

Navigating the mountains and valleys of resource demand; a road map for the future

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Abstract

In resource demand, it is often easy to see the road ahead as largely flat without the peaks and troughs that are an inevitable part of statistical programming, especially in the ever-changing landscape of an early clinical portfolio. By following this philosophy, we are often not maximizing the opportunities presented by predicting the troughs as well as the peaks in our demand; making the most of the time available for potential staff development and preparing us better for the periods of high demand as we see them on the horizon. I will demonstrate the predictive techniques that can be used to create a map for this changing resource demand. With an adjustable and experience-based tool we can maintain our flexibility but with a greater degree of foresight. As programming managers this enables us to react quicker and often proactively in our decision making; a must in the early stages of clinical development.

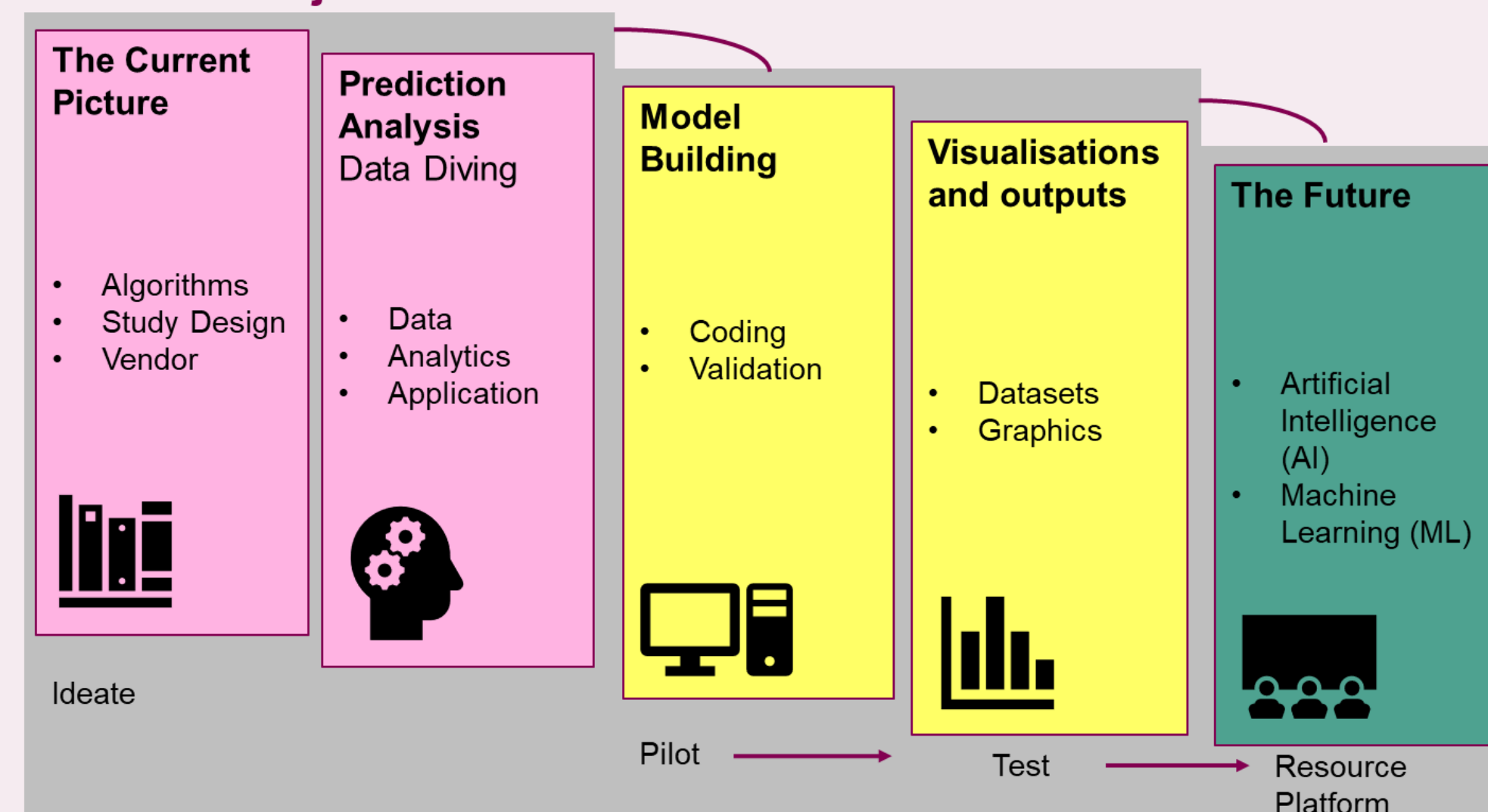
Current Picture



Resource managers generally use tools to gauge resource demand which are based on known tasks and milestones, alongside a flat FTE percentage. In order to try and model resource demand more dynamically I did the following;

- ⇒ I looked at our future total demand, and using data and patterns of the past, strived to predict the as yet unknown demand
- ⇒ I challenged the assumption that resource remains flat in a project/study and investigated how I could build a fluctuating resource model to map the demand. I started with that shown in Figure 1, presented by the navy line. By analysing our recorded time (in light blue) I saw the reality as a series of peaks and troughs which I could start to map.

Resource Project Plan



Prediction Analysis



For prediction purposes, it was also important to look at other pulls on programming resource in Early Clinical Development. An example being the desire for data visualisations for decision making, often followed by presentations at conferences.

With those being fairly predictable in terms of annual timepoints, this gave me the opportunity to look at the impact timewise currently and in the future (Figure 3).

I discovered a pattern of increases which further mirrored the peaks in recorded time within projects. This was then built into the model, seen as the green line below in Figure 4. We can now see a model that closely maps our view of the past and helps predict the future

