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Management, Innovation, Transformation

"Digital capital is the wealth of information assets (data, automated business logic) that enables effective information superiority. Access to these assets can give smart businesses leverage for growth and economies of scale that support superior performance."

— Borys Stokalski and Bogumil Kaminski, Guest Editors

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Opening Statement

by Borys Stokalski and Bogumil Kaminski

In this issue of *Cutter Business Technology Journal*, we have asked our authors to share their thoughts related to two concepts: information superiority and digital capital. Our assumption was that these concepts are particularly relevant to business leaders, who are right to believe that "digital" and "hypercompetition" are the "new normal" in business. Especially in the area of consumer services delivered primarily through mobile, digital touchpoints, the rivalry for customer attention is fierce and open to anyone. It is not just hypercompetition but "hyperconvergence" as well, where retailers, financial service providers, entertainment companies, and productivity applications need to fight for customer engagement — arguably the most scarce and capricious resource.

Organizations that are transforming to explore the opportunities of digital business must find a way to adapt to hypercompetition and hyperconvergence. In our opinion, information superiority and digital capital should serve as the strategic foundation for those architecting their digital transformation.

It was Paul Strassmann who introduced information superiority into the world of management, calling it the "capacity to increase economic value faster than the competition."[1] While Strassmann's definition stresses the outcome (i.e., increased economic value added [EVA]), another perspective, which comes from the US Department of Defense, defines information superiority as the "operational advantage derived from the ability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary's ability to do the same."[2] In the world of business, we focus on winning markets rather than crushing rivals, but the essence of the advantage remains the same. Information superiority may be one of the rare examples of sustainable advantage in hypercompetitive markets, where any kind of product- or customer-related supremacy can be relatively easily replicated and neutralized.

Digital capital is the wealth of information assets (data, automated business logic) that enables effective information superiority. Access to these assets — through the practice of data science and/or API management — can give smart businesses leverage for growth and economies of scale that support superior performance. However, although everyone agrees that data is the "new oil," the question of how to effectively refine data and fuel operational processes engines using it is still a major issue. There are countless real-world stories reporting that the road to success may be rough and full of potholes. Many companies fail to collect the right data, properly manage its quality, build a data science-oriented culture, and/or operationalize the results. On the other hand, big players like Google, Facebook, Amazon, and Netflix are able to push their competitive advantage to the limits, and even transform whole markets, by leveraging their digital assets.

Organizations that are transforming to explore the opportunities of digital business must find a way to adapt to hypercompetition and hyperconvergence.

Digital capital must fuel the execution of an information superiority strategy. Businesses manage a large number of customers, partners, products, and events. In such a complex environment, it is simply impossible to consistently make the right decisions if they are not guided by hard evidence. For this to happen, organizations need to embrace evidence-based management — a well-established paradigm that calls for effective use of available information assets to support decision making.

In This Issue

In this month's issue, our authors have done great work exploring these concepts in a way that gives readers a truly diverse yet coherent perspective on the subject.

Mariusz Rafalo opens the issue with an article entitled "Data Doesn't Matter. Time Matters," based on his survey research of nearly 100 Polish companies across a variety of industry sectors. At first glance, Rafalo's

title seems to contradict our key assumption about the importance of this issue's proposed topic. In actuality, the article makes a sound case for the importance of both information superiority and digital capital. Rafalo argues that "information (or data) itself is not as important as the organization's ability to exploit it within a specific context. As a result, organizations must strive to be not only data-driven in the strict sense, but also 'time-driven.'" Time is a critical resource in hypercompetition. Rafalo's research identifies enablers for companies that compete by dictating the tempo of market changes. Among them is "information flexibility," a key enabler of the speed of change and new business models.

If you don't have information superiority, your digital capital account will be meager no matter what tangible assets are on the books.

Readers who would like to approach systematically the process of achieving, maintaining, and improving information superiority will find many actionable insights in the article by Cutter Senior Consultant Paul Clermont. In Clermont's view, information superiority and digital capital are closely related. "If you have information superiority, you perforce have digital capital," he observes. "If you don't have information superiority, your digital capital account will be meager no matter what tangible assets are on the books." The approach Clermont offers is consistent with this observation. He urges decision makers to cross-check the company-specific vision of information superiority with the actual status of digital capital, which should be made available to support it. He also points out the importance of establishing digital capital stewardship, which is necessary to support the evolution of information superiority. Clermont rightly notes that hypercompetition makes information superiority a moving target — a journey rather than a destination.

Our next article, by Richard Veryard, takes a similar starting point to Rafalo's, linking the concept of information superiority to US Col. John Boyd's adaptive OODA (Observe, Orient, Decide, Act) loop, the "archetype" concept for time-based competition. Citing experiences primarily from the retail industry, Veryard shows us different facets of information superiority in the context of customer experience management, or "customer centricity." He demonstrates how the capability to collect and analyze data related to customers and customer interactions can lead to different strategies, from players cornering market segments by monopolizing customer data and turning it into a product (*conventional* information superiority), through attempts to use contextual data to respond dynamically to customer needs and wants (*adaptive* information superiority), up to "allowing the customer to actively participate in the creation of content" (*collaborative* information superiority).

Next, Stefan Henningsson and Christian Øhrgaard offer a technology-driven perspective on information superiority and digital capital. In their article, the authors discuss the process of converting digital artifacts — which produce a "digital trace" — to digital capital, assets that can be reliably and systematically used to support fact-based decision making. Henningsson and Øhrgaard argue that "digital artifacts present new opportunities for fact-based management that can meet the increasing need for innovation of products and processes in the digital era." The authors recommend a thorough, five-step process of transforming digital artifacts into digital capital and advocate the following key managerial principles: focus on areas where transformation can create a meaningful impact on the organization; use tools that offer specific, actionable insights; and understand that digital capital should primarily enable future actions, not just explain the past.

Our final author, Tarun Malviya, supports the view that information superiority has to be rooted in evidence-based management. At the same time, he makes the interesting observation that business transformations —

and digital transformations in particular — can make existing information superiority capabilities unsustainable. Whereas established strategies are executed through tested, optimized business operating models, the new strategies often associated with digital transformations are neither established nor optimized. The author argues that "to make sure that [the transformation] occurs smoothly and is working as expected, it is imperative to continuously measure the [business operating model's] effectiveness both in terms of current and predicted performance." To support decision makers in their efforts to manage organizations that are undergoing a (potentially continuous) transformation, Malviya offers a framework that can be used to measure the effectiveness and efficiency of the target business operating model.

One of the big paradoxes of digital business is the fact that technology — the very asset that enables creative organizations to envision, deliver, and monetize business innovations (new value propositions, better experiences, smarter products) — lowers the barriers to entry for the followers who would copy and improve on the ideas of the pioneers. Sustainability of digital business is of primary importance to anyone who wants to bet their money and career exploring these exciting opportunities, which may only grow with the advent of commercially viable artificial intelligence, augmented reality, and the Internet of Things. As the capabilities and pervasiveness of the technosphere inevitably evolve, we are challenged to make our organizations smarter and more resilient in a very turbulent and chaotic business environment. We believe that our authors' insights on information superiority and digital capital will serve as inspirations on that journey.

Endnotes

[1]Strassmann, Paul. "Governance: The New IS Agenda." *Computerworld*, Vol. 29, No. 9, 27 February 1995 (www.strassmann.com/pubs/computerworld/governance.shtml).

[2]Joint Chiefs of Staff. "Joint Publication 3-13, Information Operations." Defense Technical Information Center, 27 November 2012 (www.dtic.mil/doctrine/new_pubs/jp3_13.pdf).

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THE TIME HAS COME TODAY

Data Doesn't Matter. Time Matters.

by Mariusz Rafalo

It is a common belief that big data and real-time data analytics help organizations to improve their competitiveness. Indeed, studies and publications tend to present examples of successful application of big data technologies in companies. There is much less emphasis on companies that have encountered difficulties in adapting big data solutions. The goal of this article is to identify the necessary conditions for gaining business value from data. I argue that neither data itself nor advanced analytical tools produce meaningful value. The key issue is to connect data analysis with a specific business context and to do it quickly. I conclude the article with a model that identifies the big data capabilities needed to achieve this goal.

Information (or data) itself is not as important as the organization's ability to exploit it within a specific context.

The Data-Driven Company

A data-driven company is an organization that provides information to every employee and every business process in order to improve decisions and overall performance. Furthermore, it measures and monitors business activities and does so in an automated and continuous manner. A data-driven organization focuses not on providing decision makers with certain reports at a specific time, but rather on providing them with raw data that can be analyzed independently. Decision makers are thus not limited to data patterns defined earlier; they are free to experiment and discover new ones.

The data-driven company concept is widely connected with trends like big data, data science, and machine learning. It is worth mentioning that these terms, though often deemed "innovative," are not novel, having emerged in the 1970s.

Modern technologies offer specialized software to perform data analysis and integration that were out of reach for most companies not so long ago. Within the last couple of years, the costs of hardware platforms and specialized software have gone down, while the skills needed to implement data analysis applications have become more widely available. And technology has become more accessible, even for smaller companies. As a consequence, new concepts in data storage, exploration, and statistical analysis have emerged.

