



# The Power of **AI** and Human Intelligence

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Authors: Larysa Melnychuk, CEO and Founder at FP&A Trends Group,  
and Michael Coveney, Author and FP&A Thought Leader

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# 1 Introduction

Artificial intelligence (AI), although in its infancy, is fast making its presence felt within financial planning and analysis (FP&A) departments. Yet, much like with any new technology, people can easily misunderstand its functionality and organizations will take time to decipher the best approach for its implementation. Eliezer Yudkowsky, co-founder and research fellow at the Machine Intelligence Research Institute, supports this by saying “By far, the greatest danger of artificial intelligence is that people conclude too early that they understand it.”

To bring some perspective to this position of AI within the context of FP&A activities, the [FP&A Trends Group](#) recently conducted research examining how artificial intelligence (AI) and machine learning (ML) were being used within the profession. They carried out interviews with thought leaders and academic professionals, and examined case studies of organizations that were using AI and ML successfully.

This paper is a result of that research, looking specifically at how, when combined with human intelligence, AI can transform the role of FP&A.

## 2 What is Artificial Intelligence (AI)?

*FP&A should understand any AI related term used by consultants and vendors.*

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A significant difficulty in understanding any kind of technology is the terminology used and what these words actually mean. Misinterpretation can lead to confusion on the capabilities of specific technologies. When it comes to AI, there are numerous terms: machine learning (ML), predictive analytics, prescriptive analytics, algorithmic analysis, data-mining, correlation and regression. To the uninitiated it may appear that these are all different systems, using different technologies, but as you will come to understand this is not the case.

By way of analogy, let's consider what you would use if you had a headache. Would it be acetylsalicylic or acetoxybenzoic acid? Maybe you would prefer Genacote, Ninoprin or Easprin. In fact, there is no real difference as they are all different names for the same product, Aspirin. It is simply that some are technical terms, some are brand names and others are marketing terms.

Similarly, the way in which a product is used can bring about a different set of descriptive names, for example, headache relief, blood thinner, toothache remedy, and so on. The name used depends on the audience and the context of the description. For example, the name will be different as a consumer looking for a treatment vs a clinician who is prescribing medication. The former will have no idea of the compounds involved where the latter and the clinician will want to ensure that the product is wholly suitable for the patient.

The same is true of the use of AI related terminology within FP&A. Predictive analytics involves the use of statistical techniques including correlation and machine learning, which is the brand name for a range of specialized algorithms, that help inform organizations of what could happen. Similarly, prescriptive analytics can use those same constituents to inform organizations of actions that they may potentially take in a particular situation. The application may be different, but the process relates, more or less, to the same underlying components.

To complicate the situation further, not everyone agrees on what the terms actually mean. As a consequence, FP&A needs to be aware of how each AI related term is used by particular consultants and vendors. With this in mind, here are the terms and definitions used in this paper which we believe are the most accepted.

**Artificial intelligence (AI)** is an area of computer science that emphasizes the creation of intelligent machines that work and react like humans.

**Machine learning (ML)** is a subset of AI that uses different methods (or algorithms) to **learn** from the data, it's typical relationships and trends.

**Deep learning** is a subsection of ML concentrated on algorithms, inspired by the structure and function of the brain, that are called artificial neural networks.

**Predictive analytics** is a generic name for applications that encompass a variety of statistical techniques, that may or may not include ML, to analyze current and historical data. From this, trends and relationships are identified to make predictions about the future.

**Prescriptive analytics** is a generic name for applications that build on the capabilities of predictive analytics to provide a possible course of action, based on the program's predictions.

**Big data** is a generic term that describes the large volumes of data that are typically too large or complex to be handled by conventional databases. Data can be both structured, for example information organized in rows and columns, and unstructured such as documents, audio files and video files. Big data applications typically use ML algorithms to process and produce insights from these sources. Internet search engines are a common day example of big data application.