Figure 1

Resource demand and recorded time

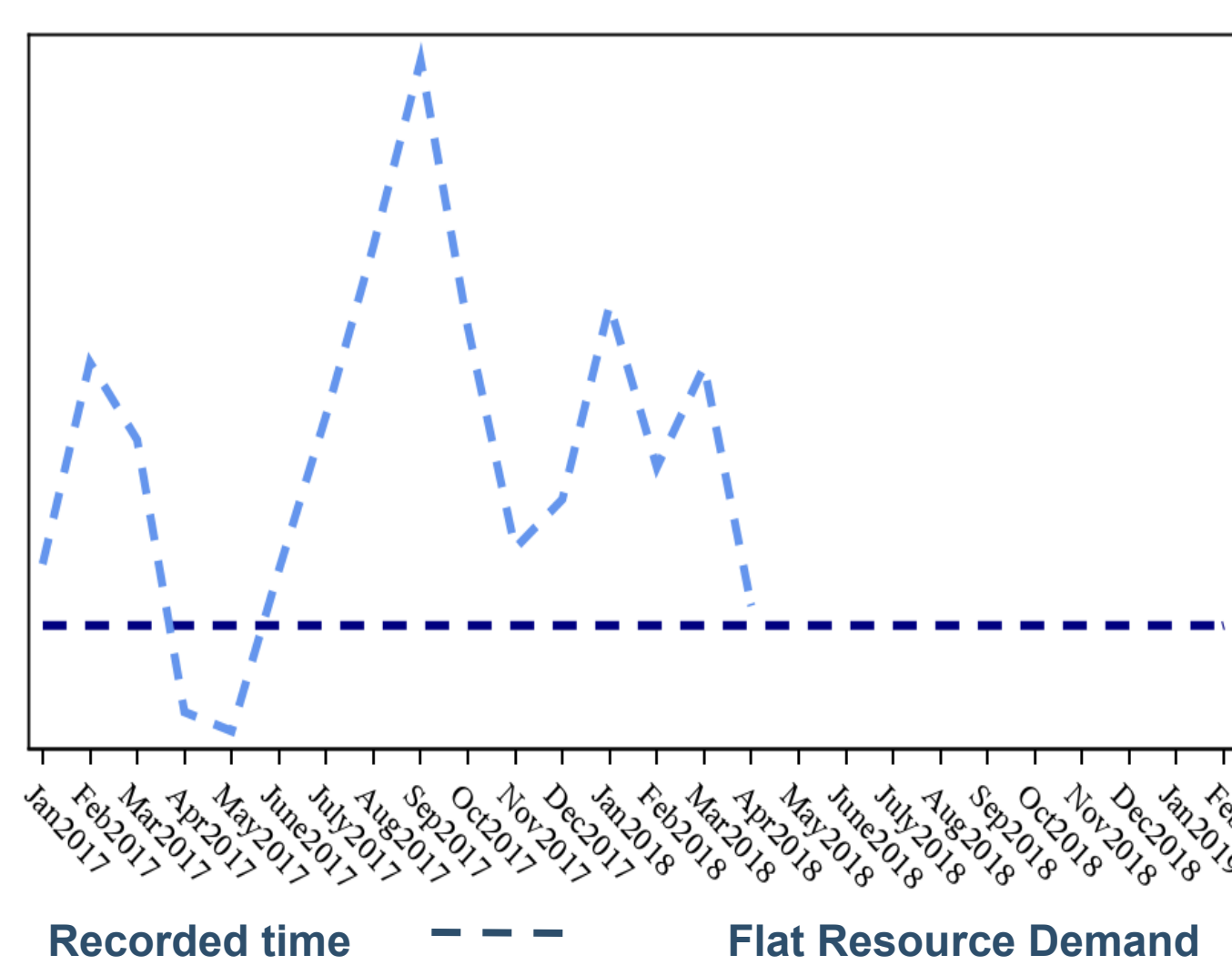