The Business Value of Information

Companies tend to seek new areas of information usage and, consequently, new revenue streams. One example is telecommunications companies that get involved in data monetization projects. Monetization of data is about sharing and selling data about customers' behavior to external partners. Currently, many non-telco companies are interested in telecommunications data — especially customer profiles, social connections, and location. For example, customer location data can tell us the number of people who visit a city or take a specific route. This information can provide valuable insights for transport companies, railways, municipalities, and so on.

Another example is represented by Nike, which has begun to equip its shoes and watches with sensors that allow measurement of specific indicators, such as number of steps, type of movement (e.g., walking, running, cycling), distance traveled, and GPS location. Data from those sensors is integrated, analyzed, and presented on dedicated mobile applications, giving Nike's customers additional functionality.

These examples show how important the data context is. When properly used, it can establish new business models or the ability to deliver new products. Nike is not a software company, yet it delivers mobile apps for its customers. Similarly, telco companies were not established to sell data, but now they do.

Context is probably the most significant factor in data processing. It determines the conditions under which information is useful. Context also determines the requirements that information needs to meet, such as delivery time, presentation form, and degree of quality.

Therefore, information (or data) itself is not as important as the organization's ability to exploit it within a specific context. As a result, organizations must strive to be not only data-driven in the strict sense, but also "time-driven." A time-driven company is able to change and adapt quickly in an internal way, but it also reacts quickly to changes in the environment. Both Nike and telco companies noticed opportunities in the environment and both were able to capitalize on them, because they had the ability to exploit the acquired data.

Time Matters

From a resource perspective, time exhibits a specific characteristic: you cannot produce more of it. There is no technology that will allow us to generate more time or produce a substitute for time, but technological advances do enable more efficient use of time, thus maximizing its utility.

From an economic perspective, time is a resource that can be a subject of trade and management. Time can be "bought" through more efficient technology or through outsourcing time-consuming tasks.

From a business perspective, every piece of information is embedded in time, and every piece of information loses value as time passes (see Figure 1). The speed of erosion differs, depending on information context. It proceeds relatively slowly when we are dealing mostly with historical data, which does not change (therefore there is no need to analyze it in a short period of time), and it declines rapidly if the data is vague and/or transitory (e.g., data from online logs or sensors).

A rapid decrease of information value can be observed in analyzing banking transactions. For example, when a bank customer withdraws money from an ATM, they may not have enough funds in their account to finish the transaction. This piece of information, if processed very quickly, can be used to offer the customer a cash loan, with the ability to confirm it and make payment through the ATM. If the information cannot be processed quickly, the opportunity is lost.

Another example of a time-sensitive data analysis scenario is preventing fraud in banking transactions. If the system identifies suspect patterns in a customer's profile and behavior (e.g., customer login takes place in another country, while a few minutes earlier the customer made a payment in their hometown), a cash transfer or ATM cash withdrawal can be blocked.

To address such use cases, data analysis systems have been developed to automate certain decisions. Specialized systems provide data in real time, analyze the data, and even make decisions themselves, based on predefined rules. Decision rules are implemented through predictive models that take into account necessary data and specific goals. Inevitably, information processing is no longer the exclusive domain of people. More often, especially in situations of high complexity and low latency, decisions are taken by independent systems.

The Time-Driven Company

There are several data analysis capabilities (dimensions) that make a company data-driven. They can be measured separately to identify a company's strengths and weaknesses in specific areas. They can also be aggregated to show the overall measure of the company's analytical maturity. As shown in Figure 2, these are:

- **Data integration** — capabilities in identifying data sources, managing them, and connecting data from heterogenous systems
- **Skills** — employee competencies needed to establish data infrastructure (development), perform the ongoing process of data delivery (maintenance), and conduct quantitative data analysis (data science)
- **Data presentation** — the tools portfolio that allows users to access the data, create reports, and perform their own analyses (e.g., predefined reports, self-service analysis)
- **Data reliability** — quality, completeness, and timeliness of data

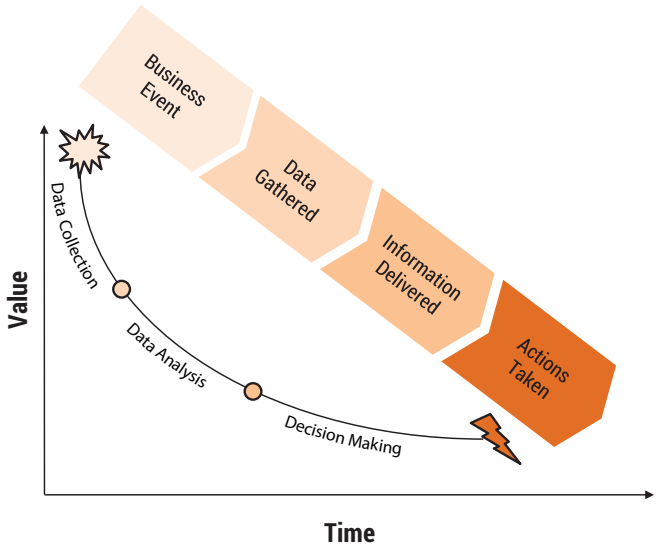

Figure 1 — Value of information over time.

I recently conducted a survey study of companies operating in Poland in the telecommunications, finance, industrial, retail, and services sectors. I received 94 responses to my questionnaire from medium- and high-level representatives of more than 30 organizations. The aim of the study was to provide knowledge about the role of data analytics in organizations. The study revealed interesting insights about the role of time management in data-driven companies:

- Data analysis has a positive impact on the speed of organizational change.
- Data analysis has a positive impact on creating new business models.
- Information infrastructure flexibility has a strong effect on the above relationships.

These findings led to the conclusion that management of time resources is crucial in a big data environment.

The study also found a separate capability that covers the speed of adjusting information infrastructure to new requirements. Information infrastructure flexibility (or information flexibility, for short) concerns the time required to implement changes associated with new data sources. Information needs are reported from various departments, such as sales, marketing, logistics, or customer service. The time between the occurrence of the need and provision of new information to users is the measure of the flexibility of the information infrastructure. The sooner a new data source is integrated into information systems, the sooner the company benefits from new information.

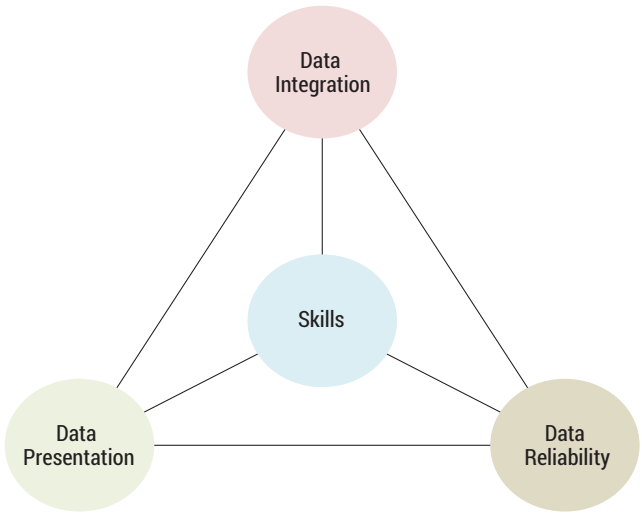

Figure 2 — Data analysis capabilities.

Information flexibility turned out to be a crucial factor in determining the business usage of analytics in a company. First, it mediates the impact of data analytics on the speed of organizational change. Second, it mediates the impact of data analytics on new venture creation.

Information Flexibility vs. Speed of Change

Data analysis capabilities are basically defined as skills, technologies, tools, and infrastructure that are part of big data infrastructure. Not surprisingly, the study revealed that higher data analysis maturity leads to faster and more efficient organizational change.

Organizational change covered such scenarios as entering a new market, developing a new business model, or introducing a new product or service. An interesting conclusion was that companies with higher information flexibility (i.e., time-driven companies) didn't specifically focus on data integration, quality, or presentation. Yet as soon as they *are* time-driven, their ability to perform organizational change was well above average (see Figure 3).

This can be explained by the fact that if the information infrastructure quickly responds to business needs, issues of data integration, quality, and presentation are not that important. This, in turn, can prompt the conclusion that data analytics capabilities have little impact on the speed of change (notice that the red line is almost parallel to the x axis).

Information Flexibility vs. New Business Models

The key issue when entering a new market or developing a new product is to determine whether the selected strategy is correct. To confirm this, data-driven companies analyze data at every moment of the project. Time-driven companies seem to outperform firms with lower information flexibility (see Figure 4).

Low information flexibility means that new categories of information are delivered relatively slowly, which raises the risk that the information will be taken into account too late. For example, in order to introduce a new product, a retail company needs to segment its customers based on their sensitivity to marketing. New classes of information cover data about which marketing activities (contacting customers via text message, email, phone calls, etc.) have led to a purchase transaction and which activities didn't lead to a purchase. Fast delivery of the needed data enables the company to exploit customer segmentation. Delayed implementation causes the marketing department to build segments without necessary knowledge. When users need access

to specific data, processing delays are frustrating and may cause them to bypass processes, pulling the data from operational systems and storing, managing, and analyzing it themselves. This approach is still time-consuming and entails more risk and less favorable marketing campaign results.

Another finding worth mentioning is the tradeoff between information quality and information flexibility. At a relatively low level of data analysis capabilities, managers need to decide whether to invest in data integration and reporting platforms or in fast information delivery. When the business need is to support rapid change, then the focus should be on information flexibility. When analytics need to support new product and service creation, though, speed (at least in the beginning) is not as important as the quality of the data and the attractiveness of its presentation. That said, at some point the need for rapid information processing will appear, even at the expense of architecture purity.

