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The impact of predictive forecasting on corporate control

A comparison of two multinational corporations

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Key conclusions

- Predictive analytics-based forecasts at a corporate level are considered more reliable than traditional bottom-up forecasts, especially in the medium to long term, and if the future is expected to follow historic patterns.
- In more dynamic environments, it is necessary to incorporate local knowledge into corporate predictive forecasts and consider how this may affect historic patterns.
- Traditional bottom-up forecasts are important for steering decentralised business units and for creating a commitment to business targets. Corporate predictive forecasts can be used to validate and de-bias these decentral expectations.
- Combining corporate predictive forecasting and bottom-up forecasting can help to identify issues in the business and deviations from plans at an earlier stage. This combination facilitates corporate control as it allows a timelier implementation of counter measures.
- Developing predictive capabilities at the corporate level is considered helpful for driving digitalisation across the whole finance function of organisation.

Foreword

Forecasts provide managers with vital near-term reality checks on how their business is expected to perform against targets and budgets. They should help managers take course-correction decisions that improve prospects for achieving success.

Many businesses use a bottom-up approach to forecasting where business unit managers, who typically have the most detailed understanding of their units, evaluate performance drivers relevant to their units and base their forecasts on these drivers. However, forecasts carried out in this way are often subject to the biases and fears of the managers involved, leading to inaccurate and unrealistic forecasts.

Algorithmic models are a promising alternative to the more traditional bottom-up approach. But this approach is not without its issues. Algorithmic models are based on drivers known to be relevant to historic performance. However, in our volatile, uncertain, complex and ambiguous ecosystems, new or expected performance drivers can emerge (for example COVID-19), that render such models inaccurate.

This comparative case study explains how both forecasting approaches are used to manage performance. Crucially, it describes how constructive conflict between the two approaches stimulates conversations about performance and informs decision-making. Strategy execution is a conversation.

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Introduction

Forecasting is essential for managers to steer businesses in dynamic environments and to manage relations with external stakeholders (Morlidge & Player, 2010). In the interplay with actuals and budgets, forecasts inform both daily and mid-term decision-making by providing information about the future. The challenge that organisations face is that inaccurate forecasts can lead to complacency or misinformation, and potentially costly and wrong business decisions. It is important, therefore, to not only have accurate forecasts but also to understand what is driving them, their underlying calculations and assumptions, as well as associated risks, in order to be able to link them to decision-making.

Given that forecast information must be created, forecasting typically involves combining the knowledge, experience and motivations of several people. Consequently, bottom-up forecasting (estimating a company's future performance by starting with low-level company estimates and working 'up') often triggers discussions around different knowledge and experiences during which superiors can reinforce accountabilities for achieving targets, but also change targets or activities to adapt to changing business environments (Bourmistrov & Kaarbøe, 2013; Frow, Marginson, & Ogden, 2010). In this interplay of forecasts with targets, bottom-up forecasting has, however, also been criticised for being intentionally or unintentionally compromised by individual's interests and cognitive biases (Jordan & Messner, 2019; Morlidge & Player, 2010). In particular, when achievement of targets is in jeopardy but managers are optimistic that it requires only comparably simple action to bring their performance back in line, they may not want to show deviation from their targets to avoid intervention from higher levels. Despite mechanisms to improve the forecasting process, either through accuracy incentives (Jordan & Messner, 2019) or the use of neutral actors such as management accountants (Goretzki, Strauss, & Wiegmann, 2018), bottom-up forecasts are still often considered inaccurate at a corporate level.

Against this background, algorithm-based calculations such as predictive analytics are considered a promising alternative for producing neutral predictions based predominantly on historical data. However, such algorithm-based forecasts are often perceived as black boxes that are challenging for individuals to understand and trust. Further, predictive analytics are considered to perform better where there is no change in the historic data pattern; by comparison, human forecasters may have recent or highly tacit information that is not completely reflected or difficult to include in forecasting models (Günther, Rezazade Mehrizi, Huysman, & Feldberg, 2017; Wagenknecht, Lee, Lustig, O'Neill, & Zade, 2016). Therefore, algorithm-based forecasts need to be complemented by contextual knowledge, human experience and common sense.

