

# 14 Crucial Questions to Consider When Business Forecasting

What most businesses wouldn't give for a crystal ball that would allow them to look into the future and see how much product customers will buy – if only that kind of magic existed. Forecasting future sales is a challenge for organisations of all sizes, industries and geographies. With this challenge in mind, our forecasting product team have defined the groundwork businesses need to lay before they can successfully glean insights from any forecasts.

In this guide, we'll walk you through the questions you'll need to ask regarding your product, stores and data quality, then offer suggestions for next steps. The goal of the guide is to give you a framework for implementing a forecasting strategy, allowing you to then choose the tool that's best suited to your business.

Bruce Madden

**Datamine Owl and Programme Manager** 

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Forecasting is at the heart of running a successful business, whether it's projecting stock, sales, weather, demand - the list goes on, yet many organisations still don't have a good way to generate accurate predictions. CREATED BY **DATAMINE** THE DATAMINE GUIDE TO **DEMAND FORECASTING** 

#### Let's imagine you run a bakery...



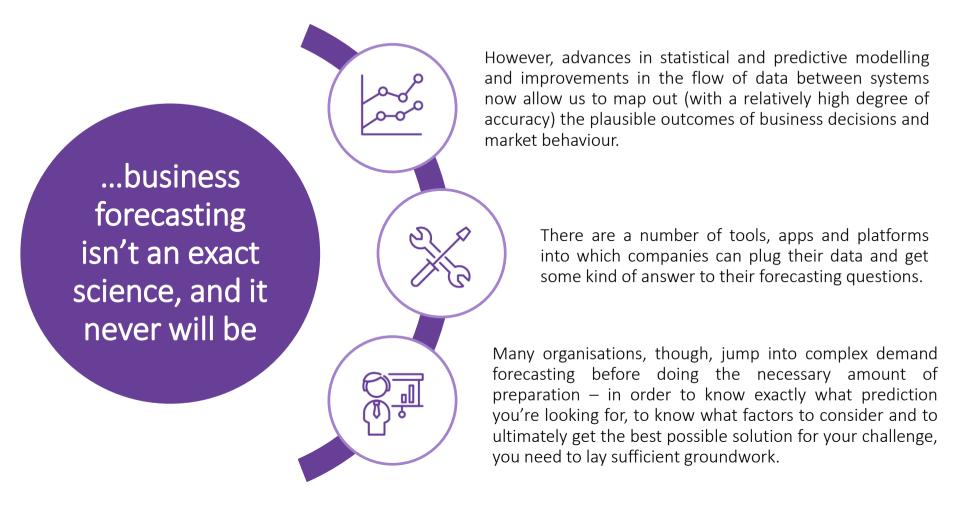
Based on how many muffins you sold yesterday, you guess that you'll probably need to bake a few dozen today. At 5pm, though, half the muffins are still sitting on the tray, and you have two options — either you sell these at a loss or you throw them out, neither of which are good for business.

The next day you therefore choose to only bake a dozen muffins, hoping not to have a repeat of the day before. Much to your dismay, the muffins are sold out by 10am and you have to turn hungry consumers away, which might affect your revenue and potentially even customer loyalty.

Most businesses have experienced some variation of this common issue, whether it's forecasting muffin demand, sizes and colours of clothes to order or which regional store branches will need certain products. And those same businesses have likely tried to do some degree of forecasting, only to hit frustrating limits in capability (such as the constraints of building and maintaining something reliable and scalable in Excel). Similarly, they might have been frustrated by the high cost and complexity of implementing an Enterprise resource planning (ERP) forecasting solution, which is beyond the means of many organisations and comes with its own risks.



#### There's a reason for all these issues



The team at Datamine have decades of collective experience in helping organisations gain deeper insight into their sales data, particularly with regards to forecasting.

This guide, written collaboratively by multiple members of our forecasting product team, will discuss the 14 questions businesses need to consider when they're in need of a forecasting solution, as well as what the answers could indicate about the best tools for those specific challenges. Let's jump in!



# All about your product

The first step to forecasting is figuring out the relevant characteristics of what you're selling, as this will differ from industry to industry and will have a significant impact on the approach you should take to the analytics process.