Capabilities Needed for Big Data Success

Technology Capabilities

Based on the above findings, I offer the following technology recommendations to enable information flexibility:

- Self-service data analysis and exploration
- Low-latency data storage
- Rule-based data and event processing

Self-service data analysis can be accomplished by implementing specific business intelligence tools that allow users to work independently. This also requires providing users with up-to-date data and a secure space to share analysis results. Users explore available data, gain insight, and base their decisions on facts rather than feelings. Keep in mind that the data will need to be presented in an adequate form and on time.

Low-latency data storage can be addressed by introducing a lambda architecture (see Figure 5), which combines real-time processing with classical batch data processing. The real-time layer provides instant access to business events, while the batch layer serves as a data enrichment repository.

Low data latency is a significant enabler for business concepts for which quick interaction is required, such as gamification and omnichannel customer support. For example, real-time data about a customer's interaction on a website offers insights about their interests and behavioral patterns. Yet at the very moment when the customer explores the website, there is limited access to their historical data; hence the need for a connection between the real-time and batch layers. Any additional data about the customer — their purchase history, demographic information, and so on — comes from the batch layer (i.e., the enterprise data warehouse).

Rule-based data and event processing can substantially reduce the time needed to adjust a system to new conditions. It is particularly profitable when dealing with a

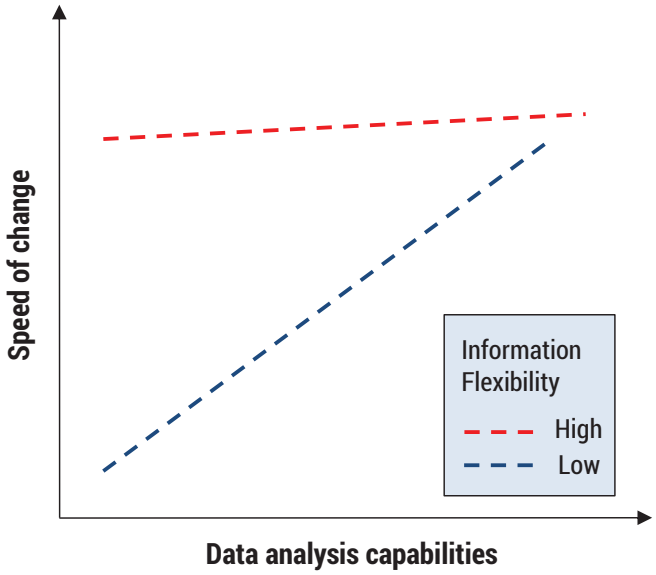

Figure 3 — Time-driven company and speed of organization change.

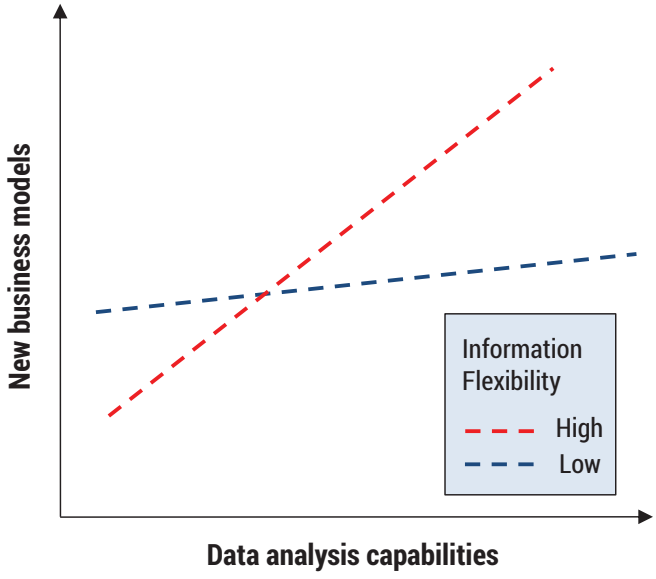

Figure 4 — Time-driven company and new business models.

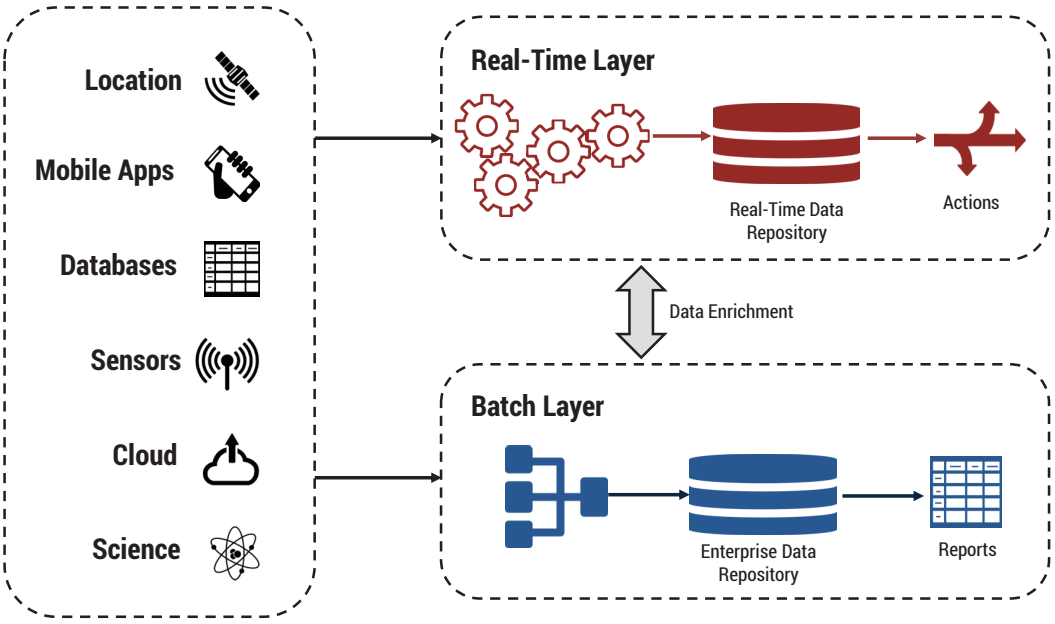

Figure 5 — The lambda architecture.

high level of volatility and a large volume of data with a relatively simple structure.

Consider the use case of an antifraud system in the banking or insurance sector. Regardless of whether the abuse is checked in real time or in batch mode, there are rules that identify suspect transactions. Yet these fraud rules, once developed, are only effective for a limited time. Criminals are always probing systems to identify security gaps. Because rules can quickly assimilate new categories of information and include them in the fraud check, they are well suited to addressing this threat.

Organizational Capabilities

As I noted at the beginning of this article, technology alone does not create value from data. To enable information flexibility, organizations should:

- Emphasize speed of data delivery while accepting relatively lower data completeness and quality.
- Not focus on data itself, but rather on the business value of specific data.
- Conduct data experiments.
- Prepare statistical models and data transformations that are as complex as necessary, but not more complex than needed. (Or as Einstein put it, "Everything should be made as simple as possible, but not simpler.")

Data analysis requires specialized skills and competencies. However, especially when dealing with statistical data analysis, other required competencies emerge. Statistical data analysis demands specific technological skills (e.g., SQL, SAS software, R packages), but also expertise in methodological aspects of analysis. Particular software skills are much easier to obtain than knowledge about designing data experiments and conducting methodologically correct deduction.

Figure 6 provides a big data capabilities model that includes the points outlined above. "Classic" business intelligence and big data capabilities need to be reorganized to meet time requirements.

Conclusion

Most organizations share similar data, both in terms of quantity and quality. All banks store and analyze demographic and transactional data about their customers. Similarly, telecommunications companies analyze customer behavior, calling patterns, social networks, and so forth. Under these conditions, organizations should focus their attention not on integrating, storing, or even analyzing the data, but on the effective use of time. Table 1 shows the difference between data- and time-driven companies with respect to three common business concepts: product recommendation, fraud prevention, and data monetization.

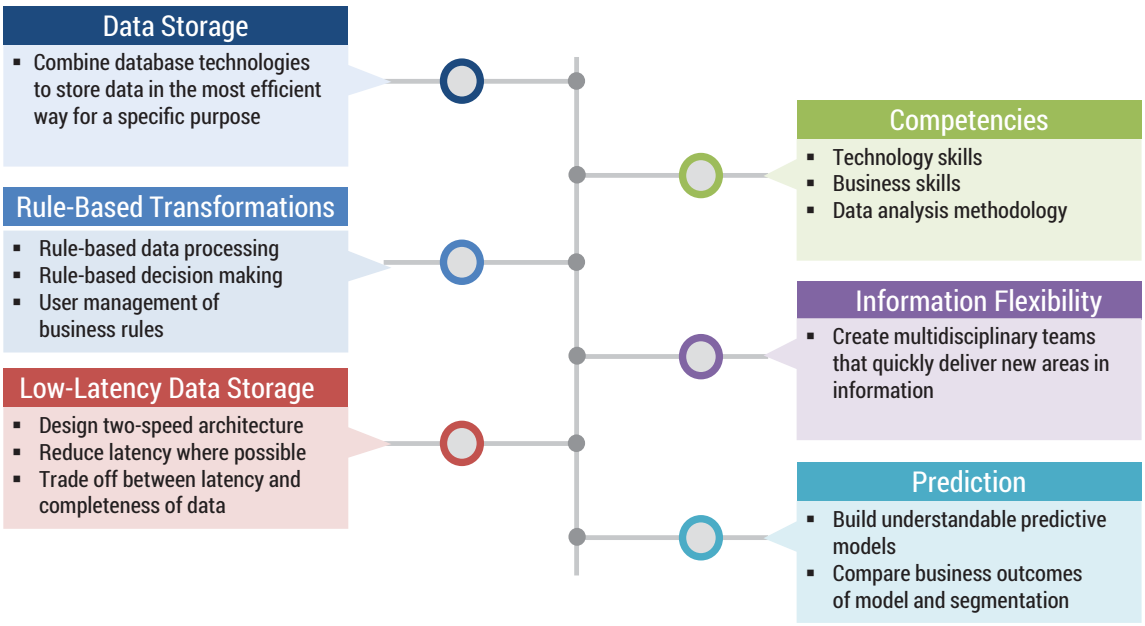

Figure 6 — Big data capabilities in a time-driven company.

