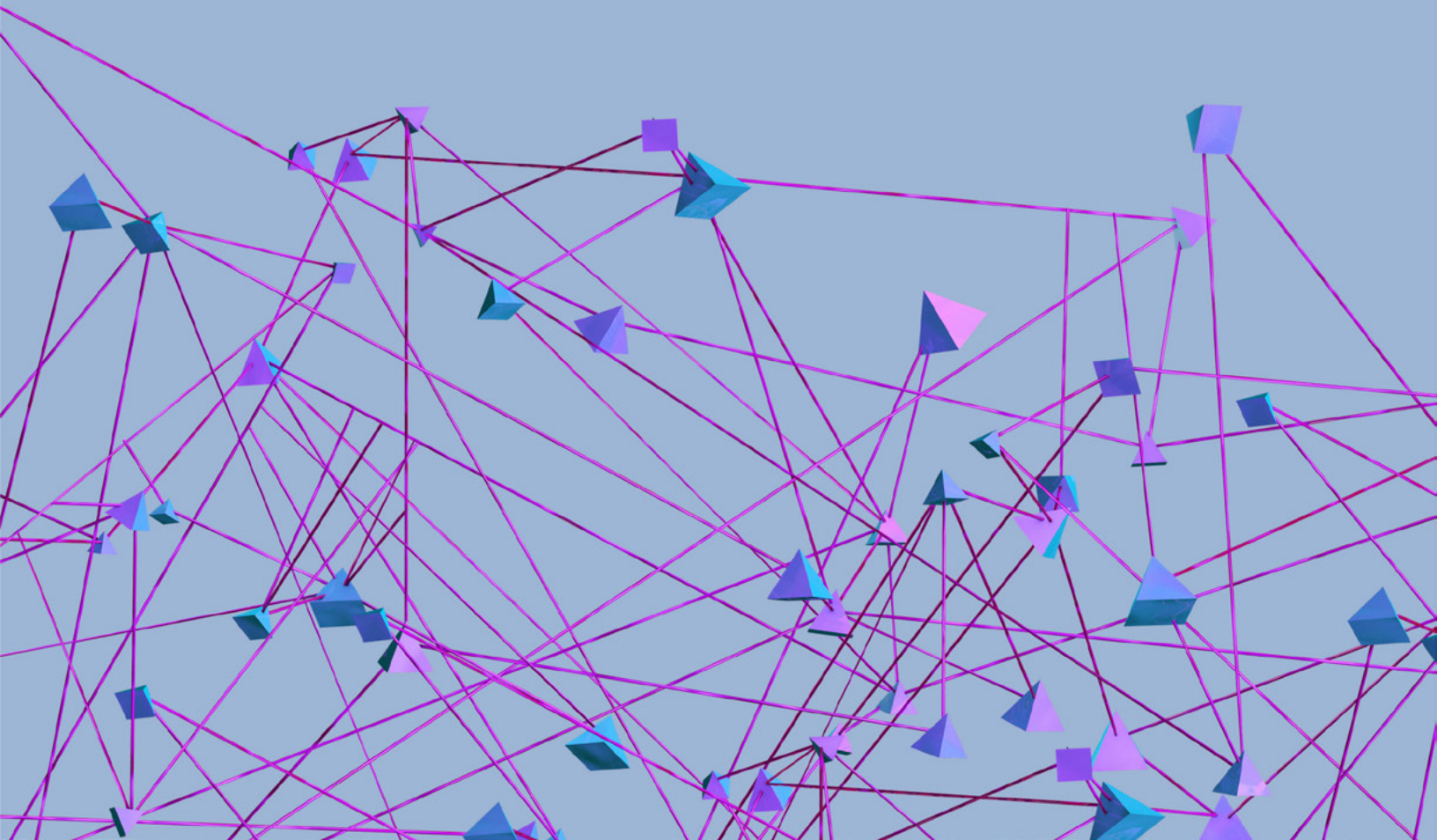


BUSINESS ANALYSIS IN THE DATA SCIENCE AGE

Driving Differentiation in High Tech



The high tech industry is going through epic disruption. Value is migrating from products and devices to software to platforms. Then, there's the unrelenting pace of technology change. Technologies such as artificial intelligence and machine learning are becoming pervasive, fundamentally changing the way companies operate. The advent of 5G is only going to add to the potent mix of technologies driving profound changes. Add to this, the ever-rising expectations of customers who want anytime, anywhere service.

