Technology Support in Business Planning: Automation, Augmentation, and Human Centricity

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PREVIEW *In his 2019* Foresight *article, Niels van Hove examined eight technological hurdles that must be overcome to enable autonomous or "lights out" supply-chain planning. He reasoned that to support such planning we need to implement a third wave of integrated supply-chain planning software.*

In this article, Niels argues that these technological advances can lead to either (a) planning-process and decision automation*, or (b) planning and decision* augmentation*. Process automation replaces human action with technology while cognitive automation replaces human decision making with technology. On the other hand, augmentation—expanding supply-chain knowledge with insights, predictions, and recommendations—maintains human centricity in the decision- making process. Although third-wave supply-chain software could cover all these elements, Niels believes that human centricity is critical, and that decision augmentation should be the more desirable form for business planning.*

BUSINESS PLANNING CYCLES

Business planning plays out across a number of horizons, from short term to long term. **Figure 1** illustrates the planning sequence.

At the longest horizon—often 10 years or more—is Visioning. The ultimate goal of any business should be to achieve its vision, which is derived from its core values, its chief purpose, a BHAG (big, hairy, audacious goal), and a description of its future vivid enough to provide guidance and direction to employees (Collins and Porras, 1996).

Strategic Planning, often for three to five years out, creates the initiatives to realize the vision (the What) as well as to promote the values and behaviors to display (the How). The budget, or annual operating plan, is normally the first year of the strategy.

Integrated Business Planning serves to align enterprise-wide plans with the organization's strategy. IBP fully integrates strategy with rolling forecasts (***bit.ly/wsp-rolling-forecast***), with a process for enterprise resource reallocation and with a corporate communication plan (Van Hove, 2016). IBP requires cross-functional alignment to eliminate silos; to achieve accountability for delivering strategic, financial, and operational outcomes; and to enable scenario planning that provides forward visibility into the consequences and risks of decisions (Sorensen, 2020). It also requires a clear understanding of the environment in which the organization operates, so scenario planning must extend beyond the enterprise to encompass value-chain dynamics and end-to-end supply-chain resilience.

Decisions from an IBP meeting need to be made in the light of the company's vision and strategy. IBP can support a company's vision by positively influencing its values and behaviors, thus actively shaping the company's culture (Van Hove, 2017). To fully support integration with annual and

Figure 1. Common Business Planning Cycles

Key Points

- Autonomous—third wave—integrated supply-planning software will serve to enhance planning cycles. But to more deeply understand how it can support business planning, we should differentiate the need for process and decision *automation* on the one hand from planning-knowledge *augmentation*.
- Understanding this differentiation is important for managers trying to navigate autonomous planning: rather than assuming everything can be autonomous, the manager can take a more sophisticated view of the people, processes, and technology needed to support the future of integrated planning.
- In this article I use several drivers to distinguish the desirability of automation from that of human decision augmentation. These include data granularity, decision frequency, business impact, system complexity, and human centricity. The importance of these drivers depends on the planning horizons, from the shortest—the Execution Horizon and Sales and Operations Execution—to the longest horizons of Strategic Planning and Visioning.
- Executive decisions in a business planning cycle will be best served by augmentation, not automation. I believe that the human aspect remains critical and that our ability to collaborate with machines becomes central to a supply-chain planner's role. The workforce must prepare itself for increasing human-machine collaboration.
- Third-wave supply-chain planning software will play the machine role in the human-machine collaboration, enabling the management of large amounts of data, use of advanced analytics, and automation of processes and decisions across the enterprise and the wider value chain. As it matures, third-wave technology may become the most important tool the workforce must prepare for.

strategic planning, the IBP horizon preferably covers a minimum of 24 months.

Yet even when a company's vision and planning cycles are connected through IBP, their execution must be connected as well. Kaplan and Norton (2005) observed that a fundamental disconnect between the formulation of a strategy and its implementation results in a 60%-90% failure rate in that implementation. IBP is the spider in a company's planning web that connects strategy with execution.

A problem arises in IBP meetings when participants are distracted by very near-term planning issues, leaving insufficient time for longer-term discussion and decisions. In my benchmark survey (Van Hove, 2017), only 25% of survey participants answered yes to the question "We have a relentless focus on only what is important for long-term business objectives." This finding speaks to too much focus on the short term and a lack of focus and commitment on maintaining a forward view of the business.

Sales and Operations Execution deals with very near-term planning issues—Gartner suggests a three-month horizon—that should be delegated to lower echelons of the organization and only be discussed by exception in IBP meetings. Doing so frees up time for executives to focus on the bigger picture.

AUTOMATION VERSUS AUGMENTATION

For over a century we have seen increasing automation in the supply chain, especially in manufacturing, and the pace has quickened in the past decade with robotization in production, warehousing, and transport. Robotic process automation (RPA) has also entered back-office operations, supporting administrative functions like purchase-order acceptance and invoice matching (***bit.ly/rpa-explained***). These ever-increasing levels of automation are creating unprecedented outpourings of machine data that can feed the algorithms of artificial intelligence (AI) and enable *cognitive automation*—the automation of decisions. What can be coded can pretty much be automated.

