effect across many industries and verticals over the coming quarters to 2 years. Businesses typically do not plan for rapid change or a complete halt like what has been seen with COVID-19. Business now will demand agility at all stages, starting with demand planning quality.

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- Agile and multiple scenario planning using internal and external data is critical -- especially where the level of granularity can rang across dimensions such as geography, product, customer or time

- Cloud and machine learning technologies help you centralize internal and external data providing common visibility across supply chain nodes. Having the right technology foundation allows you to run scenarios in short cycles leading to the reduced bullwhip effect if you were to face one.

- Leverage the COVID-19 virus impacts, heat maps, government lock down and reopening data to adjust your demand forecast at your fulfillment center, store or node level.

Lastly, it is becoming a necessity to now experiment and innovate with newer technology that can produce tangible results and roll it out across faster as the impact of COVID-19 will still affect organizations over the next few quarters.

Pluto7's Demand ML solution ignites innovation in forecasting. This solution was built on Google Cloud and leverages the power of ML and AI to reimagine forecast analytics.

Request a workshop or a free trial to Demand ML with support by sending a note to marketing@pluto7.com.

References: MIT Report : Link

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