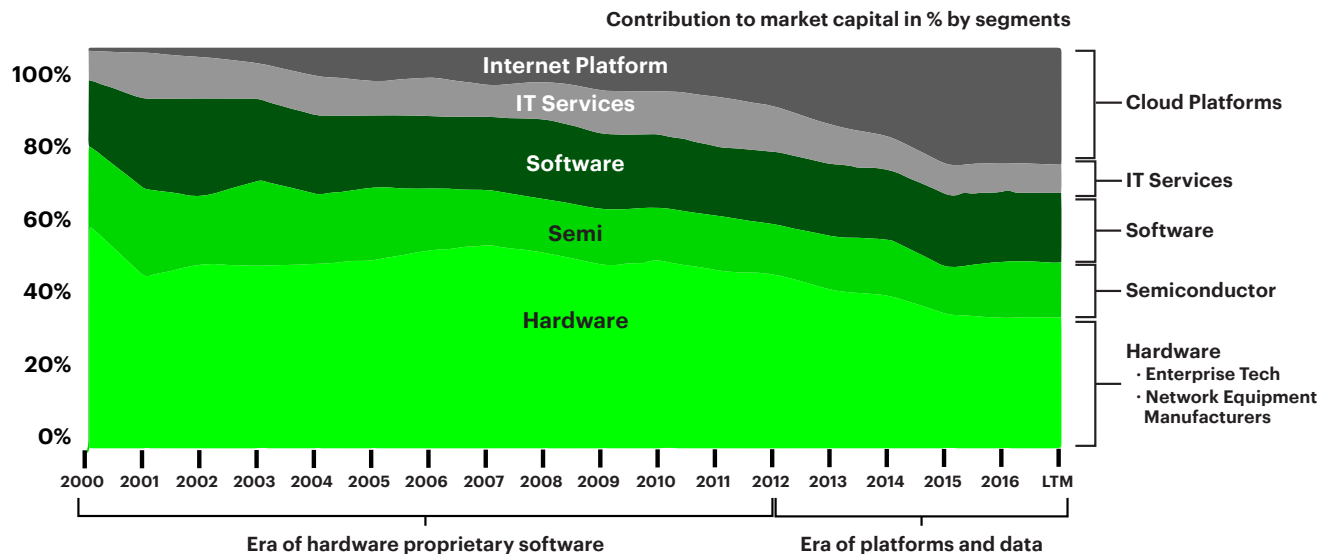
To ride this wave of disruption, high tech companies need to reimagine themselves, their products and services, and move to more connected products and new business models such as As-a-Service. They need to become more intelligent businesses and find new growth through innovation. This requires harnessing the power of data. And this is where business analysis (BA) professionals come in—they can play a pivotal role in companies' transformation to insight-powered organizations. They can help mine insights that were hidden or never correlated before, and chart the road map of innovation and differentiation for their organizations.

To do so, they need to be armed with business expertise and the ability to deal with data and relate insights to their organization. This paper looks at some of the key trends in the industry and how BA professionals in high tech can help companies take a data-driven approach to new growth.

EMBRACING THE POWER OF PLATFORMS

The high tech industry has been quick to embrace the transformational power of platforms to capture new growth opportunities. Just look at tech companies and enterprises that are born digital, such as Uber, Amazon, Airbnb, Netflix, Google or Alibaba. Many of these companies' most groundbreaking innovations are not products or services; they are the platforms on which their products and services are built, and the business models that these platforms enable.