### 3 Statistical Analysis Vs. Machine Learning

*Contrary to traditional statistical analysis, machine learning uses algorithms that learn from the data.*

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Before going further into AI, it is worth noting the difference between traditional statistical analysis, which has been used within finance for many years, and machine learning which is still relatively new.

**Traditional statistical analysis** uses a range of standard statistical methods to build a representation of the data. From these models, analysis can be made to infer relationships between the variables and trends over time. There are various techniques that can be used. Regression and correlation can assess relationships between variables and time-series analysis, such as Holt-Winters, can detect trends and seasonality over time. These techniques have fixed rules for applying relationships to the data.

By contrast, **machine learning** uses algorithms that **learn** from the data. By **learning** we mean that the algorithm generates, or is given, a starting point for potential relationships, from which it then deduces a rule which it tests against further data supplied. This is known as **training**. Rules vary depending on the data analyzed, which makes them different from traditional fixed statistical models. The algorithm will automatically modify relationships depending on how successful the individual rule links to the supplied target. It then tests and tests again. This process is repeated until the algorithm cannot improve further on the rules generated, or it fails to find any relationship.



The degree to which the rules are able to predict the target value is given a statistical probability value of how good it is. These rules can then be applied to a new set of data to predict future target values.

## 4 Machine Learning Algorithms

*Algorithms are constantly being refined and new ones added to improve performance.*

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There are many different ML algorithms that can be used within FP&A, dependent on the type of problem to be solved and the data available. For FP&A purposes, ML can be grouped into 3 algorithm types:

**Supervised learning** algorithms are those that use training data to model human supplied relationships and dependencies between predictable targets and a given set of input measures. The relationships found are then used to predict future values beyond the training data supplied. Examples of this type of algorithm include linear regression, decision tree and random forest.

**Unsupervised learning** algorithms are those used to find patterns and structures within a set of data where the human expert does not know what they are looking for. In other words, there are no particular relationships or set targets. This approach allows the algorithm to detect relationships and hence potential drivers that are not obvious. These algorithms are typically further classified into clustering and association types.

**Semi-supervised learning** algorithms are a mixture of both supervised and unsupervised methods that can reveal how other data is related to relationships that are known to exist. The process starts with the user identifying the relationships that may exist within a set of data. The algorithm then uses these to detect any supporting relationships that may exist within the data supplied.

Algorithms are constantly being refined and new ones are added to improve their performance. In 2017, Jeff Bezos wrote to Amazon shareholders about Alexa, their voice-driven intelligent assistant:

“In the U.S., U.K., and Germany, we’ve improved Alexa’s spoken language understanding by more than 25% over the last 12 months through enhancements in Alexa’s machine learning components and the use of semi-supervised learning techniques. (These semi-supervised learning techniques reduced the amount of labelled data needed to achieve the same accuracy improvement by 40 times!)” [[SEC Archives](#), Amazon 1997 Letter to Shareholders]

## 5 The Case for AI within FP&A

*AI does not change the basic role of FP&A, but it does change the way in which that role is carried out.*

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The case for AI lies in its ability to save time through process automation while also improving the quality of those processes, for example better forecast accuracy. This allows more time to be spent

on tasks that only humans can do. As a consequence, AI does not change the basic role of FP&A, but it does change the way in which that role is carried out and as a result the speed, quality, and value of what it produces.

In research conducted with vendors, academics and end-users, the most common types of AI applications used within FP&A, fall under the following categories:

## Automated Forecasts

This is where most organizations start with AI. AI can be applied to forecast drivers based on the latest information, which are then used to provide an up-to-date projection. This process can be fully automated to learn from past variances to deliver continuous improvements to the quality of forecasts.

Automated forecasts, when done right, can save hours, if not days of time and can deliver game-changing quality. Egencia operate in the travel industry and claim to have reduced their forecast process by around 30,000 FTE hours each year. They are now able to tell in real-time what is driving their business in certain markets, something that would have taken them two months previously. The benefit to this is they are able to make management decisions so much faster.