Figure 2

Resource demand and recorded time plus partial model

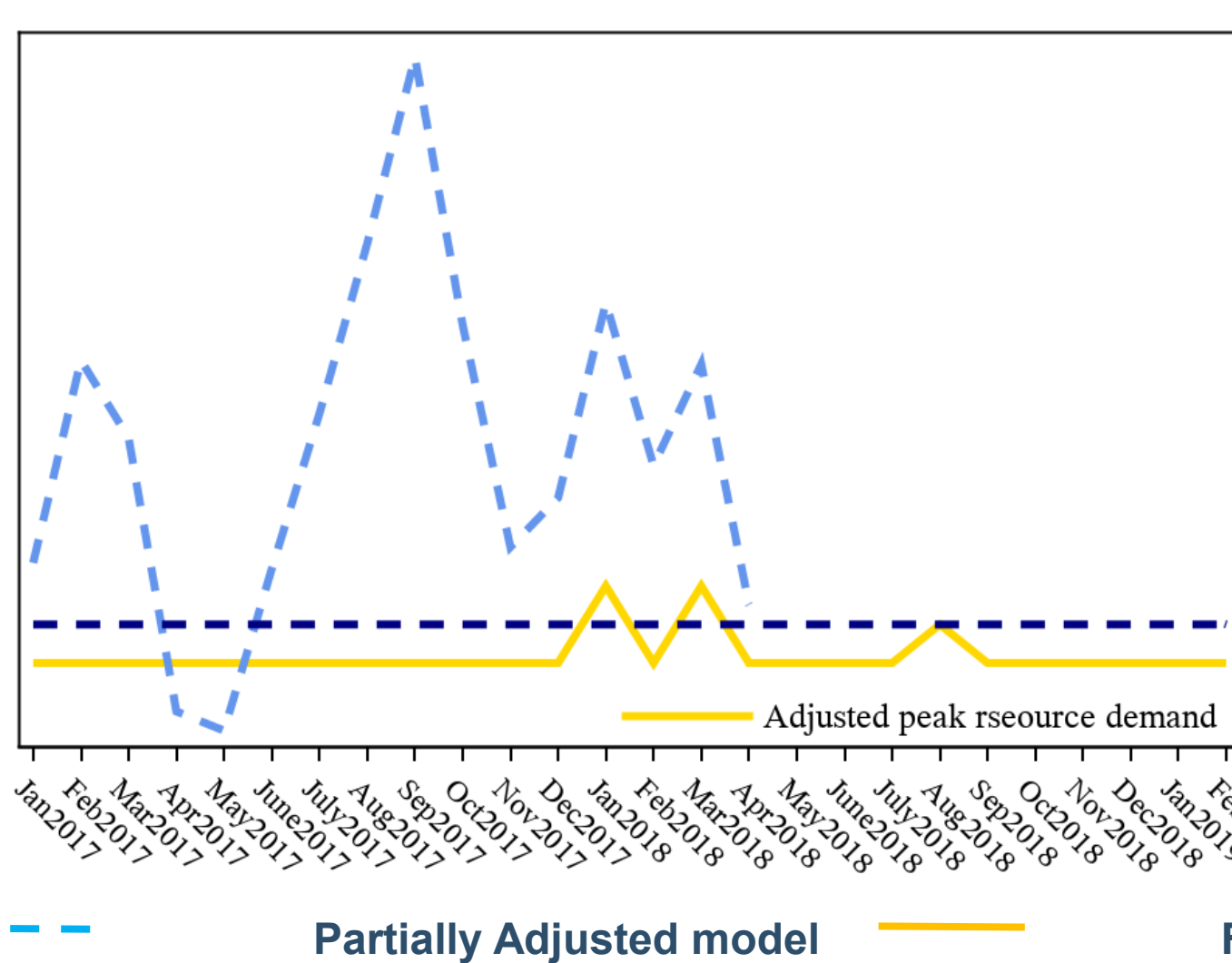


Figure 3

Conference presentation and recorded overall time