Figure 1. Traditional high tech is losing market share to cloud platforms

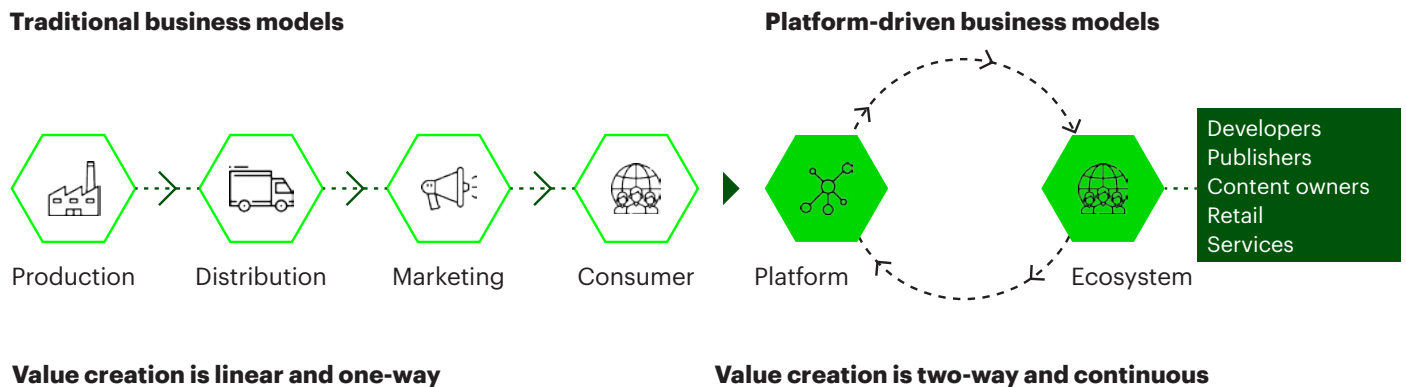


Such platform-based business models fundamentally change how companies do business. They allow companies to create entire ecosystems that do much of the work to grow and drive strategies. Indeed, the platform has become the business model that is opening up entirely new paths to growth for companies.¹ Figure 1 shows how platforms' contribution to companies' market capital has increased significantly in the platform era (post 2012).

Indeed, in today's platform-based economy, no product or service works in a silo but is connected to other products and services, building a holistic ecosystem. The platform helps companies network with the different wires and nodes of the ecosystem, making them an integral part of the connected world. We call this the "network effect of the platform economy."

A classic example is the network effect of Apple's iOS App Store, a platform the company launched in 2008. The iOS App Store includes an ecosystem of nearly 20 million developers who have created more than 2.1 million applications, which have been downloaded more than 170 billion times. The platform has generated approximately US\$50 billion for the company since it was launched. Apple is successfully harvesting the resources of the ecosystem—resources it does not need to own.²

Figure 2. Accelerating value creation: The top 15 public platform companies represent more than \$2.6 trillion in market capitalization worldwide.



Data is crucial in platform economies

In a platform economy, the biggest advantage doesn't lie with the organization that has the best product—it is with the player that has the best customer data and insights. The rule of the game is simple: the better you know the customer needs, the better your chances of dominating the business. Uber doesn't own the best car, Airbnb does not own the best hotel rooms, neither does Amazon manufacture the best products. What they have and leverage is the best data and insights to know what the customer wants.

They use data to aggregate the best offerings at the right place, right time, for the right target customers. These companies are no more auto, hotel, or retail companies; they are all technology companies who are playing a lead role in evolving the platform economy.

From hardware to platforms

There's a data explosion taking place in today's digital economy. The data produced every two days is equivalent to the entire data that existed before 2000.³ This will only go up with the number of connected devices and sensors expected to touch 50 billion by 2020.⁴ Companies are looking for real-time analytics and minimal data storage in core. The result? Industry value is moving from hardware products to cloud-based platforms.

Digital natives such as Amazon and Google, traditionally not part of the high tech industry, are displacing traditional hardware and semiconductor companies such as Dell in storage, moving data to the cloud. The disruption has hit these traditional companies hard. Figure 1 shows these companies seeing flat growth, which is also a result of them holding back their investments in new technologies in anticipation of new, data-centric 5G technology in the near future.

AS-A-SERVICE IS HERE AND NOW

The combination of the data wave sweeping across the industry and the platform ecosystem has led to high tech companies moving from traditional business models to As-a-Service business models. As-a-Service offers improved agility and speed—to get ahead of shifting markets and keep up with fast-moving customer demands. The digital customer wants only services relevant to them, whenever and wherever they want them. Platform-based service models allow enterprises to integrate devices and complementary value-added services. They also allow companies to partner with other players in emerging ecosystems to offer a variety of products and services, and integrate themselves into the daily life of the customer.

Subscription-based selling, where customers pay a certain amount for a recurring service, is one manifestation of this new way of doing business. HP, for instance, is moving from selling laptops to selling subscriptions. The subscription model is not new—many of us have subscribed to magazines and newspapers, but in the era of digital platforms, this type of selling has altered the go to market for high tech companies.