Business Concept	Data-Driven Company	Time-Driven Company
Product recommendation	Focus on segmentation and prediction models that best describe customer purchase behavior.	Ensure that quality of segmentation is acceptable; if not, create more segmentations. Focus on process.
Fraud prevention	Concentrate on creating rules that directly identify instances of fraud, based on historical data. Focus on rules efficiency.	Concentrate on preventing future instances of fraud, where rules are uncertain. Continuously verify rules; replace obsolete rules with new ones.
Data monetization	Focus on sharing data with partners. Build data repositories; anonymize customer personal data. Focus on new revenue streams.	Focus on sharing services with partners. Build convergent offerings for the customer in cooperation with partners.

Table 1 — Data-driven vs time-driven companies.

Building a sustainable competitive advantage based on data is possible once an organization becomes both data- *and* time-driven. Data, analysis tools, and skills are necessary for building the advantage, but they are not sufficient without the ability to deliver information quickly (i.e., low data latency).

When planning a big data architecture, managers and architects should therefore emphasize quick delivery of new reports and rapid development of new data sources. This is essential, especially in areas where time is of the essence, such as online marketing, product recommendation, or real-time decision processing. First and foremost, the company needs to focus on delivering business value from data, then it can address technology and architecture improvement.

Mariusz Rafalo is Cofounder and Partner at Sorigo, a Warsaw-based IT solutions provider. For the last 15 years, he has been working in IT consulting for the largest companies in Poland. During that time, he has delivered many projects related to data integration, storage, and analysis. He holds a master's degree in econometrics and is currently preparing his PhD thesis. He is a lecturer at the Warsaw School of Economics and the Warsaw University of Technology. He can be reached at mariusz.rafalo@sorigo.pl.

Information Superiority = Digital Capital?

by Paul Clermont

Defining Our Terms

Information superiority is an easy-to-understand concept that long predates IT, and it's no surprise that the phrase, when capitalized as an IT buzzword ("Information Superiority"), came from the US Department of Defense. Knowing better than your enemy where your own and their troops are on the battlefield enables a nimbleness that can offset disadvantages in numbers and weaponry, and it has since the Trojan Wars. What wise generals have always done intuitively has been codified by today's military into the "OODA Loop," where the acronym stands for Observe, Orient, Decide, and Act.

"Digital capital" is a newer phrase and a newer concept. Obviously, it includes tangible assets like hardware and software that show up on balance sheets, but in today's environment, it can and should include so much more — if not explicitly on a GAAP-approved balance sheet, then at least in how we think about investments. An article in the *McKinsey Quarterly* provides an expansive view of what constitutes digital capital:[1]

- "The unique designs that engage large numbers of users and improve their digital experiences
- "The digital capture of user behavior, contributions, and social profiles
- "The environments that encourage consumers to access products and services
- "The intense big data and analytics capabilities that can guide operations and business growth"

It would be difficult to think of a better example than Amazon of an enterprise that manages all of these supremely well.

I would suggest that information be cited very explicitly as digital capital, but not just any information. To count as digital capital (i.e., an asset, however intangible), information must be:

- Accurate
- Up to date
- Immediately available anywhere, in easy-to-use form, and to anyone who can use it for the benefit of the enterprise

Information that meets these standards[2] represents the nexus between digital capital and information superiority, the linked topics of this issue. Such high-quality information can be used at the operational level (such as for customer service), at the managerial level (to spot problems and support short- and intermediate-term decisions), and at the strategic level (to inform decisions about longer-term direction).

In OODA terms, Observe means to collect and make available relevant data on a timely basis, and Orient means to put it in a form in which it can be understood in context by the person who can use it to Decide and Act for the benefit of the enterprise.

Perspective

In the preindustrial era, when most manufacturing work was done in an artisan's shop, information was easy to get. You knew your customers, and you could know everything you needed to know about the operation by just looking around: your inventory of supplies, what employees were doing, the state of completion of orders, and so on. You had complete, accurate, line-of-sight, real-time information. In your well-run shop, you had information superiority over the artisan across town whose chaotic shop featured misplaced tools, scattered inventory of supplies, and lots of stalled work in process. You probably did better than he did because you delivered products faster and more predictably and had lower costs.

The Industrial Revolution complicated things. Large factories in multiple sites, global customers, and global suppliers all required the creation of a whole information and control infrastructure to deal with the complexity and lack of anything like real-time, line-of-sight information. Official information existed only on paper — what else was there? — and the movement of paper through (mostly?) value-adding steps became a form of

industrial process in itself. Not surprisingly, the information adhered to none of the standards cited above. Its paucity and poor quality necessitated multilayer reporting structures to maintain some semblance of control, relying on people with experience and seniority to exercise judgment and make educated guesses. Over nearly two centuries, all this became such a way of life that people thought of it as almost divinely ordained.

But no more!

For a few hundred dollars, a laptop or even a tablet can provide global visibility as good as the 18th-century artisan's eyes. The challenge is to leverage today's (and tomorrow's) technology to achieve this preindustrial simplicity and economy in a global enterprise, scraping away the accumulated barnacles of the Industrial Age. In the early 1990s, the reengineering movement started the intellectual process, but results were too often limited, usually due to lack of imagination, but also because the technology still did not have power to realize the theoretical potential. Today the global Internet, broadband telecommunications, and Moore's Law make that an ever less valid reason for falling short of information superiority and well-managed digital capital.

Getting to Information Superiority

The purpose of this article is to identify and describe critical steps and considerations for achieving information superiority and to offer practical suggestions for each.

Vision

Establishing a vision is the most critical step for identifying options and setting priorities. This step must not be shortchanged, but neither should it be allowed to become too abstract and drawn out. Critical questions include:

- What does information superiority mean in our industry/competitive space?
- What would information superiority look like for our enterprise? What could we do differently/better? What might we do that we otherwise could not even attempt?
- To what extent is information for the customer a critical component of the product or service (e.g., online forums for customers to ask questions and share ideas for more satisfactory use)?
- What more could we know about our customers that would help us serve them better or sell them more?

The scope is broad. Some of the examples below, while old and well-known, illustrate basic principles:

- What opportunities are there to enhance the value, usability, and/or customer satisfaction with existing information? One example is providing access to very detailed assembly or troubleshooting information, including video, which was not economical or practical in a one-size-fits-all user manual.
- Could we use information created by products in the field to improve the customer's experience (i.e., Internet of Things). A pre-Internet example of this was OTISLINE, a creation of the Otis Elevator Company that attached its elevators' self-diagnosing capability to a telephone that would launch a service call to fix a condition before it caused a breakdown.
- What is our customer really buying? Is it our product, or is it information that could be delivered by other means (e.g., recorded music that one could buy over the Internet, bypassing the physical medium)?
- Could we enhance the customer experience in purchasing and using a product or service? For example, frequent flyer programs began when airlines took data previously discarded after a flight (i.e., the customer's identity) and used it to reward loyalty with free flights, upgrades, and better ground service.

For a few hundred dollars, a laptop or even a tablet can provide global visibility as good as the 18th-century artisan's eyes.

- Reengineering done right can improve the speed, quality, and cost of processes all at once. The sidebar "Same-Day Claims Processing?" describes a situation where a bit of imagination could short-circuit years of incremental change.
- Managerial decisions can be made better and in a more timely manner. The sidebar "Fast Fashion" shows how large, high-risk decisions were turned into small, low-risk decisions.
- Information byproducts of no clear value could be leveraged in other parts of the enterprise or even sold outside the enterprise.

Same-Day Claims Processing?

Client T, a health insurer, was experiencing an exploding backlog of unprocessed claims, and the processors' time was increasingly taken up answering angry calls about claim status. The company wanted to specialize the handling of complex (i.e., large) claims to make sure they paid only what they should, but that created a workflow nightmare. Yet assuming all their processors were similarly versatile caused the company to pay too many invalid claims and refuse too many valid ones, with the denied claims generating protests that took up even more of the processors' time.

Client T's aim initially was to cut their processing time to three weeks, about the same as the competition's. But when they fully analyzed the situation, it became clear that there was nothing to stop claims from being processed the *same day* that complete information from providers and patients was assembled. All it took was workflow management software and the ability to capture and distribute the images that often accompanied claims to as many specialists as needed — that is, creating information superiority.