## Identifying Drivers

AI can be used to automatically deliver insights into the drivers of the business. By examining results at a detailed level, algorithms can automatically assess relationships between the data, report on whether they have changed and identify any new drivers that need further investigation. This can help reduce bias, identify drivers that would otherwise go undetected and lead to more accurate predictions.

SBB Cargo, part of the Swiss Federal Railways, use AI to examine the impact of business choices on other activities. It then produces direct business recommendations. They have found that this approach is able to improve asset utilization by more than 20%.

## Digital Assistant

Natural spoken language applications, such as Siri and Alexa, are now available to work with existing management systems. Digital assistants can be used to process user questions such as “What was the sales turnover last month?” They can then provide an answer without humans dealing with the request. Queries could be taken deeper by requesting the regions that are causing the most issues or perhaps where the biggest variances exist. This report can be sent to all line managers. This type of application not only saves FP&A time but provides users with a much faster response.

## Data Quality Checks

Data quality is an issue faced by companies of all sizes. Automated data checks can identify any values that fall outside of a specified variance. For example, you could specify that any value that is 20% higher or lower than plan or a previous time period needs to be flagged in the system. A message can be automatically sent to the person responsible so they can verify its value. Protecting the quality of data is critical and a huge amount of time can be saved by detecting and correcting errors at source.

## Dealing with Complexity

Organizations that have multiple products or services and function in many locations find that accuracy is improved when AI is conducted at a product or location level.

This is because the algorithms are able to take into account the different conditions for each product/location combination such as the local competition, and the standing of the product. The process involves a lot of internal and external data, whose complexity cannot be managed using traditional tools. The result of each individual forecast is then aggregated to produce the company forecast.

This is how Janssen, part of Johnson and Johnson, deal with their large portfolio of products, normally almost impossible using traditional methods. They have greatly increased the accuracy of their forecasts while reducing the time staff spend on this activity.

Within all of the above applications, AI is doing what any human could do, given the appropriate amount of time. The main benefit of AI is its ability to do it much faster and consistently.

## 6 The Case for Combining Human Intelligence with AI

*Human intelligence is necessary to check that results of algorithms make sense.*

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Having established what AI can do, there are some people who believe that AI will eventually replace humans within FP&A. Thought leaders and experienced AI users feel that this is completely wrong. For AI to be effective, it needs to be combined with human intelligence (HI), for a number of reasons.

### Dealing with Unforeseen Events

Not all problems can be solved using AI. Applications that focus on the symptoms of a problem rather than the problem itself are destined to fail. The clear definition of the problem requires human intelligence, as does the context in which the problem exists. Unforeseen events such as the pandemic cannot be predicted from past data, which AI is reliant upon.

### Data Preparation

Algorithms are totally reliant on good data. That data needs to be sourced and prepared in a format that can be used. It needs to be accurate, free from irregularities and consistent over the whole time period used for learning. In other words there should be no holes or data missing. AI cannot do this task itself. Some of the data will need **labelling** so that the algorithms know what data is significant for its processing. If you do this incorrectly, then the subsequent analysis will also be wrong. Whatever is fed into the algorithm will be used to deduce a relationship and a prediction. Only humans have the capability to recognize when something looks wrong and then follow their intuitive sense to track down the issue.

## Choosing the Right Algorithm

As indicated earlier, there are many algorithms to choose from. The same algorithm that is appropriate for one set of data, may not work for a different set. For example, many users explain that they need to use different algorithms for revenue forecasting across different products. Human intelligence is also needed to check the results of the algorithm to ensure they make sense. This is where a strong relationship between the business, finance and data scientists is important.

## Interpreting Results

The output of AI is a projection and a measure of statistical accuracy. It is not a guarantee that the prediction will actually happen. That is up to humans to judge based on a review of how the model arrived at its result, the drivers it used and the patterns it detected. FP&A are then required to tell the story of those analyses or predictions and place them in context of the decisions that need to be made. After all, it is still the business leaders who make the decisions.