Objectives

This study explored how predictive analytics-based forecasts can be used at a corporate level and how they contribute to managing organisations. We pay particular attention to the influence of human knowledge and experience from different levels of the organisation in the production of predictive analytics-based forecasts, explore why managers trust them, and understand how they contribute to managing the diverging interests of managers. The overarching research question is: How do organisations use predictive analytics to produce neutral, unbiased forecasts?

Research methodology

We undertook a comparative case study with two multinational companies between September 2019 and June 2020. Both companies are leading producers in their field; Chimica for chemicals and Programma for integrated business software (fictitious names). They are listed companies and experience considerable dynamism in their external environment, making forecasting an essential tool to manage their relationships with the capital market and for steering their business around the globe.

Chimica and Programma have different forecasting characteristics. Chimica is a decentralised organisation with relatively autonomous business units that are nevertheless linked, resulting in a relatively complex organisational structure. Furthermore, it is dominantly operating in cyclical industries. Programma, by comparison, is a relatively centralised organisation and has a rather stable business model without significant short-term fluctuations.

Both organisations started to use corporate predictive forecasts because of an increasing dissatisfaction with the accuracy of their traditional bottom-up business unit level forecasts. Programma decided to implement a predictive analytics-based forecast in 2016, intending to forecast the same line items of the profit and loss statement as the bottom-up forecast. They established an independent team of five corporate-level management accountants: individuals with prior experience in various central and decentral departments, junior business mathematicians and management accountants with little or no work experience. For some line items, 'satellite systems', established a couple of years earlier, supported calculations for the bottom-up forecast and were managed in separate teams by experienced management accountants.

Likewise, Chimica started its predictive journey in 2016, led by an advanced business analytics team consisting of statisticians and information technologists and supported by two corporate-level management accountants. Regular forecast calculations were reported to the management accountants, who took a mediating role in the communication with decentralised units. The team built on a system for demand planning, and started by predicting revenue and then extended to five key performance indicators over time.

As the central forecasting team at Programma was separate from the corporate controlling department, they reported to the board of managers, whereas at Chimica, the reporting was in the responsibility of the corporate management accountants. Both companies observed the quality of their central forecast for about one to two years before implementing changes related to the bottom-up forecast.

To explore the resulting changes, we conducted a total of 20 interviews with corporate level management accountants, as well as managers and management accountants from decentralised business units. We analysed our data following Morlidge and Player (2010) who argue that a good forecast needs to be timely, actionable, reliable, aligned and cost effective. Based on these characteristics, we compare the similarities and differences between Chimica and Programma regarding the problems that they experienced in forecasting, how they attempted to address them with their predictive forecasting processes, and what changes resulted.

Main findings and their implications for practice

Reliability of forecasts

- Both companies have traditionally relied on a bottom-up forecast that their decentral business units produced. In both, the top management teams weren't satisfied with the 'accuracy' of the forecasts, which at Programma peaked in the organisation making a bad decision that negatively impacted performance in the subsequent year. It is important to note that top managers and management accountants in both organisations acknowledged that there are always biases and errors in forecasts and that this is acceptable within tolerable limits. However, their dissatisfaction resulted from the perception that forecasts were diluted by what they termed 'politics', reflecting the typical budgetary biases. In particular, with longer forecast horizons, they felt that decentral business units tended to forecast too conservatively. Conversely, once agreed, decentral staff were reluctant to adjust forecasts even when the original forecast was unrealistic and were guided by interests and emotions when assessing the impact of current issues. This biasing behaviour stemmed from the comparison of forecasts with budgets and prior forecasts which led to the feeling that with every submitted forecast their performance and their efforts invested in achieving targets were to be evaluated. As a consequence, managers were reluctant to show in their total-year forecast unfavourable deviations from revenue or cost targets if they felt there was enough time to make it up until year-end, and favourable deviations to not give up resources early in the year or to hide a potential revenue surplus to maintain a buffer in case problems arise until year-end. In the forecast for the current quarter, however, biasing behaviour was less of an issue because 'everyone knows that the result will be there in two months, there is not much leeway to hide something' (Head of Central Forecasting Team, Programma).