- 1. Does it have a shelf life?
- 2. Do you make it or do you buy it?
- 3. How much of it can you store?
- 4. How often does your product range change?
- 5. How do you identify when you're stocked out of a product?
- 6. How substitutable is your product?
- 7. What are the influences on your product sales?
- 8. What are your constraints and limitations during production?
- 9. What time scale do you need for your forecast?
- 10. What constitutes a trend in sales for your product?

#### 1 Does it have a shelf life?

If your product has a shelf life, your demand forecasting will need to be much more precise than it would otherwise. Under the umbrella of 'shelf life', there are two legs to consider.

#### Raw stock shelf life

How long can you keep ingredients in the refrigerator or freezer before they go off?

#### Product shelf life

After you've made the product, how long does it last once it's actually out on display?

When you've determined the shelf life of your ingredients and product, you need to consider production scheduling. You can't have a production cycle that's longer than your

shelf life, or you will run out of stock before the next run. If you only produce enough in each run to get through to the next, you may risk running out early if you underestimate demand.



If you create an "overlap" between runs and make a little extra product, you create a buffer that protects against running out and having to be so accurate – unfortunately you then run the risk of overproducing. This could mean a waste of product (if it expires) and materials, or a waste of labour resource or production plant time.

In cases where you've overproduced, there's a window of opportunity to ramp your next production run down by the amount you have left over, assuming it doesn't go off. This is a good approach for a short shelf-life products. There are still considerations to bear in mind – for example, if there is a minimum display requirement (to keep cabinets full of product and looking appealing), the amount of demand must include enough product to meet the minimum requirements after that leftover stock has expired.



This is simpler to keep track of when you've only got a couple products in rotation, but it becomes complicated when you're dealing with many items, at all times, each on their own rotation.

# 2. Do you make it or do you buy it?

If you buy your product, then your constraint is the lead time of the supplier:

How long does it take from when you place the order till when it turns up?

How far away does the stock have to travel from the supplier – is it coming on the next truck from vour local distribution centre down the road, or via a shipping container from Germany?

Perhaps supply is influenced by less foreseeable events, such as overseas weather or agricultural

conditions?





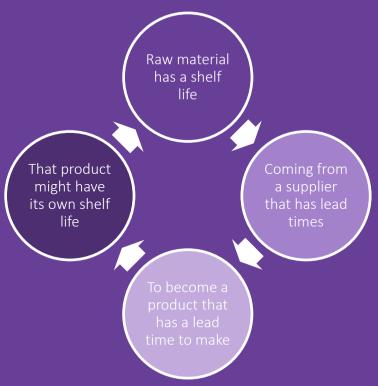
It will matter what delivery cycle your supplier works to – for example, a supplier might be shut on regional public holidays, meaning you need to place orders a day earlier, or the lead time might increase if the supplier despatches from a different distribution centre. Both you and your supplier's head office might need to be open to exchange orders, which would also have to be considered when shifting order times forward.

It's important to be able to schedule around these types of external constraints.



If you make your product, then you're not subject to the lead time of the supplier. However, it's important to ensure you have the raw materials for your product in good supply and that you've accounted for the lead time to make the product.

In many cases, both of these situations compound. complicating the issue further. For example, you might have raw material that has a shelf life, coming from a supplier that has lead times, which will become a product that has a lead time to make, which then might have its own shelf life. The extent to which you are reliant on external factors and lead times will affect which type of forecasting will be the best for vour situation.



## 3. How much of it can you store?

Organisations that have warehouse space available and a product that isn't perishable can store as much as they want for the foreseeable future, and the forecasting doesn't have to be spot on — your freezer or warehouse racks can act as a buffer for busy times. However, after a while you'll likely run out of one (or both) of two things:





**Space** 

Cash

One might be a more important constraint to your organisation than the other (depending on circumstance), but your demand forecasting should be designed to help you keep both those factors optimised while still maintaining a regular supply for your predicted demand.