## Realistic Scenario Analysis

Once the forecast process has been automated, it is a simple step to move onto the analysis of alternative scenarios. This is where human intelligence is combined with machine intelligence. By changing the driver parameters, FP&A are more able to look at the impact of decisions. They can look at drivers that either take advantage of newly identified relationships or those that help the organization cope when unexpected events occur.

# 7 Introducing AI Into the Organization

*Using AI requires a different skillset that may not exist within the organization.*

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From the last section, it can be seen that a combination of AI and HI is required for AI to serve any real value. However, to achieve this combination requires an approach to be operationalized. No matter how much effort is invested into AI, it is only valuable if the results are not accepted and acted upon. Otherwise it is a total waste of time.

Fig 1 provides a summary of the different levels of interaction required in realizing the benefits of AI.

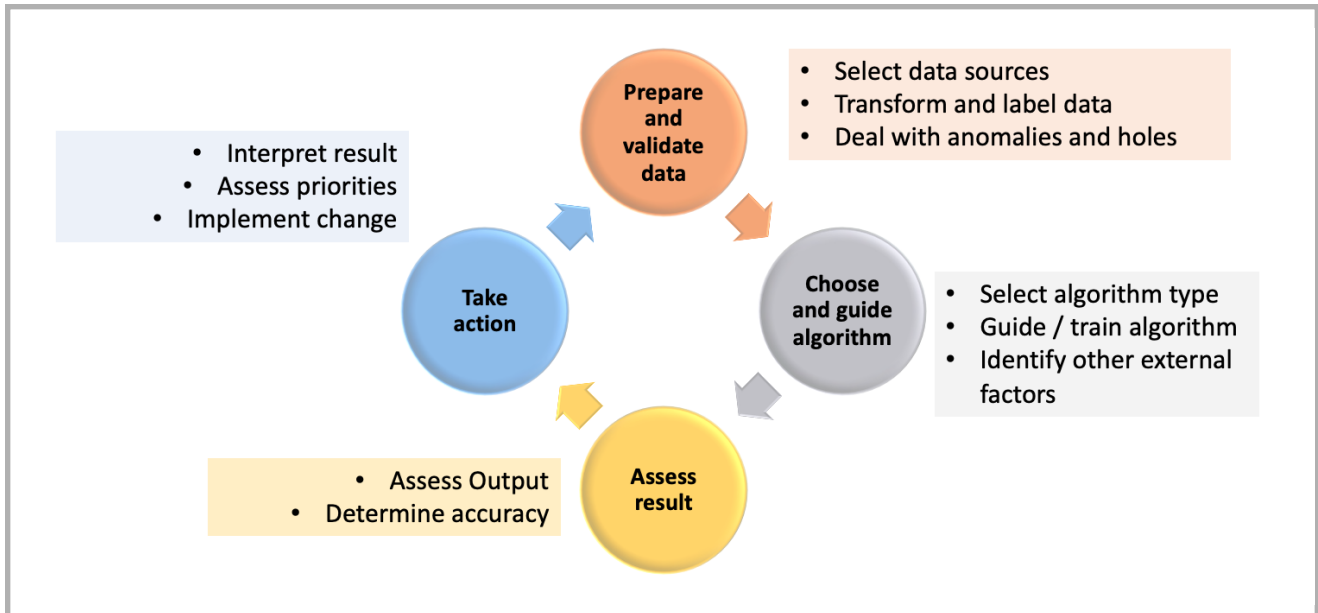


Fig 1: Combining HI and AI within an organization's planning process

Gary Kasparov, the grand chess master, who was famously defeated by Deep Blue, IBM's chess computer, has studied the application of AI within business. He concluded that "Weak human plus machine plus better process" is superior to "Strong human plus machine plus inferior process." In a business context, this means that the value of AI lies only in its implementation within a business process. A process that can be rolled out, that people use and that contain results people rely on. To do this people's fears of AI must be confronted. Here are a few suggestions based on the experience of companies that have embraced AI.