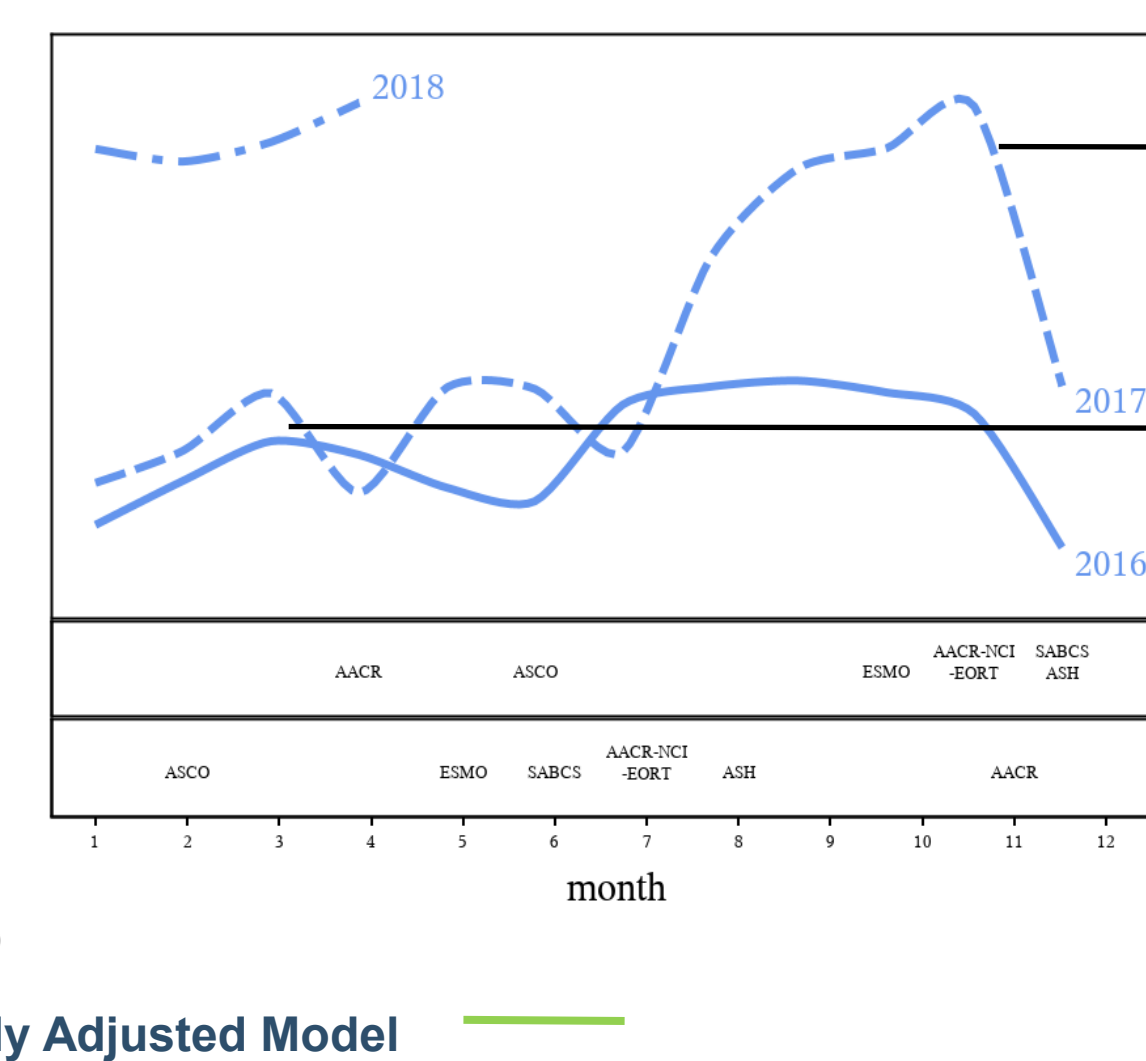
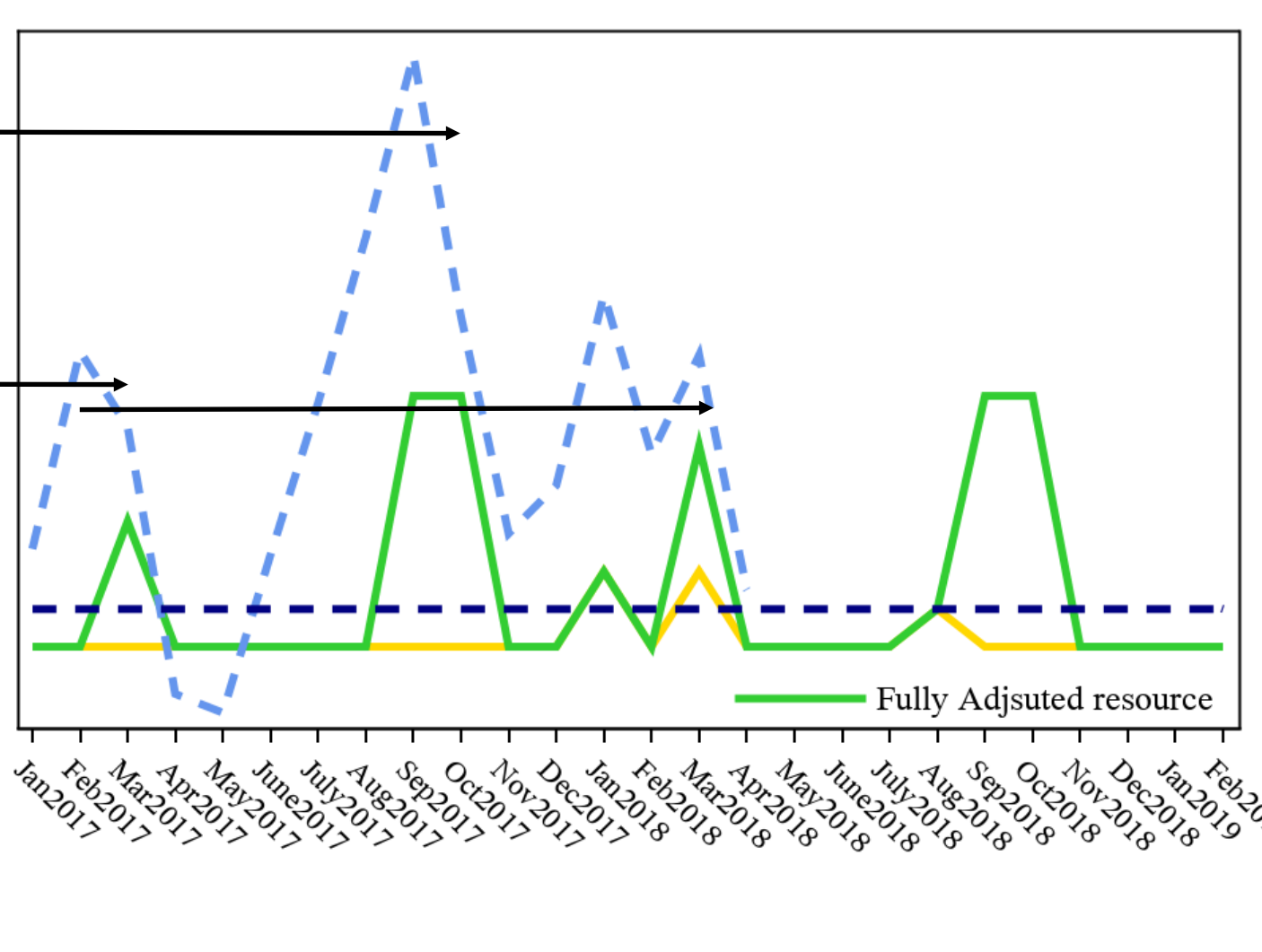