> 'I would say one of the main reasons that the [predictive forecast] was created, was because we want to leave behind any… political influence that the operating divisions may like to show.' (Corporate Management Accountant, Chimica)

- **To resolve this, both organisations implemented a corporate forecast that was centrally calculated, based on predictive analytics. Interestingly, both companies deliberately did not eliminate their traditional bottom-up forecast processes.** They believed that the business units needed their own bottom-up forecast for steering purposes and the process of creating a bottom-up forecast generates a commitment to targets across all organisational levels. However, at Chimica the bottom-up forecast was no longer included in reporting to the board of managers, while at Programma only a part of the bottom-up forecast was included.
- In both organisations, a central forecasting team was responsible for developing and calculating a predictive analytics-based forecast. Having a separate unit was important to avoid 'political' influences and ensure staff felt only accountable for the accuracy of the forecasts. Neither company officially tracked forecast accuracy, however, forecasters would compare their forecast with the actuals to see how 'good' their forecast was or if they needed to make adjustments to the forecast model. Where Chimica and Programma differed was the approach taken in calculating the corporate forecast calculations as is shown in Table 1 on the next page.

Table 1: The corporate forecast approaches of Chimica and Programma

	Chimica	Programma
Starting point	Built on an existing system used for demand planning; it started with the calculation of one KPI and expanded to a full P&L	Aimed to calculate a full P&L and used different systems depending on the character of the line item; 'satellite' system already existed
Scope of forecasting	Calculation of KPIs (net sales, contribution margin, fixed cost, EBIT and EBITDA before Special Items)	Full P&L
Method of calculation	Uniform approach: predictive analytics model, that incorporates: ▸ Internal data (historical data, regular events) ▸ External economic information (industry-specific and economic information) ▸ Forecast is not based on other forecasting-indicators	Three approaches: ▸ 'Satellite' systems: Combine detailed data from different transactional systems in real-time; for line items that are based on individual long-term contracts as parameters of contracts determine future potential of that line item (e.g., personnel expenses, maintenance, cloud revenue); incorporate predictive analytics models (e.g., attrition rate) ▸ Predictive analytics models: Based on time-series model (e.g., travel expenses, third-party expenses) ▸ Manual calculation: For revenues that are largely influenced by 'last minute' tactical decisions of the sales force; based on CRM data and decentral information

- **To provide reliable forecasts, central forecasting teams in both companies considered it essential to incorporate local knowledge from the decentral business units, in particular, in relation to sales.**

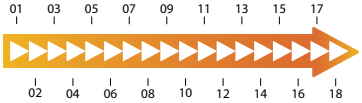
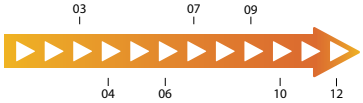
  'We must be in strong communication with the decentralised units […] to get a feeling for the data. […] We have tried to organise the contact. We now have an alignment meeting for each forecast.' (Head of Central Forecasting Team, Programma)

- That is, as systems can only draw on historical data and hence would assume historic patterns in predicting the future, one-time events or strategic decisions of the business units that would cause a deviation from these patterns were added manually. The start of the global COVID-19 pandemic at the beginning of 2020 illustrated this in an extreme way. At Chimica, for 2–3 months, the bottom-up forecasts were more accurate than the predictive forecast, however, after this period, the forecast team was able to 'train' the predictive forecast in the new 'COVID pattern', resulting again in accurate forecast numbers. As Table 1 shows, the way the local knowledge was acquired differed but aimed in both companies at incorporating knowledge in an as-objective-as-possible manner to avoid reflecting what they referred to as 'politics'.

Timeliness of forecasts

- In both companies, forecast cycles were perceived to be appropriate in light of the business model of the organisation. Accordingly, they continued with the same forecast frequency and time horizon after the introduction of the corporate predictive forecast (see Table 2) below.

Table 2: Time horizon and forecast frequency at Chimica and Programma

	Chimica	Programma
Time horizon	Corporate and bottom-up forecast: focus on year-end, with an 18-month rolling forecast 	Corporate forecast: until year-end  Bottom-up forecast: until quarter-end 
Forecast frequency	Monthly 	Twice per quarter 

- While both companies believe that the predictive analytics-based forecast has more advantages in the medium to long-term (i.e., in the time horizon of more than six months), there are, as Table 2 shows, differences in how Chimica and Programma use their corporate and bottom-up forecasts with regards to the time horizon. At Chimica, both forecasts had the same time horizon, which allowed for a comparison between the two. Whereas at Programma, the two forecasts had different time horizons, so that a direct comparison was impossible. The reason was that Programma acknowledges that each forecast has a slightly distinct purpose because their revenue is rather dependent on sales tactical decisions as opposed to external (economic) factors. Therefore, the corporate forecast was considered more accurate in the long term, whereas the bottom-up forecast was considered to be more accurate in the short-term as it supposedly reflected decentral managers' commitment to achieve the forecasted numbers. The differences between Chimica and Programma brought about different dynamics with regards to the alignment of the corporate and bottom-up forecasts.