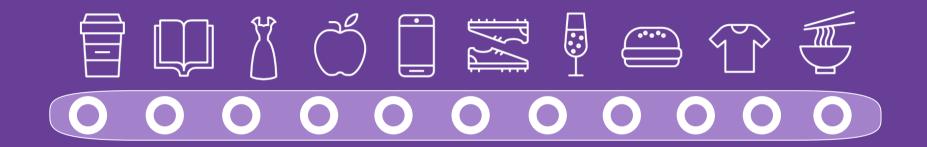


## 4. How often does your product range change?

Forecasting becomes more straightforward when your product range remains static over time, because patterns are easier for a model to determine from a long history (season trends are a great example). If you have new products constantly coming into circulation, though, and don't have a sales history to forecast from, you'll have to come up with a way to onboard a product. This might mean treating it like an existing product until there's enough data to make a forecast.

The ultimate goal should be to pre-plan when those new products are coming online so they're represented in your forecast with enough lead time to allow labour planning, supply ordering and production scheduling.

Issues can arise here if your business doesn't have a consistent approach across all outlets for what should be a national product range. Therefore, it's essential to have a way to deploy new products consistently across multiple locations while learning rapidly how they're performing and how to adjust them.



# SOLD OUT CREATED BY **DATAMINE**

# 5. How do you identify when you're stocked out of a product?

#### Stockouts are extremely important to identify.

To begin with, being out of stock isn't always bad. Perhaps you have times of the day during which you sell a large number of a certain product, like breakfast burritos, and by midday you've sold out — this isn't a bad thing, as it is unlikely afternoon customers would have wanted to buy one. So stockouts need to be considered against ranging decisions and time of day, season, and so on.

It is *unwanted* stockout events that provide information on a very important metric to measure: lost sales. During unwanted stockouts, the forecasted demand represents the amount of product you could have sold, but probably missed out on. The purpose of good forecasting is to avoid these lost sales, not just to win back those extra dollars, but also to keep your customers happy and coming back for another visit.

Spotting lost sales gives you a measurable potential impact that better forecasting could have on your business, assuming you can reduce stockout events.

Lost sales also add another really important consideration toward how you measure demand in the first place. If your forecast is based on your sales history, it will be limited by how much you were able to sell, and will continue to predict that level of sales.

- Let's say you sold 1000 bananas last month, but you ran out of stock, and your forecast (which is reliable) predicted you could have sold 3000 bananas
- Next month, it would be remiss for a model to predict that you will sell only 1000 bananas, because that's all that people wanted last month
- All because of that stockout event, we can understand that 1000 is not a good input for the month. A good model should add lost sales (2000) into the sales history (1000) to make sure it is continuing to predict demand (3000), not just current level sales

A reliable method for quantifying lost sales becomes important for a good future prediction. Defining how you identify stockouts (in your data) is key to supporting this. You may be able to cross reference inventory data or production quantities. If you have a frequently selling product like a flavour of burger, it might be possible to spot tell-tale gaps in sales alone, but this becomes complex in other lines of business. In fashion, for example, where sales are less frequent, it might be more challenging to determine from sales data whether a particular size, colour or style has stocked out, and a sale has been lost.

This is also assuming that if you're out of stock your customers will go to a competitor and you'll lose a sale. But maybe they'll wait until you've ordered that missing model of TV next month and come back then instead? Or maybe they will choose a different model, or even buy a more expensive one. This factor – substitutability – must also be considered, which leads to our next question.



#### 6. How substitutable is your product?

Let's say it's common for an end customer to just buy the next colour or flavour of whatever product you sell if another has run out of supply. This is good for avoiding lost sales, but how should you allow for this effect when you forecast and introduce new items into your product range? If your products aren't substitutable and you are about to launch a new one, say, one month in the future, you would need to see your total sales increase from that launch date by the same amount as the new product is expected to sell.

But if that product was very substitutable with existing products, you should expect a smaller net change in total sales — or maybe higher if it's likely to pull new customers from your competitors. Either way, how many sales is that new thing likely to steal from other products, and which ones?



# 7. What are the influences on your product sales?

Not everything is about products being on the shelves. Whether it's day of the week, weather, public holidays (and their variance from year to year) or the price of crude oil, there are bound to be external factors that influence not only much you can supply, but how much people want to buy.