Figure 4

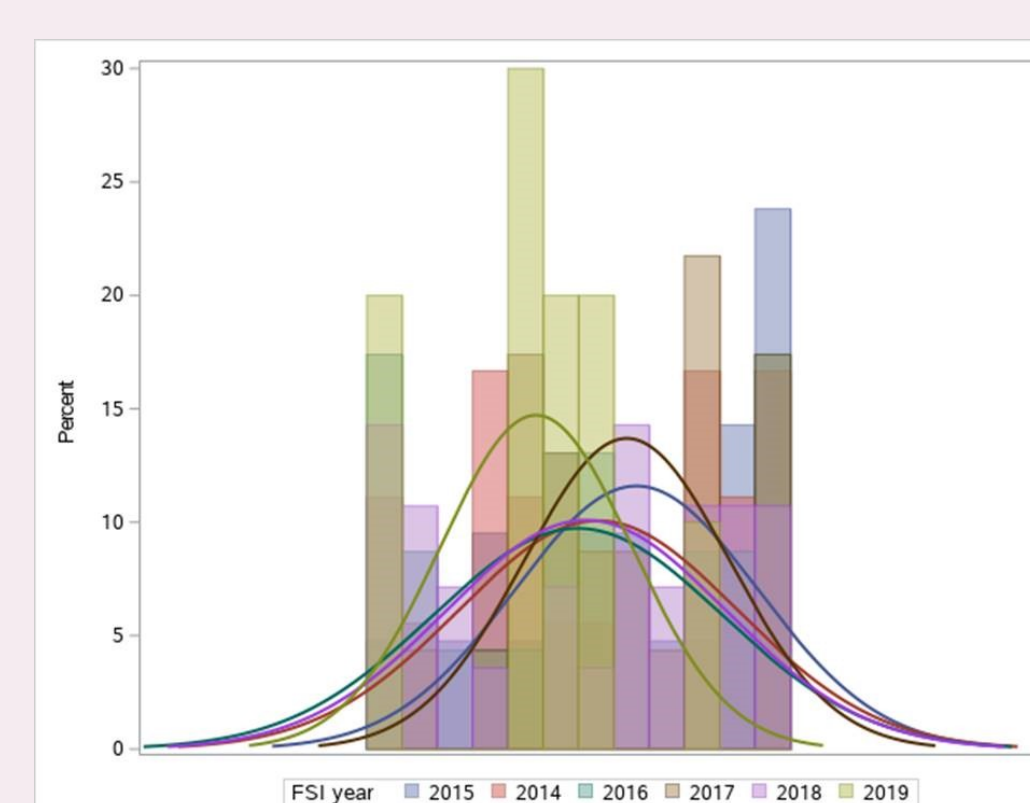
Resource demand versus and recorded plus fully adjusted model