Everything As-a-Service (EaaS) is another As-a-Service model that's gaining popularity, with several companies already adopting or planning to adopt EaaS to deliver new experiences with smart and connected products. Companies such as Adobe, Service Now and Microsoft are frontrunners in this business model.⁵

What exactly is EaaS? For a better understanding of this model, think of any company—large or small—that needs to refresh their fleet of devices every few years. Now, this is a costly exercise, requiring a huge spend on procurement, training, deployment, servicing, etc. EaaS helps mitigate this cost by allowing organizations to procure a hardware product (mobile, laptop, desktop, tablet, etc.) and bundle it with services and software that are maintained and managed by a single service provider for a subscription-based contract. The advantages? No impact on the capex, as the entire exercise is managed more as an administrative and operational expense. EaaS also allows users to upscale and maintain solutions with upgraded quality as part of the contract.

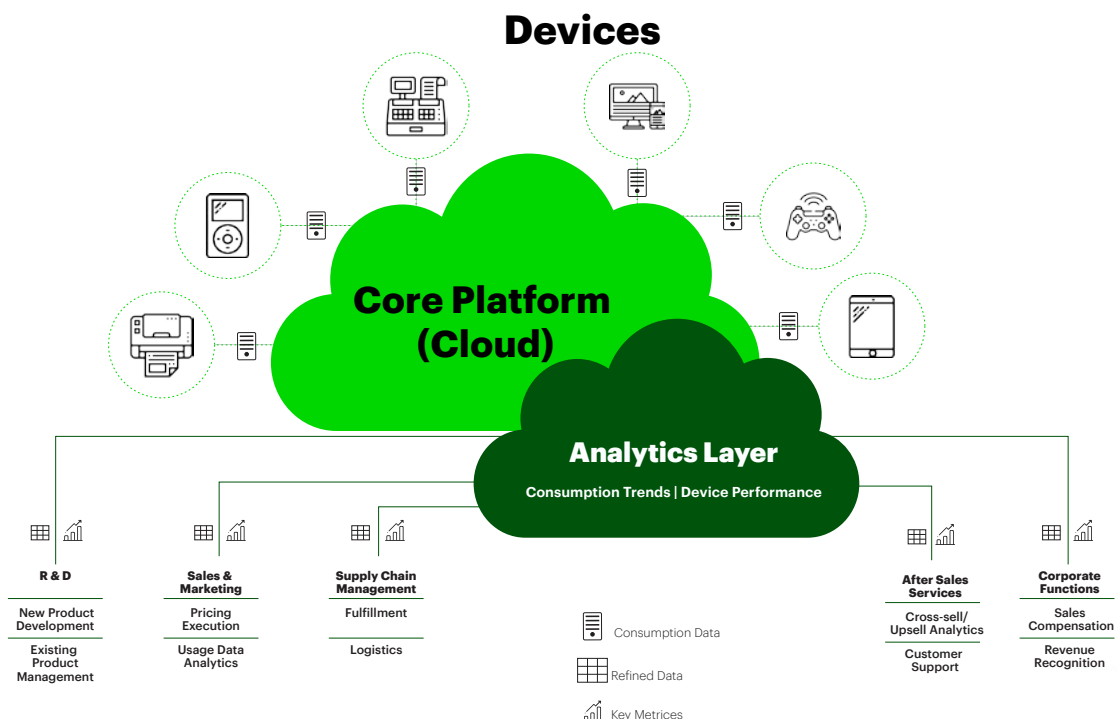
This model also allows users to choose a maintenance contract or opt for a fully managed service whereby vendors leverage predictive analytics to monitor devices for security, policy compliance, and potential hardware failures. Predicting and preventing potential problems (such as hard disk malfunctions) ensures worker productivity and results in time and cost savings.

How is data key to EaaS?

Data plays a big role in shaping new business models. In service-based models, there would be continuous integration of service consumption via IoT sensors, which would need real-time data consumption, tracking, and analysis to formulate a future product road map.

It is not only the business model that changes; the technical architecture of systems and applications that enable these models also changes. The architecture (see figure 3) undergoes transformation right from the way the product is configured and developed, to the way it is marketed as an offering with defined entitlements (rights of usage for customers) and sold more as subscription or consumption-based contracts bundled with service levels and entitlements. The architecture to handle supply chain for hardware, software, and services need to be integrated and then linked with the after-sales service applications and billing applications, which capture humongous amounts of polling data from thousands of devices across the install base sending out consumption-based real-time data every second.