Where process automation replaces human action with technology, cognitive automation replaces human decision making with technology. But while automation will continue, it will not

necessarily lead to better outcomes. Historically, the car industry has been a leader in production automatization and robotization. Mercedes-Benz, however, sought to replace robots on its production lines with human labor, finding it just too costly to constantly reprogram the robots (*Industry Week*, 2016). Elon Musk, CEO of Tesla, has admitted that too much automation was slowing down Tesla's Model 3 production. The tragic 2019 Boeing Max airplane crashes, where automation took over control from the pilots, showed that in complex environments we need better human-machine collaboration.

There is an alternative to cognitive automation, and that is to use the algorithms fed by increased data availability to augment human decision making, rather than replace it. Augmentation maintains the centricity of human input in the planning cycles but expands supply-chain knowledge with insights, predictions, and recommendations. However, augmenting human decisions is not limited to the use of AI; specifically, machine learning (ML) can become the focus when discussing intelligence augmentation (IA) to improve human capabilities in decision making (Makridakis, 2018). Augmentation of decision making doesn't even necessarily require AI. Many business decisions can be supported by simple logic, calculations, and trade-offs, digitized in a process flow and presented to a planner to make the final decision.

I believe there are six main differentiators in planning that influence the choice of automation vs. augmentation.

Data Granularity At what level of data detail are the decisions made? Data granularity decreases the longer the planning horizon.

Decision Frequency How often do decisions need to be made? Decision frequency decreases the longer the planning horizon.

Data Generation and Availability How much data is generated in the decision-making process? The shorter the planning horizon, the more data that is being generated.

Business Impact What is the impact of decisions made? In most situations, the longer the planning horizon, the higher the business impact.

System Complexity How much interconnectivity of elements is there within a system as well as between a system and its environment (Chan, 2001)? The longer the planning horizon, the more unknowns and the higher the complexity surrounding decisions.

Last but not least,

Human Centricity What human qualities and capabilities are needed to support decision making?

THE RELATIVE BENEFITS OF AUTOMATION VS. AUGMENTATION

Figure 2 displays the levels of these six drivers by planning horizon, and **Figure 3** presents what I believe to be the relative efficacy of automation (in both process and decisions) vs. augmentation across the business planning horizons.

EXECUTION ENVIRONMENT

Execution within a production or warehousing environment offers the greatest opportunity for automation. This is because of the need for frequent, repetitive, low-impact decisions at the most detailed data granularity—SKUs and materials by work center or storage location. It is too much to expect that we humans can cope with these requirements on a mass scale, so automation here is highly desirable. Execution environments can be very complex, but relative to longer planning horizons, they have fewer links outside the four walls of a factory. Still, there must be human oversight and control, ideally managed by exception, to guide use and maintenance of machines and software.

S&OE ENVIRONMENT

In the ***S&OE horizon***, automation can be beneficial, since many decision processes, rules, and thresholds can be digitized and automated. For example, *demand sensing* has been used to update short-term demand plans based on automatically detected changes in sales orders, point-of-sale information, competitor activity,

Figure 2. Six Automation and Augmentation Drivers and Their Relative Impacts by Planning Horizon

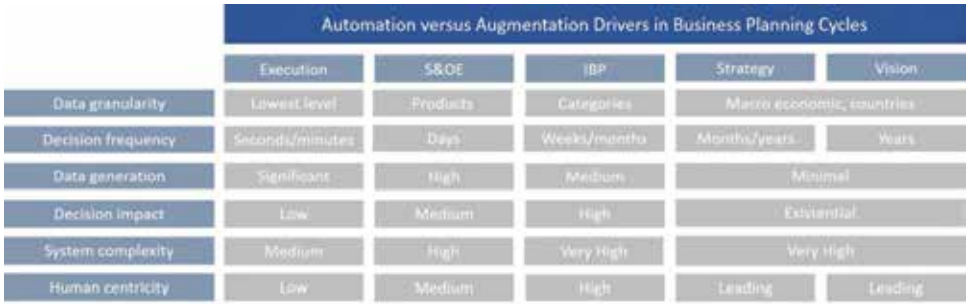

Figure 3. Relative Preference for Automation and Augmentation by Business Planning Horizon

and other drivers. A system can automatically ship stock across the supply chain to optimize customer service and minimize obsolescence.

Due to the lower decision frequency (days vs. minutes/seconds), there is time to support planners with predictions and recommendations, especially with regard to the more complex and high-impact business decisions.

The COVID-19 pandemic has caused much supply-chain disruption, increasing system complexity for S&OE as well as business impact, and at an unprecedented scale. Many companies have been scrambling to augment their decisions with simulations of the impacts from the closing of production plants or whole regions, the loss of suppliers and unavailability of materials, and severe drops in demand.

IBP ENVIRONMENT

In the ***IBP horizon***, decisions are relatively infrequent but have high system complexity and significant business impact. Here, communication, collaboration, and alignment are essential before decisions are made. Moreover, in IBP meetings, decision options, risks, and financial impacts must be presented and explained to the executives.