Fast Fashion

Zara is a large Europe-based chain of clothing shops catering to young women who want to be fashionable on a limited budget. This is not an easy clientele. Tastes can be fickle and hard to predict. Most retailers in that space cannot afford to have garments made in high-wage Europe, so they rely on distant low-wage countries for their production. While this lowers unit costs, the lengthy supply chain stretches the turnaround times for changing the mix of products — styles, colors, sizes — and the markets to which they're sent. Thus, the stakes of production decisions are high, and the error rate in making these decisions is reflected in the prevalence of clearance sales with markdowns of as much as 70%-80%. And what never makes it to the financial statement is the opportunity loss when an item is an unanticipated hot seller and the retailer can't get more to the shops in time.

Zara made their products in Spain, their home country, in small workshops close to their distribution facility. They could afford this because they used IT to reduce the scope, and thus the risk, of their product decisions. By capturing extensive product data at the point of sale, transmitting it in near real time to headquarters, and analyzing it quickly and thoroughly, they could very rapidly change work orders and production runs to increase the supply of what sold well and decrease or eliminate what didn't. They could also quickly reallocate products from one market to another, if, for example, Dutch women liked something German women didn't. The result was a near absence of clearance sales. Everybody won. Customers got what they wanted, Zara made money, and Spaniards got good jobs.

Note: A version of this account originally appeared in: Paul Clermont, "When You Must Make Hard Choices," Cutter IT Journal*, Vol. 27, No. 9, 2014 (www.cutter.com/article/when-you-must-make-hard-choices-488261). The information is taken from: Andrew McAfee, Anders Sjoman, and Vincent Dessain, "Zara: IT for Fast Fashion," Harvard Business School Case #604081-PDF-ENG, 25 June 2004 (https://hbr.org/product/zara-it-for-fast-fashion/604081-PDF-ENG).*

- Big data and analytics can take advantage of super-cheap storage and processing power to analyze data in new and creative ways that help identify trends and patterns.

When crafting a vision, it's critical to keep the horse before the cart, thinking through what to do and why before going too far with technology. It is also important to recognize that the vision will evolve.

Assessment

Now comes the reality check. Having developed ideas for where we want to be, we need to look at where we are and what we have to build on. First, the applications portfolio:

- What information do we produce and keep?
- What information do processes and products create that isn't being stored, let alone used, because nobody saw its value?

- How fully are we utilizing and leveraging enterprise suites like ERP, CRM, and supply chain?
- Out of all this, what information do we have or could we easily gather that's relevant for achieving the vision?
- Does the information we have meet the standards for digital capital? That is to say, is it timely, accurate, and accessible enough to support the vision? What's missing?

The technology infrastructure (processing, storage, communication, and software) may not be up to meeting the "immediately available anywhere" standards for digital capital. Big data and its analysis require tools and techniques *plus* people — business analysts and data scientists — who know how to use them to good effect.

Barriers

The other side of assessment addresses what can keep you from achieving the vision. Some barriers are "merely" technical (i.e., they can be overcome by spending money):

- Organizations, functions, and processes have legacy systems never designed to interact with one another or share data. Almost inevitably, this means incompatible hardware, applications, data definitions and structures, and coding schemes. There are copious details to sort through where the devil can lurk.[3]
- Even enterprise software packages can be customized in different and incompatible ways. Version releases can get out of sync.
- The "available anywhere" standard means exposing new surface area for hackers, necessitating enhanced security.

Cultural barriers are also there, particularly in established enterprises trying to transform themselves into digital players:

- Organizational silos die hard. Loyalty to business units, departments, or functions may override loyalty to the enterprise as a whole. Internal rivalries and distrust are common.
- Budget battles for resources are usually a zero-sum game where losers may sharpen their knives, especially if they feel that office politics trumped a solid business case for funding.
- Subtle differences in data definitions may have their logic, making them difficult to resolve without a *diktat*, another form of the zero-sum game.
- Even the best information isn't a productive asset if people don't use it or don't know how to use it to maximal effect. Case files of IT projects are rife with examples of functionality installed with inadequate preparation, orientation, training, and follow-up. This is primarily true of information systems (rather than transaction processing), where the job has been and can be done without the new information, though not as well. But people resist change, a reality that must be dealt with.

Creating information superiority is a journey, not a destination. It's never finished, because competitors can and will catch up.

Far too many IT initiatives have disappointed or gone astray because cultural factors were ignored or scanted. IT managers tend to do that by nature, and too often the business people don't feel enough ownership of the intended benefits to make the necessary effort to ensure they're realized. (And guess who gets blamed?)

Planning and Phasing

No big bang!

IT-related fiascos and mere disappointments have many causes, but their negative effect is greatly exacerbated when expectations have been raised about the coming transformation. Creating information superiority is a journey, not a destination. It's never finished, because competitors can and will catch up if the innovation has merit.[4] Digital capital should grow over time, as new and better ideas and technologies emerge.

The best approach is incremental steps toward the vision, each delivering some tangible value, even if limited in scope or scale. Benefits should be measurable, whether in money, quality, and/or cycle time.

A bit of showmanship can pay off. It is better to ensure early phases do something visibly useful, even if it isn't the technically optimal implementation sequence, in order to best maintain interest and support. Sink some easy shots, pick some low-hanging fruit — choose your metaphor — early on to build credibility. Too often IT programs get in trouble when an optimal implementation sequence is pursued that requires a lot of spending on infrastructure and preparation before any value is

delivered. CIOs can find themselves on the defense, with the technically correct explanation sounding like jargon-laden excuses for slow or no delivery. ("There they go again.")

Each step, particularly early ones, should be chosen for quick doability and because it delivers something of value. If it's successful, a less than brilliant design can be made more robust and flexible. If it's not, the project team should figure out why and try a different approach or move on to more fertile ground.

Steps taken toward the vision don't have to occur one at a time. Two or more paths can be followed if they are independent enough of each other that a problem in one does not affect the other(s).

Evaluation and Learning

The one sure thing about the vision is that it will need to be updated to reflect new technology and changes in the business landscape. Every step in its implementation should produce not only value but learning. Inevitably, some ideas will not prove as brilliant as hoped. Failures can be even more instructive than successes, but only if we ask what happened and why without treating it like an inquest:

- If the benefits did not materialize as projected, why not? Did we not understand the situation well enough? What did we miss and how did we miss it?
- Were the intended beneficiaries insufficiently prepared or committed? How did that happen? If formal change management was used, why did it not work? If not used, could it have made a difference?
- Was the technology too much of a stretch? Not as good as advertised?
- Did the information end up falling short of the information superiority standards? What led us to believe incorrectly that the data was current and accurate enough?
- Can we fix the shortcomings, or should we move on?
- What should we make sure we do differently?

Success should also generate questions:

- What were the risks — technology, people, business — and how did we mitigate or overcome them?
- What could we have done differently to achieve even better results?
- What did we do that we didn't need to do, and how could we have recognized that beforehand?
- Are there barriers — technology, people, business, quality of available data — to replicating the success in other parts of the enterprise?
- If this was a pilot project, what are the constraints to scaling it up?

In short, every step provides learning. Absence of mistakes and disappointments means you didn't attempt enough. When mistakes do happen, learn from them and move on!

Continuous Improvement

There will always be better ideas, whether generated internally or thrust at us by a competitor we must match or exceed. The Lean approach, based as it is on successful Japanese manufacturing practice, makes a big deal of this, as it should for any part of a program aimed at information superiority. This is one way information systems differ from transaction processing systems, where "success" is more binary — either the transaction is processed correctly or it isn't. In information systems, there is no such thing as "correct" when you can always do better.

Stewardship

The term "capital" in digital capital implies something of value that needs to be carefully nurtured and protected. In the subset of capital represented by information, the notion of stewardship applies in three ways:

1. Proprietary information of value to the enterprise must be protected from competitors and hackers.
2. Private data of importance to customers must be protected from hackers.
3. Information generated at little or no incremental cost by processes, services, and products in the field, but for which no immediate use is apparent, should be stored, indexed, and made retrievable. In an era of big data and cheap storage, why not? You may find a use for it later.

Privacy and security are the two areas where stewardship means that the "quick and dirty" approach suggested above needs to give way to "cautious and deliberate."

Direction and Management

CIOs cannot drive the creation of information superiority and digital capital, though they must be responsible for implementation of agreed capabilities. When business

heads commit to an initiative, they must be accountable for producing the projected benefits. That assumes IT delivers the agreed functionality *and* that the functionality has been specified through a thoroughly collaborative process. The Agile approach can be very helpful, and the CIO needs to insist that it be followed, at least in spirit.

It is also important to manage expectations; not every at bat yields a home run or even a single. We should remember that even though Babe Ruth hit more home runs than almost anyone not on steroids, he also struck out a lot more than most. That's why focusing on early, visible value from information superiority successes is so important. The CIO must trade off between technically optimal sequencing and promptness in delivering business value.

Conclusion

To answer the question in the title, no, information superiority and digital capital are not synonymous. They are, however, intimately related. If you have information superiority, you perforce have digital capital. If you don't have information superiority, your digital capital account will be meager no matter what tangible assets are on the books. More than ever, information superiority is what successful organizations need to build and nurture, just as successful generals have done for thousands of years.