Figure 3. EaaS high-level architecture



To handle data of this scale, it is necessary to understand the relevance of the right data at each step of the value chain for this model and refine it to generate the right metrics and reports. These reports can range from those for tactical usage such as for creating billing documents to strategic ones such as for creating KPIs to understand consumer behaviour, cross-sell or upsell opportunities, etc.

IMPLICATIONS FOR BUSINESS ANALYSIS PROFESSIONALS

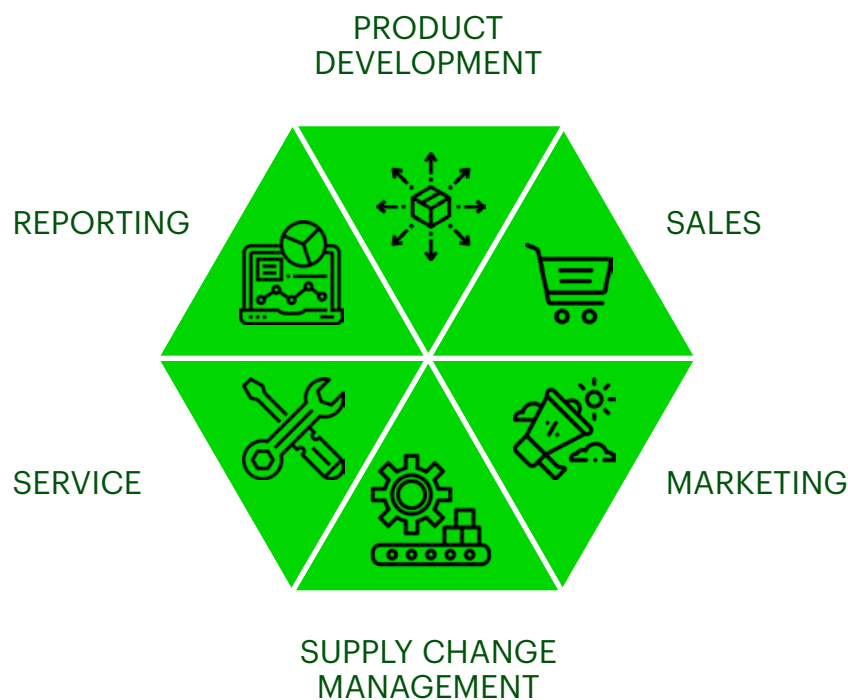
In the changing high tech business landscape, the key to business analysis would be data-handling capacity. Not only maintaining the data, but also analyzing it for impact on business; changes in business processes and models that could take place; and steering organizations toward improved processes in the case of traditional companies or disrupting the processes in the case of new entrants. For BA professionals equipped with handling and comprehending data, the job would become very interesting. They could include taking on more of a consulting role rather than a traditional IT one, which many times gets confused with those of information technology analysts (ITA) and systems analysts.

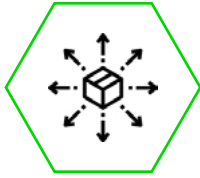
Another thing that would become crucial for BA professionals would be industry knowledge and expertise in business processes, to be able to clearly assess the shifts in the industry and their impact. Further, BA professionals would need to collaborate across functions because any such shift impacts not only a few processes, but the entire value chain.

Also, it is very important for BA professionals to have a good knowledge of data modelling and data visualization. Knowledge of databases and data architectures to handle real-time data from multiple sources would be an added advantage. Data will have more strategic value moving forward and data-centric BA professionals will be in a better position to bring new insights.

The shift from traditional business models to As-a-Service models and EaaS changes the underlying business processes of an organization. It is very important for a BA professional to understand the impact of the process changes, the relevance of data in these key process changes, and the solutions that would be required for a seamless transition to the new models.

Let us look at the high tech industry processes that would be impacted by the new service-based business models, the data play that could enhance processes and the understanding BA professionals should have to drive greater business value.





PRODUCT DEVELOPMENT

One of the key inputs to product road map planning is primary/secondary research or historical data. With products sold as services, product road map planning will be supported with real-time insights and will require a more personalized offering.

Data Play: The latest product development technology trends in high tech revolves around the use of the digital thread and twin concept, which in turn, depends on real-time field data from device twins. This new technology can be used to customize a product offering based on customer usage data and field performances. Understanding the data from digital twin and thread in the context of product development can also lead to better after sales service.