  'So, in the short-term is better than in the long-run. In the short-term, they are better, in the long-term we are ... the central approach is better.' (Central Forecaster, Programma)

Alignment of forecasting

- **As the corporate and bottom-up forecast fulfil different purposes, it was considered important in both organisations to carefully align the forecasts to coordinate action across all organisational levels.** Accordingly, the corporate forecast was discussed with representatives from the decentralised business units and adjusted before the final numbers were reported to top management. At a corporate level, the bottom-up forecasts were considered a commitment of the business unit. Therefore, the business units were challenged and questioned on whether their forecast provided a realistic outlook. This corporate alignment process with the business units differs within the two organisations.

- Chimica uses the direct comparison between the corporate and bottom-up forecast. After calculating the forecast after extraordinary events, the corporate forecast team formally shares the numbers with the decentral business unit and asks them to comment on the deviations of the corporate forecast and their commitment. Subsequently, representatives from business units are questioned on the gap between the two. The corporate forecast has become an accepted yardstick that shapes those discussions. That is, decentral business units now explain why their commitment deviates from the corporate forecast instead of justifying why their forecast is the truth.

  "So, if the [predictive] forecast comes out with a hundred million and we say fifty million, then we have an intensive dialogue. Also with the regions, to say: 'Where does this come from? " (Management Accountant in Decentral Business Unit, Chimica)

- At Programma, the corporate forecasts are not shown to business units. Instead, the Head of Group Controlling would challenge the bottom-up forecast as part of the bottom-up forecasting process. Hereby, the questions revolve more around whether the bottom-up forecast is too conservative (especially with regards to sales) and the reasons behind the forecast numbers. The Head of Group Controlling would then bring this information about risks and problems into the meetings with the corporate controlling and the central forecasting team to decide potential adjustments to the corporate forecast.

- **Furthermore, both organisations found it important that their corporate forecast was in line with top managers' expectations and plans.** Therefore, they would manually adjust their system-calculated forecasts to take account of top managers' knowledge of certain events or planned measures that should be reflected in the forecast. While these might be seen as 'political' influences, forecasters did not consider this subjectivity problematic as it was transparent and could be included in commentaries and future forecast calculations.

Actionability of forecasts

- In general, forecasts should provide detailed enough information to facilitate decisions to achieve targets in light of current circumstances. Becuase of the differences in the calculation method explained above, Chimica and Programma facilitate this in different ways.
- Chimica developed a dashboard to split up the forecast to elucidate to what extent a KPI in question is driven by external factors (specifying what those factors are) and by historical data. This information was also shared with the decentralised business units before they were asked to explain the gap between their forecast and the corporate forecast. In this way, the corporate forecast was used as a benchmark in discussions, allowing issues to be identified earlier and facilitate — given the more decentralised organisation of Chimica — decisions of decentral business units about actions to be taken.

  'We now really have a comparison every month between what company divisions tell us as commitment and what PACE tells us. And so we have much earlier and much more transparent discussions …' (Head of Controlling, Chimica)
- At Programma, people described the predictive model of the corporate forecast more as a black box. As forecasters were asked to explain their forecast, they compared prior forecasts with the current forecasts to see differences in how the model was calculated. For those receiving the forecasts, however, it did not reveal much about the underlying issues.

  'Either you trust the model and say that I have had very good experiences so far, the accuracy has been good, or I do not. […] I can tell you the model fits, but I can't tell you if it's because of the flights, too many trips, that's not possible, the doesn't come out of the model.' (Central Forecaster, Programma)
- In contrast, forecasters that worked with satellite systems were able to provide more transparency about underlying issues.