Endnotes

[1]Bughin, Jacques, and James Manyika. "Measuring the Full Impact of Digital Capital." *McKinsey Quarterly*, July 2013 (www.mckinsey.com/industries/high-tech/our-insights/measuring-the-full-impact-of-digital-capital).

[2]I first heard this comprehensive set of criteria articulated as the "Information Focus Principle" by my former colleague Sherman Uchill.

[3]Perhaps the first Great Computer Fiasco occurred in 1970, when the New York Central and Pennsylvania railroads merged. Merger negotiations and the regulatory approval process had been going on for 13 years, during which the two railroads independently pursued extensive automation with completely different and incompatible systems. When the merger went operational, chaos ensued. Freight cars simply disappeared — not physically, but nobody knew where they were. Within a few months, the new Penn Central went bankrupt. We've learned a lot since those early days, but not as much as one might have hoped.

[4]While American Airlines' frequent flyer program was first and automated from the start, all the major carriers quickly offered similar programs, albeit using ugly and expensive paper-based systems for the first few years. The programs became simply a cost of doing business, like beverage service. (Oops.)

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Information Superiority and Customer Centricity

by Richard Veryard

The business value of consumer analytics and big data is not just about what you can discover or infer about the consumer, but how you can use this insight promptly and effectively across multiple touchpoints (including e-commerce systems and CRM) to create a powerful and truly personalized consumer experience.

In this article, I will explore how the concept of information superiority interacts with the concept of customer centricity. I will look at three modes of information superiority: conventional, adaptive, and collaborative.

Much of my recent work has been in the retail sector, so many of the examples will be retail-specific. However, many of the findings have a broader relevance.

Information Superiority = Volume + Speed

Google and Facebook appear to possess enormous power in the Information Age. Their high stock market valuations are based not on their current revenues, but on expected future revenues.

This power stems from possessing extraordinary amounts of data and using this data to speculate (not always accurately, but accurately enough to make money) about our behavior patterns and secret desires. I will describe this power in terms of *information superiority*.

The idea of information superiority emerged first as a military doctrine, as leaders recognized that the ability to collect, process, and disseminate an uninterrupted flow of information yields an operational advantage. In a military or competitive context, the advantage comes not only from the quantity of information at your disposal, but also from being able to process the OODA (Observe, Orient, Decide, Act) loop[1] faster than your competitors. As real estate economist John Tuccillo observes:

> With a system that works the whole OODA loop, it is possible to stay on top of where your markets are going and to get there before the customers arrive, positioning yourself as the key supplier of their needs and wants.
>
> But using the OODA loop also goes beyond understanding the market. It entails being ready to act as soon as you understand what is happening and what it means for your business.[2]

Technology vendors have always tried to sell products based on the idea that speed provides a competitive advantage. But even if we limit ourselves to traditional data, the relationship between data volumes and response speed is not as simple as all that. Let's look at a specific example. If a retail store gives the customer a handheld scanning device and/or places electronic tags on all the goods, it can collect a much higher volume of data about the customer's behavior — not merely the items the customer takes to the checkout, but also the items that the customer returns to the shelf. As technology becomes cheaper, this enables a huge increase in the volume and granularity of the available data, collected while the customer is still shopping, which means the retailer has more time to use the data before the customer leaves the store.

You might infer from a customer's browsing behavior that she is looking for her favorite brand of pasta sauce. The shelf is empty, but you know there's a new box just being unloaded from a truck at the back of the store. All you need to do now is find a way of getting a jar to the customer before she reaches the checkout. That's what some people called the "two-second advantage."[3]

Data Rich, Data Hungry

The power of Google and Facebook comes in part from the sheer quantity of data that they command and the broad range of inferences they can draw from the data.

Google has fired up many interesting initiatives over the years, many of which had no obvious line to revenue. But all of them have had the potential to generate vast amounts of rich content — much of it related to the observed behavior of Internet users. For example, Google's directory inquiry service GOOG-411 enabled speech data to be collected from across the US (think of the word "pizza" spoken in a range of accents) and was

only discontinued when Android provided access to much larger quantities of speech data.

When Motorola wanted to use Skyhook's voice recognition on Android instead of Google's, Google forced it to fall into line. Daniel Soar, an editor with *London Review of Books*, argues that this was not because Google executives feared losing revenue, but because they feared losing access to an important source of content. As Soar puts it, "Google faced the unfamiliar problem of the negative feedback loop: the fewer people that used its product, the less information it would have and the worse the product would get." (Google subsequently bought out Motorola Mobility.)[4]

In this interpretation of Google's strategy, initiatives are dropped not because they fail to generate revenue, but because they fail to generate enough of the desired kind of content. Google has been betting its future on building and maintaining this content through powerful positive feedback.

Google's strategy is therefore surprisingly traditional — it involves capturing some territory and defending it against its competitors. In other words, it takes possession of as much data as possible and uses this to generate data products. In a recent article, venture capitalist Matt Turck describes this as the new Gold Rush:

> First, a key principle: the business of selling *raw data* is generally not a great one.
>
> Instead, companies that successfully monetize a data asset tend to offer data-driven *products*. To use an obvious example, Facebook doesn't sell its user data in raw form. Instead, it has built an infinitely more lucrative business around data-driven advertising products that enable brands to target Facebook users, based on the troves of data they provide about themselves.
>
> Even when companies want to license the actual data itself, they tend to do it through data products, rather than in raw form, sometimes with built-in analytical capabilities. For example, Twitter evolved its original firehose business into a full-blown enterprise data platform, GNIP (originally through the acquisition of the startup of the same name), which offers various APIs such as "historical," "real time," and "insights." Mastercard offers data indexes and research products through MasterIntelligence. Foursquare provides its data through a product called Place Insights.[5]

Competitive advantage here is grounded in economies of scale (large quantities of data) and economies of scope (added value from data repurposing and mashup).

The Science of Retail

Information superiority is not limited to Internet giants such as Facebook and Google. The British supermarket chain Tesco achieved information superiority in the mid-1990s following the introduction of its Clubcard scheme, which gives its customers vouchers in return for their data. After an initial trial of the Clubcard in three stores, Lord MacLaurin, then chairman of Tesco, is reported to have said, "What scares me about this is that you know more about my customers after three months than I know after 30 years."[6]

The loyalty card had a revolutionary impact on the way retailers treated their customers. For a start, the customers had a persistent identity — you could recognize a customer as "the same again," track and analyze their purchases over time, and detect patterns. You could differentiate customer behavior, inferring preferences and perceptions for different customer segments. You could play around with special offers and work out how price-sensitive customers were. And you could establish feedback loops to optimize all aspects of your marketing mix.

Google's strategy is surprisingly traditional — it involves capturing some territory and defending it against its competitors.

While some supermarket chains (such as Walmart's UK subsidiary Asda) stuck to a "knowledge light" approach, many retailers followed Tesco's lead and collected large quantities of data. However, not all of them were able to use the data as effectively and profitably as Tesco. The Clubcard scheme established Tesco's dominance of the grocery market in the UK for over a decade, thanks to a mode of information superiority that is not just about the data collection (thanks to the loyalty cards), but also about integrating sophisticated management information and analytics into the business process and decision making.

Conventional Information Superiority and Its Limits

Tesco uses its data to sell stuff to people, and the business advantage comes from achieving greater efficiency and effectiveness, both in selling and backward along

the supply chain. Google has a somewhat more complex business model, as it gets its revenue from advertising. This is sometimes crudely interpreted as "selling" the user to the advertiser, a principle first articulated in the 1973 film *Television Delivers People* by Richard Serra and Carlota Fay Schoolman:

> In commercial broadcasting the viewer pays for the privilege of having himself sold.
>
> It is the consumer who is consumed.
>
> You are the product of TV.
>
> You are delivered to the advertiser who is the customer.
>
> He consumes you.[7]

This is the origin of the commonly cited maxim: "If you are not paying, you are the product."

But instead of simply regarding the customer as the "product," I prefer to see Google as operating in a complex, multisided market, where its ability to make money from advertisers is dependent on its ability to provide reasonable utility to its large population of users.[8] Be that as it may, Google and Tesco represent a relatively conventional approach to information superiority — seizing larger quantities of data and extracting value through fairly straightforward commercial means.

Forecasters develop a sophisticated view of the customer journey and identify the key decision points within the journey.

In 2012, Tesco's profit growth faltered for the first time in 20 years. Different people have offered different explanations for this. According to Liz McShane, marketing manager at retail design firm Portland Design, the problem was that Tesco neglected customer service:

> Tesco has taken its eye off the ball for some time now, focusing more on the science of retail rather than the emotion of it. By that we mean the prioritization of the loyalty card programme and harvesting customer data, which has led to the fundamentals of good service being neglected, for example the first thing you are asked at the check-out is for your loyalty card, rather than a simple (but appreciated) hello.... Reliance on discounts as a point of differentiation has in turn neglected the in-store experience.[9]

Ctrl-Shift founder Alan Mitchell, however, said it was a matter of Tesco's putting "personalized icing on impersonal cake":

> The original theory behind CRM was that the data the organization collected would provide it with deep insight into the attributes, preferences, and propensities of each individual customer, thereby allowing it to customize and personalize all marketing efforts (offers, communications and so on), thereby reducing costs while maximizing returns.
>
> Tesco does a tiny, tiny amount of this: personalizing the mailings it sends to Clubcard members. But in reality this is an extremely thin piece of personalized icing on a completely impersonal cake. Most uses of Clubcard card data have nothing to do with understanding individual customers and nothing to do with marketing communications. They are about aggregate data (patterns, trends) applied to core operational improvements ("which promotions work best, under what circumstances," "what is the most profitable price difference between private label and the main brand?"). This has got nothing to do with what most people mean when they talk about "CRM."[10]

These explanations converge on the notion that Tesco has been very successful at a fairly narrow mode of information superiority, owing to a favorable set of conditions, but that this success wasn't sustainable indefinitely.