SALES

The change in the product ordering process that needs to be understood is the shift from ordering a product to ordering a service based on customer entitlements. Not all features would be made available to all customers, they would be as per the entitlements.

Data Play: Most of the orders in the service models can be preconfigured by analyzing the order history data of a similar customer over a period. Technologies, such as AI, can be used to streamline the configuration, pricing, quote, and ordering process in the IT systems.



MARKETING

Product pricing will give way to subscription-based pricing, where each offering will be priced based on customer entitlement, and keeping in mind the duration of subscriptions and offering life. The services will have to be priced to meet the minimum margin requirements of the bundled products and services, and remain competitive despite that.

Data Play: Most of the pricing decisions in the As-a Service business model need to be governed by AI-based dynamic pricing models, where the prices of services and discounts applied on them must be varied depending on subscription quantity and duration requested, consumer type, and demographic and past purchasing details.



SUPPLY CHANGE MANAGEMENT

Product fulfillment will no more be just about the procurement, manufacturing, and distribution of the product hardware. It will also include registration, provisioning, and activation of software and services along with product bundles. The IT systems and technology used to enable these changes along with traditional hardware fulfillment would be an added challenge.

Data Play: Fulfillment processes will get more complex as not only the hardware fulfillment, which is traditionally handled by ERP systems, but also the software fulfillment, need to be tracked. In the platform economy, technologies such as blockchain can be leveraged for end-to-end tracking of raw materials to finished goods with a provenance check. Also, the fulfillment in an As-a-Service model is not only about forward logistics, but also about simultaneous refreshes and reverse logistics, which are very important from a track and trace point of view. Bringing AI in data-driven decision making in these data-loaded processes will be key to the success of these models.



SERVICE

Product billing is one of the most significant process changes in As-a-Service models that are primarily consumption-based. For every consumption of pre-defined metric as per entitlement, the users are billed according to the service consumptions. All these data are captured real time through IoT platforms and are ingested into metering-based billing systems that use this data to run a pre-defined algorithm to generate billing.

Data Play: This is one of the most data-intensive part of the entire service model, where there are millions of data sensors emitting data for consumption tracking across the install base of customers, across geographies. The data need to be accurately captured, converted into meaningful data and used for creating bills and invoices. As a downstream input, they are also used to intelligently recommend upselling and cross-selling of offerings to customers in the service renewal stage.



REPORTING

Financial reporting is the core of any organization's financial books—it helps the organization to decide the ROI and success of a business model over time. With organizations adopting service models, the usage of these services is more aligned to operational and administrative expenses in the balance sheets as compared to capital expenditure, which become a liability after a point of time.

Data Play: For most organizations, it is very difficult to remain competitive and operate businesses that have higher capital cost and deeper constraints on liquidity. As-a-Service models allow organizations to shift a lot of their IT budget to more manageable and predictable cash flows with a lowered total cost of ownership. Financial data analysis, modelling and forecasting are crucial in helping organizations take strategic decisions and make the right investments.

BUSINESS ANALYSIS PROFESSIONALS—ENGINE FOR DATA SCIENCE PROJECTS

Like any other data-intensive project, a data science project for the high tech industry starts with a problem statement identification and leads to a deployment of an intelligent, insight-based data product as a solution. A BA professional can start contributing right from the due diligence stage of identifying a business problem and be involved in all of the phases leading to the final data solution, maintaining the solution, and refining the solution.

The BA professional’s role becomes critical as with the advent of the platform economy, data capturing, structuring and analysis have become even more unique in the high tech industry with several partners, systems and other ecosystem players contributing data and consuming data in various forms. For instance, in As-a-Service models, the entire value chain starting from product design (R&D) to manufacturing and supply chain, and sales and marketing to after sales services have different stakeholders who contribute data, which is consumed in real time by other ecosystem partners.

Most of these ecosystems players currently have disjointed systems. The simple reason for this is that every partner has a sequential product-centric value chain focused on their own product or products. For As-a-Service models to truly come alive, all players in the ecosystem need to have interconnected customer-centric value chains that interact with each other and feed information into every possible enterprise systems—product design and development; manufacturing execution; supply chain-related ordering, inventory and fulfillment; billing and invoicing; customer support; marketing and sales analytics; sales compensation and finance-related revenue recognition systems. It is imperative for any BA professional to not only understand the process changes and system changes but also the changes in data handling.

Let’s look at a business scenario to understand a typical data science project life cycle.