To facilitate these decisions, augmentation will be required to provide planners with results of supply-chain simulations, investment and risk modeling, product portfolio optimization, price setting, and even advice in negotiation strategies. Multiple options, with the risks, impacts, and cost of solutions needing to be explained to executives. So decisions in the IBP environment will be best served by augmentation, not automation.

Although decision automation in this horizon plays a minimal role, many of the underlying planning processes that feed IBP can be effectively automated, including data collection and cleansing and the mainstay types of statistical forecasting. Optimization of trade promotion is a digitized process in some companies, so that the predicted trade and promotional uplift is added automatically to the statistical baseline forecast to create the demand plan. The supply planning processes are already being driven automatically by the demand plan, and inputs set for levels of safety stocks, lead time, and batch order sizes. It doesn't take imagination to monetize these plans to assess their impact on P&L, to create an automated rolling forecast and to calculate variance from budget.

STRATEGIC AND VISIONING ENVIRONMENT

The ***strategic horizon*** is characterized by low-frequency, high-impact decisions,

and neither process nor decision automation is possible or desirable. Decision augmentation might be introduced through supply-chain network optimization or war-game simulations to analyze impacts of trade disputes or competitor actions. Megatrend analysis will be useful to better understand market trends, changes in consumer tastes, and technological developments that create new markets (think electric vehicles).

Human centricity must remain paramount if we are to understand the social and cultural contexts for strategy formulation.

Decision augmentation based on long-term trend analysis might be used during *visioning* as well: human centricity is the only basis for defining purpose, values, and behaviors, but also sustainability, corporate responsibility, diversity, and inclusion—elements which are beyond the reach of automation.

THE HUMAN ROLE IN THE FUTURE OF WORK

The impact of AI, supply-chain automation, and decision augmentation will certainly expand into new areas we can't yet imagine. The role of the human in the supply chain will be dramatically affected.

AI has been estimated to displace 38% of transport jobs and 30% of manufacturing jobs (Ghosh, 2018). A significant loss of jobs in the manufacturing sector is also projected by the U.S. Bureau of Labor Statistics. The truth is the real extent of the problem remains one of the great unknowns: long-range workforce forecasting is notoriously complicated, especially where a fast-growing technology like AI is involved (Sohn, 2020).

We've seen many examples of the limited reach of automation in both process and decision making. Moreover, human centricity remains important even in highly automated environments. Robots still require human design, training, programming, and maintenance. Jobs will certainly disappear, but technology will also reshape the future role of labor. An automation leader like Amazon is retraining a third of its U.S. workforce for higher-skilled jobs, providing opportunity for a warehouse worker to become a data analyst or IT support technician (Porter, 2019).

Automation and augmentation will occur side by side in business planning, resulting in a better-informed and more knowledgeable supply-chain worker. They will have more free time to strategize, communicate, and collaborate with peers, customers, and suppliers. The large chunk of time now spent on data gathering, data cleansing and segmenting, and analyzing will diminish. I've witnessed the excitement of a supply planner when she realized her cumbersome data gathering and analysis process could be digitized and replaced with instant recommendations, ready for her approval. However, to fully realize the benefits of these technologies, planners must learn to most effectively collaborate with third-wave supply-chain software.

The ability to collaborate with machines becomes central to a supply-chain planner's role, and human centric capabilities will become a key job requirement. Deloitte estimates that over 30% of highly paid jobs are social by nature (Hagel and colleagues, 2017), and McKinsey (2018) estimates a 24% rise in demand for social and emotional skills by 2030 (***https://www.mckinsey.com/featured-insights/future-of-work/skill-shift-automation-and-the-future-of-the-workforce***).

Human-machine collaboration will also be essential for a company to stay competitive. Kasparov's Law envisions that a superior human-machine interface will beat superior human knowledge and superior technology managed with inferior human-machine collaboration (Kasparov, 2017). Enterprises need to shape their vision, culture, organizational structures and processes in support of the human-machine interface (Sanders and Wood, 2020).

Third-wave supply-chain planning software will play the machine role in the human-machine collaboration. We are now seeing third-wave systems; for example,

a cognitive operating system that enables knowledge workers to manage large amounts of data, use advanced analytics, and automate processes and decisions across the enterprise and the wider value chain. As it matures, third-wave technology may become the most important tool the workforce must prepare for. In the end, machines will do whatever they are programmed to do. However, it is humans who may have a harder time adjusting. We aren't so easily programmed (Sanders and Wood, 2020).

CONCLUSION

Constant process and decision automation will shape the future of work in the supply chain. It is an exciting journey, where new boundaries between human and machine need to be explored, reassessed, and reset. It is a journey where humility is required, and where trust is essential to make the human-machine interface work. Maybe this is best said by Garry Kasparov, who was on the receiving end of the brute force of automation when he lost a chess match to IBM's Deep Blue in 1997.

> *"With so much power now brought by machines, we have to find a refuge in our humanity. It's about our creativity, our intuition, our human qualities that machines will always lack. So, we have to define the territory where machines should concentrate their efforts. This is a new form of collaboration where we recognize what we're good at and not interfere with machines where they're superior—even if it hurts our pride."* (Teichler, 2018)

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