  'Because it's made centralised by the team we know the assumption is in there … we are in a quicker position to assess when a question arises as to why, such as what the cause is.' (Central Forecaster, Programma)
- As a result, top Programma management used the corporate forecast as a benchmark that shows a trend and uncovers what revenue or cost items are heading in the wrong direction. The bottom-up forecast then helped to identify which business areas are facing problems and challenge people in business areas to hold them accountable for their performance but more importantly — given the rather centralised organisation — to extract information that explains the difference between the corporate and the bottom-up forecast. This interplay of corporate and bottom-up forecasts allowed top managers not only to hold people in business areas accountable for their performance but also to derive potential measures to ensure achievement of targets. These measures are subsequently discussed with the business areas.
- Furthermore, both organisations produced a range of forecasting numbers rather than a single number. At Programma, they provided the board of managers with best/worst/realistic scenarios whereby the final numbers are varied by adjusting software sales. It also allowed to flexibly simulate the impact of potential issues and decisions. Chimica does not calculate explicitly different scenarios but also discusses possible forecasting ranges.

Cost-effectiveness of forecasts

- Both Chimica's and Programma's top managers said that the benefits of having an additional corporate forecast outweigh the cost. Development costs aside, they only needed a small team to generate the corporate forecast as the calculation of it is partially automated. Moreover, they perceive the development of predictive capabilities as an ongoing improvement process that offers, in the mid-term, a huge potential for efficiency gains and, importantly, a way to drive overall digitalisation in their originations. At Chimica, the heads of decentralised business have already started to develop their own predictive forecasts to be able to use as a benchmark to debias the bottom-up forecasts that are reported to them. At Programma, the satellite systems that are used in the calculation of the corporate forecast are also supporting the calculation of the bottom-up forecast.

Conclusions

This study has analysed the implementation of predictive analytics-based forecasts in two multinational global corporations. Predictive forecasting at a corporate level was valued in both organisations as providing a realistic outlook. Interestingly, despite acknowledging the biases of traditional bottom-up forecasts, both organizations did not eliminate the need for and value of their bottom-up forecasting practices. Rather, predictive forecasting served as an additional benchmark to take the bias out of bottom-up forecasts. It was considered essential to keep the bottom-up forecast for steering purposes in the decentralised business units, leveraging local knowledge to account for extraordinary events and structural changes.

Using a predictive forecast as an additional measure influenced decision-making and corporate control. At Chimica, the discussions between the corporate level and decentralised business units became more efficient and effective as it shifted the burden of proof to the decentralised representatives and required them to justify deviations from the corporate forecast. In this way, issues were uncovered earlier, allowing Chimica to act in more timely manner. At Programma, the predictive forecast provided an outlook that helped to ascertain achievement of total-year targets and identify the revenue and cost positions that caused issues. The interplay of corporate and bottom-up forecasts allowed top managers not only to hold people in business areas accountable for their performance but also to derive potential measures to ensure achievement of targets. In both organisations it was important that at a corporate level, managers had a mechanism they owned that provided analysis to facilitate these productive conversations and thus changes to their discussion and decision-making culture.

Furthermore, starting to develop predictive capabilities at the corporate level was also considered helpful for driving digitalisation across the whole organisation. It had a positive effect on centralised and decentralised peoples' mindsets, as it gave people ideas how data can be used and how efficiency gains can be realised. In both organisations, that paved the way for an increasing penetration of technology in forecasting practices.

Further reading

Bourmistrov, A., & Kaarbøe, K. (2013). From comfort to stretch zones: A field study of two multinational companies applying "beyond budgeting" ideas. Management Accounting Research, 24(3), 196–211.

Frow, N., Marginson, D., & Ogden, S. (2010). "Continuous" budgeting: Reconciling budget flexibility with budgetary control. Accounting, Organizations and Society, 35(4), 444–461.

Goretzki, L., Strauss, E., & Wiegmann, L. (2018). Exploring the roles of vernacular accounting systems in the development of "enabling" global accounting and control systems. Contemporary Accounting Research, 35(4), 1888-1916.

Günther, W. A., Rezazade Mehrizi, M. H., Huysman, M., & Feldberg, F. (2017). Debating big data: A literature review on realizing value from big data. The journal of strategic information systems, 26(3), 191-209.

Jordan, S., & Messner, M. (2019). The use of forecast accuracy indicators to improve planning quality: Insights from a case study. European Accounting Review, 1-23.

Morlidge, S., & Player, S. (2010). Future ready how to master business forecasting. : Hoboken, N.J. : Wiley.

Wagenknecht, S., Lee, M., Lustig, C., O'Neill, J., & Zade, H. (2016). Algorithms at Work: Empirical Diversity, Analytic Vocabularies, Design Implications. In (Vol. 26-, pp. 536-543).

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