Figure 4. Life cycle of a data project: Activities involved and techniques applied.

LIFE CYCLE STAGES	PROBLEM DEFINITION	RIGHT ACCESSIBLE CLEAN DATA	STATISTICAL ANALYSIS INTERPRET CHALLENGE	DOCUMENTATION OF RESULTS	REPRODUCIBILITY MAINTAINABILITY
	Clear & Complete Problem Statement	Right & Clean Data Set	Correct Modelling Technique Testing	Storytelling Data Visualization	Flexible and Adaptable Data Models
ACTIVITIES	Plan Stakeholder Engagement Plan Elicitation Elicitation & Collaboration Elicitation/Workshops Confirm Elicitation Results Communicate with Stakeholders	Identify Relevant Data Identify Data Sources Evaluate Paid and Unpaid Data sets Finalize Data Sets Define Data Storage Requirements Feature Engineering Communicate with Stakeholders	Select Suitable Statistical Techniques Build-Test-Fix	Selecting Appropriate Chart/ Object Proper and Complete Documentation Reporting at Various Levels with Appropriate Metrics Result Validation Identify Key Results Create a Story Communicate with Stakeholders	Identify and Store all Project Artifacts Document Process using Markdown Facilitate Detailed Process Documentation Change Management
TECHNIQUES	Identifying Business Objectives Design Thinking Potential Value Document Analysis	Business Cases Cost Benefit Analysis Mind Mapping Risk Analysis & Management	Statistical Modelling Regression Testing	Data Interpretation Storytelling Data Visualization Communications	Markdown Documentation

SCENARIO

The sales head of a high tech business to business (B2B) organization notices a downward trend in sales revenue for a specific product family over the last six months in the Latin America region.

Now, typical scenarios like these are very broad problem statements that need to be drilled down to specifics based on some trends, data, and derived insights to lead to a solution. All of this information does not reside at a single source, but needs to be sourced from multiple departments, teams, and functions. Let's take a step by step look at how BA professionals can solve this particular problem using specific activities and techniques meant for data projects (see Figure 4). The first step is about understanding the right problem and cause.

STAGE 1: PROBLEM DEFINITION

A BA professional will typically start the journey by planning a Design Thinking session involving SMEs from cross-functional teams to understand the possible problem areas. A precise description of the problem is of utmost importance. Based on the outcome of the Design Thinking session, hypothesis on probable reasons can be created, prioritized, and analyzed further. For instance,

Hypothesis 1: Dipping revenue due to faulty devices. – Service team

Hypothesis 2: Dipping revenue due to decreased usage. – Sales team

Hypothesis 3: Dipping revenue due to slow replacement process. – Supply Chain Management (SCM) team

After identifying the prioritized list of hypotheses, the Data Science team will pick high-priority items for validation.

STAGE 2: RIGHT | ACCESSIBLE | CLEAN DATA

The BA professional will use his or her business knowledge to identify the right data set that would be required to validate the prioritized hypothesis (in this case, hypothesis 3), check accessibility for the data and check legal rights for the use of the data considering some of this data will be coming from end points used by customers. After the team has access to the right data, the next step is to check for missing, incomplete, incorrect, and skewed data. Based on his or her industry knowledge, the BA professional can then select the data that generates the best business value for the client. A business case or cost benefit analysis for the data sets would be helpful.

Data Sets: Supply chain data for different offerings, geo-wise consumer replacement requests, industry benchmarks for replacements, usage of device in a specific timeframe, and product performance data.

Using Exploratory Data analysis, more data analysis will be performed. Then based on industry knowledge, exception rules can be defined for data sets after which the data will be ready for data modelling algorithms.

STAGE 3: STATISTICAL ANALYSIS AND INTERPRETATION

In this phase, the appropriate modelling algorithm will be selected, and data will be used to train these models. This is an iterative phase where a lot of solutions will be tried, tested and shared with stakeholders, and based on feedback received, a new solution will be created. This requires close coordination with the Data Science team to keep the project aligned to the overall business goals.

Insights from product data: One part of Product A was faulty and was reflected in device performance data for a specific geography.

Team's suggestion: Predictive maintenance of device or automatic order for device replacement.

Business decision: Predictive maintenance of all devices if they are tagged for repair or fault.

This cycle of solution building, testing, and incorporating feedback will go on until the problem is solved.