How do you identify this from your dataset, particularly when the influences aren't immediately obvious?



chain, knows that if it's raining on a weekend, people tend to buy more pies than sandwiches. Even with the complexity of today's meteorology, it's not reliable to predict rain down to that level—a street and an hour—far enough in advance to make a good decision about changing a production cycle.



To allow for
out-of-the-ordinary fluctuations,
it's helpful if the business, and a model,
can adjust as rapidly as possibly based on
the recent data – for example, there might
be low sales and a higher leftover stock
rate if demand is down due to a storm, and
the next production run can be reduced
accordingly. The responsiveness of
the system becomes an effective
way to fine tune around
unusual fluctuations.



However, there are going to be correlations between the months in which rain is more likely and lower sandwich sales, all purely based on actual sales data. Without integrating unreliable weather forecast input data, a model can use sales data and week of year as the starting point for good general sales predictions that account for weather.







# **Case Study**

Another project we worked with involved predicting tomato yield, a unique case because the final outcome was almost entirely dependent on unpredictable variables.

The most important variable in a tomato plant's 9 week growth cycle is sunlight during first few weeks of fruiting, the amount of which will determine the final yield - unfortunately as a grower, you don't know how much sunlight you will get until it's already occurred.

Greenhouse labourers are also required to trim leaves well to allow the fruit to mature fully (the more light that flowering trusses get, the bigger they grow), without bumping or stressing the plants too much.

Further factors such as humidity, pests, temperate and dozens of other variables also contribute significantly to yield.

To take these factors into consideration, the solution had to forecast each new nine week cycle with a broad confidence interval until enough data was available to refine the prediction towards pick time and ultimately reach an accurate forecast three to five weeks from production time.

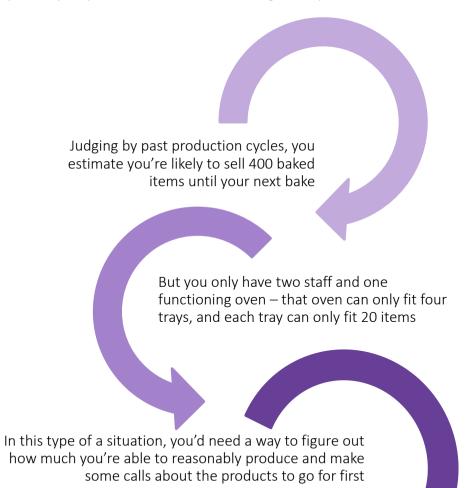
Despite the influences being unpredictable, having a solution that responded quickly to new data provided a robust and incredibly successful result.



# 8. What are your constraints and limitations during production?

Your production cycle will have different constraints and limitations depending on the nature of your product and industry.

Before you can accurately forecast, you'll need to know what their different iterations will mean for your production cycle. Some examples might be the number of staff, number of your ovens, space in your refrigerators, seats on your trains or space in your warehouse. This is especially important when forecasting food production. Take the following example in which you're a baker:



#### Can you meet the required number of products to break even?

If you don't have enough capacity to produce the full range in one cycle, which items should you choose to make:

- The best sellers?
- Maybe the longest shelf life products are a better bet, or the ones with the highest margins?
- Or an evenly reduced range to support the widest offering?

From there, you must also determine what to do about the products you didn't have the capacity to make:

- Do you try to make them later?
- Do you add an entirely new production run (potentially even early, if labour and shelf life allow)
- Or do you lump that extra product in with the next planned production run?

A forecasting tool is particularly helpful with determining what you can produce with the constraints identified, but all of this qualitative thinking will need to be done in advance.

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# 9. What time scale do you need for your forecast?

Some businesses might need to forecast for the next season, others for next week, daily or hourly depending on the product type, demand influences, operational cycles, and target customers.



Organisations that require forecasts multiple times a day need to consider the following - forecasting hourly, even with the best data, doesn't guarantee an accurate or reliable prediction. It's very difficult to predict what product is likely to sell in a given hour of the day because at that level there is much more randomness — who knows exactly which hour someone will walk in and ask for a chicken sandwich?

The objective should be figuring out the level at which your organisation can get a reliable prediction (this may be different for different products), then working out a way to break that number down into the most likely outcome.