As a first step I adjusted the FTE algorithms in line with the peaks and troughs, the yellow line in Figure 2.

Deploying this philosophy across the portfolio meant I could effectively see when to mobilise contract resource to cover those peaks.

However this only maps in part, the time spent.



To completely predict and manage that future demand I also worked to develop a series of pre-defined parameters to provide a view of new/increased project/study demand.

In order to define these I carried out review of historical data, looking for patterns and changes which included **distribution of FSIs (see graph), %increase in the portfolio, attrition and slippage, project advancement, and vendor selection.**

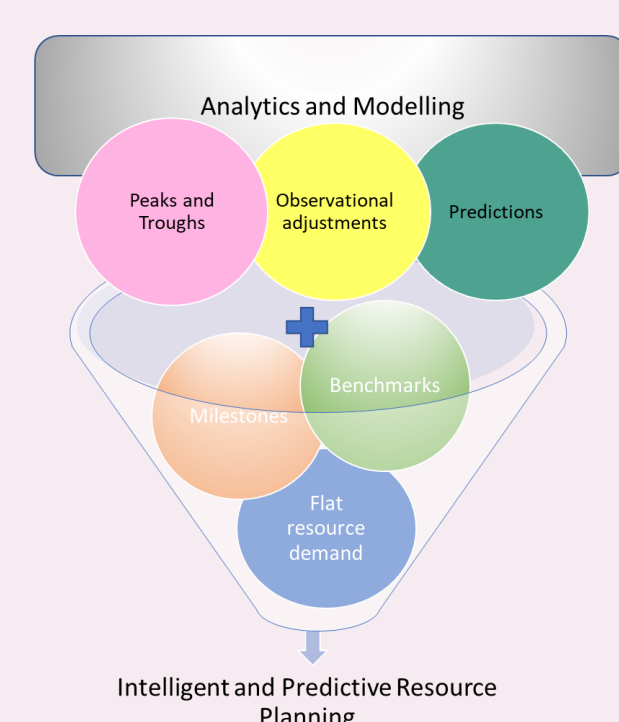
Model Building and Outputs



The flexible and adjustable parameters from the data dive and the mapped resource helped to build the model for future years using techniques such as random number generation for 'dummy' predicted new demand.