STAGE 4: DOCUMENTATION OF RESULTS

After a solution is found, the results will be shared with various stakeholders so they understand the implication of the solution. The solution also might require changes for upstream and downstream applications. A thorough documentation of the results is important for the successful implementation of the solution.

Service team: will be notified of potential device failure. They can plan for a visit in advance.

SCM team: An automatic order will be placed for the required component, so it is received well in time. A notification will be sent to the Service team for the same.

Product team: Considering the fault is with a part of Product A, the component needs a thorough inspection while manufacturing.

Impact on business: Decreased downtime due to preventive measures will mean greater use of the device, resulting in increased revenue for the company.

BA professionals can also use various data visualization tools to make the insights more meaningful for cross-functional teams. Expertise in data visualization will make communications more effective.

STAGE 5: REPRODUCIBILITY AND MAINTAINABILITY

Imagine a time when end point devices will themselves place an order for faulty components and in parallel place a service request. For this to happen, the company will need to revisit its existing models. This also requires reproducibility. BA professionals have to make sure that all the initial training data, all the data exceptions and business rules used at the time of data preparation, all assumptions, all decisions and each small detail responsible for the solution are well documented in a format easily understood by the technical as well as functional tool. Most of the programming languages offer tools such as Markdown in R. BA professionals must work with the tech team to cover all of these areas.

This level of documentation will enable the team to maintain the solution with a high prediction or accuracy rate for months and years even though systems and data format might change. With mergers and acquisitions, and industry consolidation happening in the industry, new systems and data from organizations will keep getting into the mainstream system. Hence, the AI or machine learning-based solutions that are data-intensive need to be trained and retrained to be adaptable, scalable, and relevant in these dynamic times.

SUCCESS FACTORS

Data is the new currency for the high tech organization today. However, companies need to make data tangible and real to be able to create value for customers and businesses. While leading organizations are unleashing the power of data by using insights from data to make strategic choices, many are finding it a challenge to unlock the value of data. Pragmatic approaches with clearly defined targeted outcomes must be identified and applied to solve business challenges.

For BA professionals today, it is paramount to understand the nuances of allied data skills that can help them excel in data science projects. Basic knowledge of data modelling, statistics, and data architecting, combined with business and functional knowledge, critical thinking, and presentation skills such as data visualization, hold the key for success. But these skills are not enough. Knowing when to apply these skills across a variety of engagements is equally significant. Understanding the scope of leveraging data skills wherever necessary, applying them for insights and productivity gains (for instance, using automation and AI) and balancing between the need and investment of efforts is very important. This is where the role of BA professionals takes many shapes and dimensions, and where they can make a difference with industry, business, and technology expertise.

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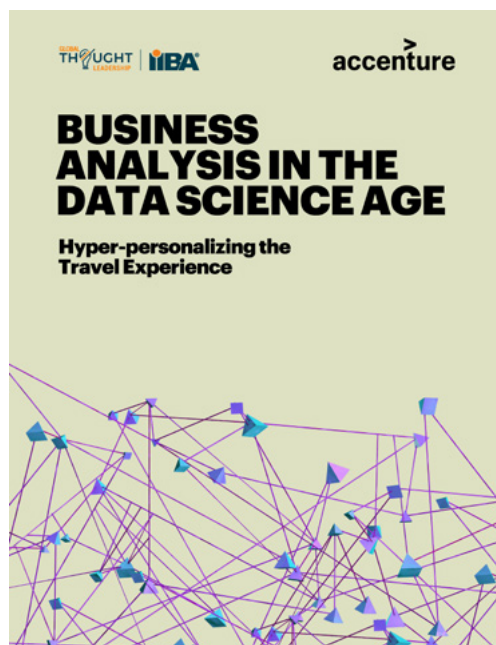
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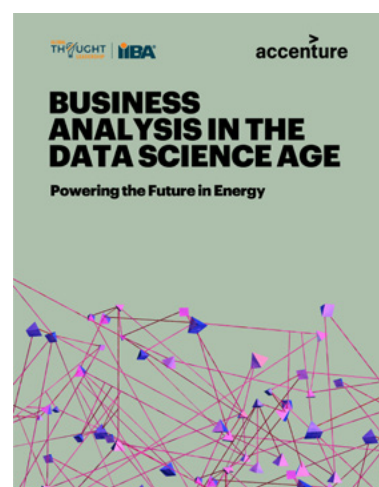
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