The national bakery chain mentioned on the previous page have the need to forecast every product at every hour of the day. The product we built for them took a daily forecast at the category level, then used a second model to divide that into likely products per hour. This solution gives a good probabilistic prediction, and can then be kept accurate by responding quickly to fluctuations – in this case adjusting the next prediction based on sales in the last hour.

How this will look for your organisation is going to depend on how frequently your sales data becomes available – real-time feeds coming into the model will allow you to respond more dynamically.



"The best approach to 'trends' is assuming an event won't happen again until it does happen again."

# 10. What constitutes a trend in sales for your product?

Another consideration is how responsive you need your forecast to be based on recent changes in sales patterns. This can significantly affect the reliability of your model down the line.

Let's say you run a pizza shop, and one Thursday a tour bus stops outside, leading to an influx of customers who buy out all the sell-by-the-slice pizzas you had prepared. You've run out of pizzas (which isn't ideal), but sales were good. The big spike in sales will be reflected in your data — however, you can't assume that the same bus will come by the same day next week because, so far, it's a one off event. How do you want your forecasting model to decide whether or not to account for such an anomaly?

However, maybe the latest food magazine just named you restaurant of the year, and it's day one of a sustained stretch of bookings for the next month. It's worth thinking through how your product is subject to short terms events.

Typically, the best approach is assuming an event won't happen again until it does happen again. It's important to strike a balance between responding quickly enough to maximise the opportunity but cautiously enough to ensure you don't jump the gun.

Let's say that tour bus comes by two Thursdays in a row – two repeat events could potentially be the start of trend. It happens three or four Thursdays in a row? It's probably a sustained trend and should be taken into consideration in the forecast.

It might be tempting to want an improvement in sales over the past week to be reflected in the future. Just remember that if you try to make it too responsive, you will get a highly variable forecast based on events that are unlikely to repeat, which is unreliable in the long term. Think about the best balance point for your business, and the greater risk of aiming too high or too low, and find a tool that can deliver the flexibility you need.

The other component of this that is important to account for in your forecast is planned promotional events – if you know you're going to run a sales promotion for a week (a discount on microwaves, for example), a forecast should be able to take this 'special event' into consideration using data from similar past promotions. Otherwise you run the risk of confusing your model into thinking that this spike in sales is a new trend.



# All about your stores or outlets

Once you've done some analysis of your product, the next step is to consider the following questions regarding your stores, factories or points of distribution.

- 11. What will your range look like across all your stores?
- 12. How many stores do you have, and are you opening more?
- 13. Where are your stores in relation to your suppliers?
- 14. What are the labour considerations you have in-store?

## 11. What will your range look like across all your stores?

The process for forecasting will be very different depending on what kind of product range you're trying to achieve across your various outlets. There are typically three scenarios that play out with regards to this question:

One extreme

Sometimes smaller businesses only make what they think they can sell at each specific store, meaning they'll run a very efficient operation with minimal waste. Yes, they might only be selling one designer dress, or four pies, or 10 widgets per day at each location, but they're fully optimised for minimising waste and are only producing what is necessary to meet demand.

The other extreme

On the other end of spectrum, larger companies might want to build a more consistent brand or national range. This means no matter what branch a customer walks into, the same range of products will be available (regardless of whether or not they will sell). This is necessary for brand and continuity (imagine going to a McDonald's that doesn't offer Big Macs) but can mean a larger amount of wasted product and resource to make it.

The middle ground

Most companies fall somewhere in the middle. There's a balance point where a business has a core range of products that is consistent across all outlets, as well as some special offers that suit the local customer base. In these scenarios, waste can be balanced or optimised for gains in sales and availability of product.

A good solution should eventually be able to help you optimise challenges like getting rid of leftovers, bringing future production up/down or lowering wasted resource, but it's important to first determine where on this spectrum your business falls.

# 12. How many stores do you have, and are you opening more?

Similarly to a product range that is constantly adapting, the number of stores you currently have (and are planning to have) will affect your future forecasting.