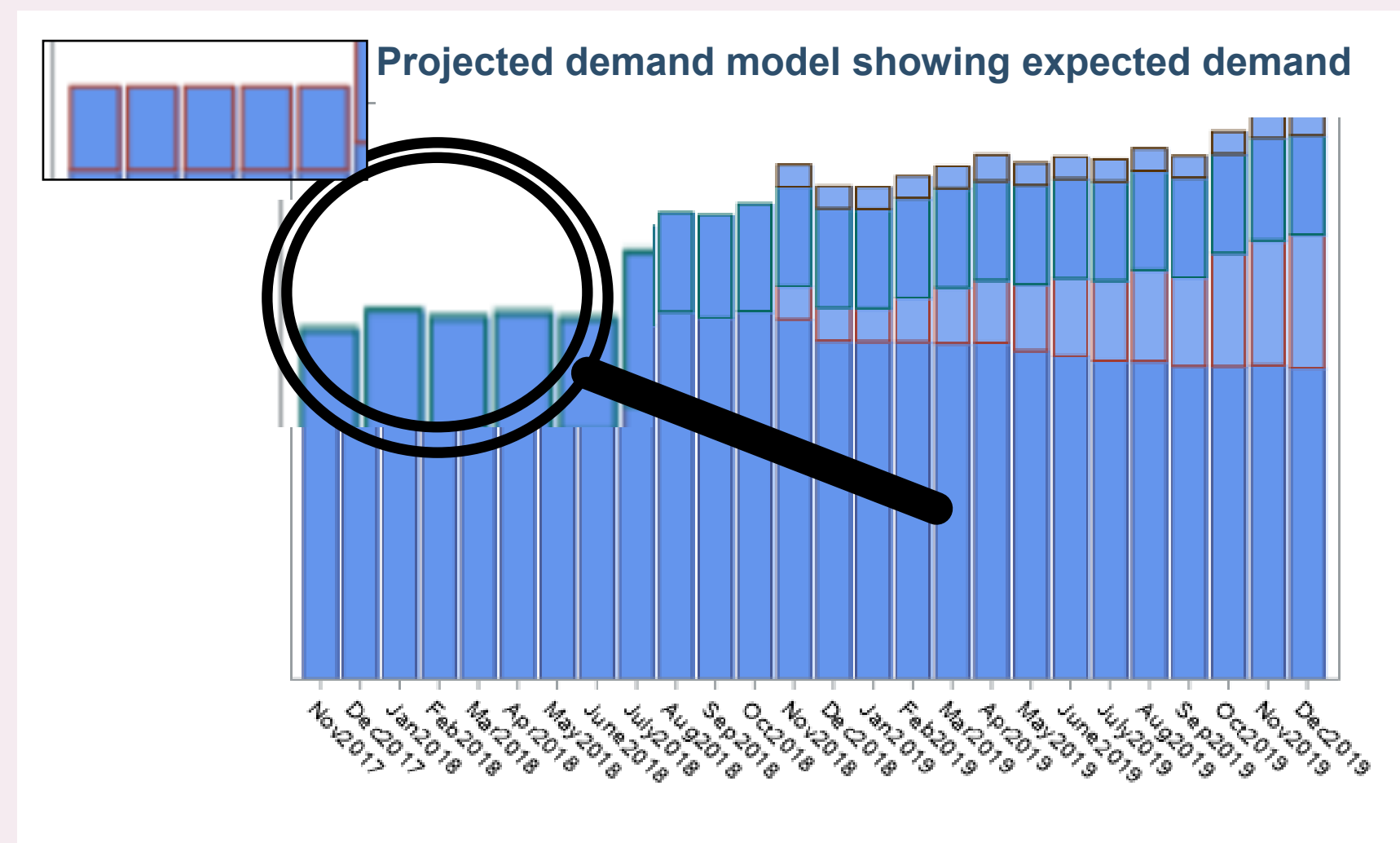
Resource demand was then generated around the three elements I had looked at;

- ⇒ Study/project level peaks and troughs
- ⇒ Situations which have a significant impact on demand i.e. conference presentations
- ⇒ Predictions based on analytics



The figure on the right illustrates our known and future demand.

The darker blue indicating our known demand. The magnified section shows the peaks and troughs compared to the flat resource in the small inset. The lighter blue is our additional predicted resource based on the new parameters



The Future



One of the best aspects of having a model for resource demand that is parameter driven is that simulations are possible where parameters can be changed and possibilities explored. The true development of this way of thinking lies in artificial intelligence (AI) and machine learning (ML) where systems can be taught to react in a more intuitive way to the distributions seen in past data, creating the parameters required for prediction without the need for human manual review.

We will be working on ways to automate and generate that machine learning as more past data becomes available, helping us to see further into the future of programming demand. The ultimate aim being to link into a web based platform that can be used across functions with selection based interactive reporting. We hope that the techniques demonstrated here can be launched and used in the operational space.

In recognition I would like to thank the Biometrics and Capacity teams in early clinical development at AstraZeneca, specifically Yvonne Jangvik (Team Leader, Programming) and Alison Dobson (Director, Clinical Trial Data Science) for their support during this process

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