In many industries, forecasting is based on the predicted behavior of the customer. Forecasters develop a sophisticated view of the customer journey and identify the key decision points within the journey. Customer insight allows the identification of predictive demand indicators, which can provide extra data to predict future purchases. This includes both extended patterns of search (e.g., the customer of a travel company may be looking at holidays for several weeks before making a final booking decision) as well as sentiment analysis.

One of the key insights that can be gained from this kind of analysis is the extent to which customer decisions are governed by price or by features. This allows marketing organizations to use feature enhancement as well as price adjustment in order to improve yields.

The demand-side perspective may also be applied to yield management. Thus, pricing is determined not only from the supply side (optimizing the utilization of inventory), but also from the demand side (generating maximum revenue and profit from the customer base). Pricing decisions are typically influenced by considerations of customer retention and lifetime value, as well as by the competitive environment.

Achieving Real Customer Centricity

Conventional Information Superiority

There is clearly significant advantage in being able to collect and process data, but it doesn't go far enough: the commentary around Tesco's recent problems confirms this. Although many firms can now subject their customers to a kind of intensive scrutiny and speculation, in my opinion this doesn't count as true customer centricity.

Firstly, these organizations don't really know us as individuals, merely as clusters of propensities. They can make money by calculating probabilities, but these probabilities refer to the set rather than the individual. They may note that I occasionally buy peanut butter, but this just drives them to look for ways to sell me more peanut butter in the future.

Secondly, they know our behavior but not our intentions or context. As WibiData CEO Christophe Bisciglia notes:

> Real-time decisions and online recommendation engines are great for helping you understand that customers who bought X also bought Y, but that doesn't capture the intent that the customer is expressing in that current session. It won't tell you that somebody is shopping for a gift, not buying what they normally buy. And it won't tell you that the customer just purchased a TV, so stop showing them other TVs and start showing them HDMI cables and speaker systems.[11]

So if conventional information superiority is insufficient, what other modes of information superiority could there be? To answer that question, we only need to look at what some other retail organizations are doing.

Adaptive Information Superiority

The first step is to move from fixed segmentation to dynamic response. In other words, don't just put customers into fixed segments (age, demographic) but respond to their context.

Simple versions of this often involve mobile phones:

- Your phone vibrates when you walk past a restaurant.
- *And* it is nearly lunchtime.
- *And* this restaurant has submitted the highest bid for the marketing opportunity.

Context can get much more personalized than this, though. Of course my phone knows my current location and the generic time "near lunchtime." But there's a lot of other relevant stuff my phone probably knows. For example, it may know what time I usually have lunch and what I had for lunch yesterday. (Easy if I used the phone to pay for my lunch.) It may know which friends or colleagues I'm with (thanks, Bluetooth), and it may know that I've just got off a plane from Hong Kong (affecting both my body clock and my food preferences). Furthermore, my phone has detailed knowledge of my social network. Like a discreet servant, it overhears the word "lunch" in a conversation with my brother-in-law and can make a contextually relevant suggestion.

Although many firms can now subject their customers to a kind of intensive scrutiny and speculation, this doesn't count as true customer centricity.

Context awareness is not fixed — we should always be open to learning (and exploiting) new fragments of context. When designing context-aware services, we generally try to decouple the context awareness from the underlying capability in order to maintain adaptability and openness.

Once you arrive in the restaurant, what happens to the context that was used to tempt you inside? Perhaps the waiter or the cook also has some access to this context, which helps them match the experience to your expectations — for example, whether you are in a hurry, whether it's a special occasion, or whatever.

What about privacy? You might want the waiter to know it's your birthday, but not how old you are. Context and consent must be managed at an appropriate level of granularity. My phone publishes only those aspects of context that I permit, and the restaurant subscribes only to those aspects of context to which it can meaningfully respond.

Collaborative Information Superiority

The next step is to move from adaptive to collaborative — allowing the customer to actively participate in the creation of content. This concept is known as *co-creation*.

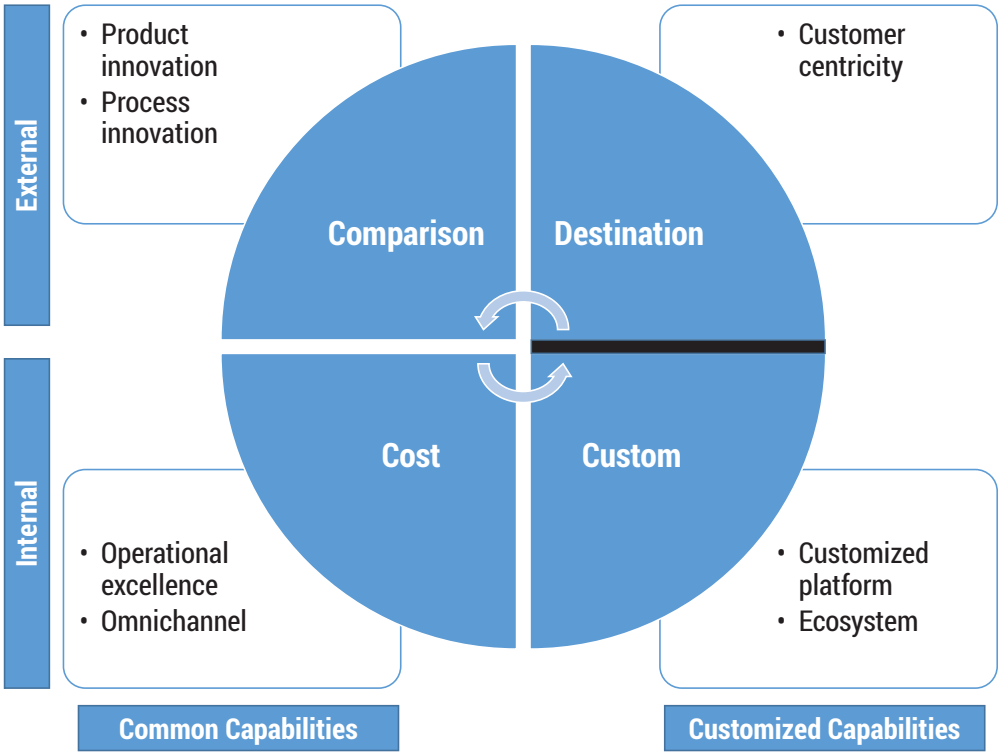

Figure 1 — Retail cycle capability requirement.

The online fashion retailer ASOS offers an excellent example of personalization through co-creation. ASOS provides a platform for customers to suggest combinations of ASOS and third-party products, thereby establishing itself as a fashion destination. Other retailers currently developing capability around user-generated content include FF Group, IKEA, and Missguided.

Retail Cycle

In an earlier article, Philip Boxer and I discussed the retail cycle, calling it "a dynamic process, in which the supply-side is constantly learning new forms of supply in response to a demand which is always evolving — and never fully satisfied" (see Figure 1).[12]

The retail cycle allows us to identify four critical challenges for retail organizations:

1. The first phase of the cycle is focused on the challenge of *innovation*. This results in the emergence of new forms of the supply-demand relationship, which expand to become new forms of offerings.
2. The next phase of the cycle standardizes these offerings within a unified business model. This is the challenge of *omnichannel*.
3. In order to personalize the capability for each customer, the offerings are decomposed into services, recombined with third-party services, and orchestrated via a joined-up platform. This enables customization of services under a standardized model of supply. The key challenge here is the *ecosystem*.
4. Finally, the *customer centricity* challenge is focused on embedding the service, in as full and flexible manner as possible, in the customer context.

If and when the cycle is completed, it can start again with a fresh round of disruptive innovation. There is always something left to be desired, and this is what drives continual change with retail markets.

Principles of Information Superiority

Table 1 identifies some key principles of customer centricity, which should be applied to information superiority. Competitive advantage is now based not only on the economies of scale and scope, but also on the economies of alignment — the ability to create additional ways of organizing the business relationship with a customer over time.

Customer Context	Understand customer pathways, including changes and repeating patterns over time. Understand the customer's network — friends and influences.
Customer Perspective	Don't just see things from the company's perspective. Understand what these events mean to the customers themselves.
Holistic Approach	Understand how multiple factors interact to produce particular behaviors and preferences at a given point in time.
Closed-Loop Feedback	Realize that the outcome of each action helps to calibrate the next action. Understand that rapid feedback supports broader experimentation and promotes effective learning (i.e., the OODA loop).
Ethical and Authentic Interactions	Respect consumer preferences and values. Operate in a trustworthy manner, and trust the customer to do the right thing (within reason).

Table 1 — Principles of customer-centric information superiority.