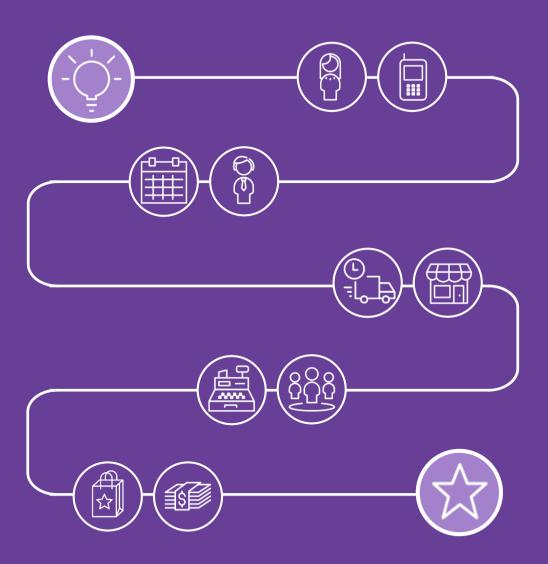
The first consideration is that if you have a new outlet opening up, you won't know how it will sell without a history to forecast from, meaning you'll need to find a way to build an estimate using existing data. Assuming it's going to behave like another store, or group of stores, you can base your forecasting model on data from somewhere similar. Perhaps store size or location is an easy way to group up similar stores, but if you only use one factor to determine your groups, you may end up trying to predict the same product range at two very different stores with very different customer bases, or quantities, etc.

One good way of approaching this instead is to group stores dynamically using a statistical clustering, meaning the system can create groupings in your forecasting tool considering any number of factors, such as the behaviour of the customer base, time of the day people visit, most popular products, total items sold, and so on.

Whenever a new store is due to enter your network, you can manually decide how to fit it into the most likely cluster, then once there is enough actual data, the system can move it to the correct cluster. If the forecast results aren't quite right during the onboarding of the new store, then it's a matter of moving it to a different cluster, and assessing again until a good result is achieved.

The second thing to consider for your new outlet is cannibalisation — before moving forward, you'll have to make a decision about whether the sales from that proposed store would be additive to total sales, or whether it is going to be poaching customers from your nearby stores. If it does, you then need to have an approach for determining the impact on your total forecast.





# 13. Where are your stores in relation to your suppliers?

This question is connected to the lead times to be considered when ordering from suppliers.

Before you can forecast, you have to work backwards to understand the time needed to keep ahead of demand how long does it take the supplier to deliver from each distribution centre? Are there blackout days when stores can't be supplied? Which one will be supplying each of your stores (if there are multiple) and what is the distance from that supplier point to your store?

Depending on how widespread supplier distribution centres and your stores are, the more complicated scheduling will become, so it's important to coordinate with your suppliers to know the timing and availability of stock for each point.

#### 14. What are the labour considerations you have in-store?

The final question to consider with regards to your stores is the way employee resources influence how far forward you need to forecast.

First, the number of labour hours available might create a constraint on how much can be produced at given time of day, taking into account staffing level, shift times and other conflicting responsibilities, and there may be a need to add this constraint into a forecast model.



Second, the amount of labour you can utilise might determine how accurate your forecasting needs to be. Let's say you own a deli: if you only make salads once or twice a day, you have to be accurate in the amount you make in order to avoid topups (as this will require more labour time). Conversely, if you make small batches every hour, you wouldn't have to predict as accurately, as you can react and adjust your production to align with recent sales. However, the labour costs would be unreasonable and likely unprofitable.

Sales forecasting and production scheduling should help find the optimisation point between the amount of resource spent on labour and other outcomes, like waste and availability of product.



"The amount of labour you can utilise might determine how accurate your forecasting needs to be."









# At some point, your data quality will matter

Anomalies within your sales data (and let's face it, everyone has them) can have an unwanted impact on your future sales predictions. The following questions are important to ask:

- How often do you find anomalies in your data, and how do you deal with them?
- Is your network prone to data outages (data has stopped flowing through, so it's just a functionality issue) or a real outage (your kiln is broken, or your store is shut because of an earthquake)?

Similarly, sales spikes may be false due to badly coded transactions or loading issues, or real due to an unforeseen one-off event.

A good approach is handling all data events in the same way and checking inputs against an expected range before these feed into your model. If any of the inputs are say, more than three standard deviations from the mean for a particular cycle, then these can be replaced with the mean to keep the forecast from responding to highly unusual events.