## Communication

It is important that staff understand what AI is and what it can do. This requires education including case studies from organizations that have used it successfully. People should be shown how AI can enhance the value of what they do and how it will improve their own skills and abilities.

## Commitment

The first few attempts using AI will probably fail. This is common as people get used to the technology and struggle to find good quality data that can be put into a suitable format. Perseverance is necessary which requires commitment at a senior level and a belief that AI is the way forward. Implementation will require patience and resources, but the end result will be more than worthwhile.

## Upskilling Staff

Using AI requires a different skillset that probably will not exist within the organization. Most organizations start by hiring in expertise from external sources, particularly with data scientists. However, the intention is always to bring those skills back in-house. AI requires good sound business judgement, therefore FP&A need to work with other departments to apply AI and interpret its results. For many, this has resulted in FP&A becoming a center of excellence, at the forefront the business.

## Focus on Value-Add Activities

The value of AI for FP&A is that it takes away the drudgery of non-value activities and provides the team with more time to focus on value-add activities. When used to identify drivers or provide forecasts, AI can add considerable value and allow FP&A the time to place results in the context of necessary business decisions. FP&A can provide a narrative as to why those predictions may be more reliable. AI enables FP&A to become true business partners and overall makes the role so much more satisfying.

## 8 Conclusion

There is no doubt that AI is going to be a game-changer in the value that can be offered by FP&A.

When implemented as part of the normal FP&A process, automated AI is like having another member of the team. It can look at variances, delve down into the detail, highlight issues and opportunities, and predict future scenarios. More importantly, it can do this constantly in the background, night and day, with little to no human intervention. Therefore nothing gets left out and no question goes unanswered.

However, to fully embrace AI, FP&A needs to change. It requires a range of human skills that may not exist within FP&A today. Skills that need to work together to ensure AI is correctly applied and results are correctly interpreted.

Anton Malmygin, Head of FP&A, BI and Cost-out initiatives Europe at Amazon, commented recently on their achievements in using AI. “We have reduced the time spent on gathering and checking data and more time is now spent on data governance, analysis, and activity based implementation. What we are now seeing is FP&A skills transformation”.

In summing up, AI does not replace the need for FP&A. AI is an enhancer of human intelligence that will allow FP&A to meet the planning challenges of organizations in an increasingly complex world.





## Larysa Melnychuk

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Larysa is a passionate Financial Planning & Analysis (FP&A) professional and influencer who has held senior FP&A roles at leading organizations before setting up the International FP&A Board in 2013. In the last three years, she successfully expanded the Board into 27 chapters in 16 countries across 4 continents.

Larysa is also the founder and CEO at [FP&A Trends Group](#), the leading online resource for FP&A professionals. She chairs the [Global AI/ML FP&A Committee](#) and runs a number of high-profile initiatives in the area of modern financial analytics.

Larysa holds a Master of Science degree in physics of materials and is a qualified chartered management accountant (CIMA), chartered global management accountant (CGMA) and is a holder of an FP&A certification. She is also a member of the exam content writing team for the Association of Finance Professionals (AFP) FP&A certification.



## Michael Coveney

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Michael Coveney has over 40 years of experience in designing and implementing software solutions that combine 'best management practices' with technology to improve the efficiency and effectiveness of planning, budgeting, forecasting and reporting processes.

He has conducted senior management workshops with leading organizations around the world and led courses for the American Management Association and Antwerp Management School on the topic of Corporate Performance Management.

His energetic style and extensive experience led him to become a regular speaker at many international events and the author of many articles and books. His latest, 'Budgeting, Planning and Forecasting in Uncertain Times' is published by John Wiley & Sons. In recent years he has focused on the role of IT within FP&A departments.

If you have any questions or comments, please feel free to contact us via email [info@fpa-trends.com](mailto:info@fpa-trends.com).

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