Again, it depends on the normal shape and variations in your average sales as to what the final solution should look like.





# I've considered these 14 questions – what now?

- Next steps
- About the author
- 3. WeekAhead case study
- Request a demo of WeekAhead
- Datamine experience
- Testimonials

# I've considered these 14 questions – what now?

The answers will influence how you should gear your modelling production.

Now that you've got an in-depth understanding of the various factors that impact forecasting, you can begin looking into a product that will help you account for all of them. The best forecasting tool for your business needs will depend on your answers to the questions.

If your forecasting needs fall somewhere in between complex enterprise-level products and simple excel tools, you might consider looking at something like **WeekAhead**, a demand forecasting and production planning tool designed to help food & beverage chains increase sales and decrease wastage. It might also be wise to sit down with a forecasting or analytics expert – they'll be able to take a closer look at your individual business challenges and offer a variety of options that will suit your needs.



#### **About the Author**

As Datamine's Programme Manager, Bruce's strength lies in the delivery of complex ideas in a simple, effective and visual way, whether it's building software or analysing data. He's passionate about solving actual business problems and ensuring there is a real impact – and making it easy for the people involved!



#### The solution

Through the use of WeekAhead, the retailer was able to understand the likely demand for the products at each individual store, depending on the time of day and the day of the week. The application also allowed the client to overlay business rules and constraints, creating an optimal recommendation of products to stock on an ongoing basis.

As an additional bonus, WeekAhead also consolidated supplier activities and minimised the disruption of stockouts.

#### The challenge

Datamine was approached by a large international retailer that wanted a more advanced forecasting solution. The company had thousands of stores, each of which had its own way of deciding what products to stock on any given day. This led to a lack of central visibility, difficulty optimising the range and a significant wastage issue.

The organisation found that these challenges led to disappointing customer experiences, as well as inconsistencies that made it difficult to implement sustained improvements across the brand.

#### The result

In the first 12 months after implementing WeekAhead, the retailer achieved an increase in sales of over 8% and an overall waste reduction of around 17%. The predictive recommendations from the application successfully determined which were the right products to stock in a given time and place to best serve customer needs.

Another beneficial outcome of using WeekAhead was the improved ability to onboard new products and get them into the right places more quickly.

We've offered the questions – now find out what to do with your answers. Request a consultation and free demo of our **WeekAhead** tool and learn how your business could forecast better with Datamine.

#### **Request a consultation**



Right Product Right Place Right Time



#### **Datamine experience**

With over 20 years' experience, Datamine is a leading analytics consultancy and product developer dedicated to enabling businesses to implement smart, data-driven decisions. Using our 350+ different solution types, including segmentation, profiling, churn detection and modelling, operational excellence, strategic direction and performance improvement, we deliver repeatable success across a range of industry sectors, such as banking, telecommunications, energy, retail, insurance, travel, FMCG, government, and healthcare.

Datamine is all about connecting and empowering people to benefit from data analytics every day. With a focus on collaboration, innovation and pragmatic excellence, we're passionate about giving organisations the knowledge they need to unlock the value in their data.

#### **Testimonials**

"Weekahead has hugely optimised our production quantities, and it's now unthinkable to forecast without it. The Datamine team are engaged and responsive towards building a highly capable software."

-- Manager, Daily Bread

"Datamine provide answers to help us make better, more informed, decisions. Personally, I like to have all the facts, and, through our work with Datamine over many years, we have seen things that have led us to make different decisions than we would if we'd just gone with our 'gut feeling'. Datamine provide us with evidence of what is actually happening in our business. This can be different to what we might believe and, at the end of the day, helps us to be more effective."

-- New World Brand Champion, Foodstuffs Auckland Ltd

"We really enjoyed having the opportunity to work with the team at Datamine. They come with sound knowledge, clear understanding and impressive expertise with analytics, and they delivered a very thorough and client-friendly report that provided in-depth insights into our donors as well as future recommendations. Their professionalism and interest in making sure that what they delivered was to brief was evident, and I would not hesitate in recommending Datamine to any company considering their services."

-- Marketing Manager at Child Cancer Foundation