Information Superiority Stage	Stage Characteristics	Capabilities Enabled
Conventional	Segmentation, behavioral clustering, predictive inference. (Now seen as bread and butter.)	• More effective use of digital campaigns; more targeted, more coordinated, more timely. • Improved conversion rate on campaigns. • Improved yield management, reduced customer churn. • Reduced price sensitivity — can base offers on consumer desire rather than discounts.
Adaptive	On-the-fly decisions, learning algorithms, real-time feedback. (Basically, conventional with some new technical tricks.)	• Support for innovation (e.g., trial offers or campaigns) because faster and more comprehensive feedback takes away some of the risk. • Growing accuracy of consumer profile, thanks to continuous feedback. • Lifetime value of consumer.
Collaborative	Customers are invited into the process. Focus is on respecting and not alienating them.	• Messages across all channels are more relevant to customers. • There is increasing customer affinity with the channels and brand. • Customers feel that the enterprise is directly responding to their actions and preferences.

Table 2 — Three levels of information superiority.

Conclusion

In this article, I have looked at three stages of information superiority, with increasing levels of customer centricity, as shown in Table 2. Conventional information superiority is typically exercised at the expense of the customer and cannot be regarded as genuine customer centricity. Adaptive and collaborative information superiority are explicitly exercised on behalf of and/or with the active participation of the customer, which is where true customer centricity lies.

Endnotes

[1]Veryard, Richard. "The Emergence of Organizational Intelligence." Cutter Consortium Data Analytics & Digital Technologies *Executive Report*, Vol. 10, No. 7, 2010 (www.cutter.com/article/emergence-organizational-intelligence-400741). For a longer treatment, see Veryard, Richard. *Building Organizational Intelligence*. LeanPub, 2012.

[2]Tuccillo, John. *The Eight New Rules of Real Estate: Doing Business in a Consumer-Centric, Techno-Savvy World*. Dearborn Real Estate Education, 1999.

[3]Ranadivé, Vivek, and Kevin Maney. *The Two-Second Advantage: How We Succeed by Anticipating the Future — Just Enough*. Crown Business, 2011.

[4]Soar, Daniel. "It Knows." *London Review of Books*, Vol. 33, No. 19, 6 October 2011 (www.lrb.co.uk/v33/n19/daniel-soar/it-knows).

[5]Turck, Matt. "The New Gold Rush? Wall Street Wants Your Data." mattturck.com, 17 January 2017 (http://mattturck.com/2017/01/17/the-new-gold-rush-wall-street-wants-your-data/)

[6]Ruddick, Graham. "Clubcard Built the Tesco of Today, But It Could Be Time to Ditch It." *The Telegraph*, 16 January 2014 (www.telegraph.co.uk/finance/newsbysector/retailandconsumer/10577685/Clubcard-built-the-Tesco-of-today-but-it-could-be-time-to-ditch-it.html).

[7]Serra, Richard, and Carlota Fay Schoolman. *Television Delivers People*. 1973.

[8]Boxer, Philip. "Asymmetric Demand Is Multi-Sided Demand." *Asymmetric Design*, 18 October 2011 (www.asymmetricdesign.com/2011/10/asymmetric-demand-is-multi-sided-demand/).

[9]Curtis, Polly. "Why Are We Falling Out of Love with Tesco?" *The Guardian*, 18 April 2012 (www.theguardian.com/politics/reality-check-with-polly-curtis/2012/apr/18/tesco-retail).

[10]Mitchell, Alan. "Why Tesco Clubcard Is a Dead End." *Marketing Magazine*, 16 April 2010 (http://web.archive.org/web/20140127222444/http://reinventingmarketing.marketing-magazine.co.uk/2010/04/16/why-tesco-clubcard-is-a-dead-end).

[11]Henschen, Doug. "Real-Time Prediction, Big Data Scale: Impossible Dream?" *InformationWeek*, 17 December 2013 (www.informationweek.com/software/information-management/real-time-prediction-big-data-scale-impossible-dream/d/d-id/1113125).

[12]Veryard, Richard, and Philip Boxer. "Metropolis and SOA Governance." *Microsoft Architecture Journal*, July 2005 (https://msdn.microsoft.com/en-us/library/aa480051.aspx).

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Follow the Digital Trace: Turning Digital Artifacts into Digital Capital

by Stefan Henningsson and Christian Øhrgaard

Digitization: The Challenge and the Opportunity

In the last decade, digital technologies have gone from supporting corporate processes to becoming *the* way to do business. Initially, we saw the effects of this shift on industries whose products lend themselves easily to direct digitization, such as music, newspapers, and games, where the enabler was a move from physical to digital distribution. Then the wave hit industries such as finance, recruitment, travel, and hospitality. Now we are seeing the effects in almost any industry, with real impact also in traditional industries such as the retail, construction, agriculture, and automotive industries.

Production is increasingly carried out by robots that act through software-defined algorithms; scheduling and routing of logistics are determined by artificial intelligence; warehouses and complete supply chains are being automated; marketing is done through digital campaigns; B2B sales and purchase are negotiated through automated auctions; and even physical products are permeated with software that turn them into digital artifacts.

This wave of digitization is fundamentally rewriting the rules of competition across industries: the characteristics that made firms successful in the past are not the same characteristics that distinguish winners from losers in the digital era. One of these fundamental changes is the steadily increasing importance of innovation and continuous improvement. Research shows that the more digital an industry becomes, the more rapid the speed of change in the industry.[1] There is no such thing as a sustained competitive advantage in the digital era.

However, digitization does not only create challenges for actors in affected industries. Digitization in itself also provides the keys to tackling the changing competitive dynamics. Because most firms still do not leverage the opportunities, the quickest ones to learn how to exploit them will be the ones that come out on top.

When it comes to the challenge of constant innovation and improvement, digitization holds the keys to identifying improvement opportunities. Understanding what works and what does not work is a fundamental prerequisite to improvement. Digital artifacts — produced for internal or external use, and consisting of or containing an embedded element of software — typically have their production history inscribed. Because digital work leaves a digital trace that can be followed to recreate characteristics of its development processes, such digital work presents new opportunities for fact-based management of investments. A study from the MIT Center for Digital Business found that organizations driven most by data-based decision making had 4% higher productivity rates and 6% higher profits than their peers.[2]

In the remainder of this article, we will explore how organizations can convert digital artifacts that are already present in their organization today — and will be omnipresent within a near future — into digital capital for evidence-based management to establish a position of information superiority internally and externally:

- **Internally,** as the information derived can be used strategically and tactically to optimize, measure, and modify delivery organizations to deliver according to their strategic objectives
- **Externally,** as the consistent, objective data puts these companies in a position where they have information superiority with vendors, allowing fact-based input to guide contract negotiations and renewals and enabling them to award work to the best vendors

Leveraging Digital Artifacts for Internal Information Superiority

How do you know who is performing well in your organization? Do you know why this individual or that team is performing well? Do you know which parts of

your digital delivery organization are more effective than the rest? How do they compare to other teams outside your organization? Being able to answer these questions is critical for improvement. When you can answer them, it's possible to promote and spread effective behavior within an organization.

Traditionally, we have relied on mostly subjective measures to answer questions of what is working and why it works. In a few areas, such as sports and music, it might be possible to isolate the contribution of individuals. But most of us contribute to success through complex systems of influencing conditions that involve teams, processes, structures, and many levels of intermediate outcomes before we arrive at something measurable, such as profit. The link between action and outcome is full of ambiguity, and interpretations of it become highly subjective — not based on facts.

What digitization brings about is an increased opportunity to gather and analyze data so that managerial decisions come to be based on facts and not merely gut feeling.

Data-driven decision management is an approach to managing business that focuses on decision making that can be backed up with verifiable data. The success of the data-driven approach relies on the quality of the data gathered and the effectiveness of its analysis and interpretation. What digitization brings about is an increased opportunity to gather and analyze data so that managerial decisions come to be based on facts and not merely gut feeling.

As noted above, the production of digital artifacts has a key advantage with regard to data-driven decision making in that it typically leaves a digital trace that can be followed. Unlike work with physical materials, almost every bit that is added to a digital artifact is associated with metadata explaining its provenance. It's as if every worker on a construction site signed and time-stamped each brick laid, and with a query you could determine to what extent each of those bricks contributed to the effectiveness of the construction. In a similar way, if the right measures are put in place, following the digital trace enables transparency, traceability, and objective insight.

Information can be extracted through five steps that turn digital artifacts into digital capital:

1. **Decide on what is good.** The first step is to define what "successful" means in the specific area that is being investigated. For NASA, errors in the software code were simply not acceptable.[3] For other organizations, cost efficiency might be the critical condition for success. For still other organizations, adaptability may be what will determine the long-term success of the organization. Defining the objectives of the task being investigated frames the standards that should be measured.
2. **Convert the source code to a database of change history.** In this step, source code is deconstructed into a data model that interrelates the specific element types that compose the code, such as methods, expressions, and variables, with their location in the source code. This makes it possible to interrogate the code base to understand the code and how it was created.
3. **Enrich the data with contextual variables.** This can include developer details such as job title, location, employer, cost, seniority, and skills. It can also include project-level information like bug reports. The more contextual variables added, the greater the possibility of identifying performance patterns in the data.
4. **Visualize to identify patterns.** Dashboard displays showing the relations between performance measurements, source code, and contextual variables allow for rapid identification of broad patterns. These might be individuals, teams, or projects that stand out from the average — positively or negatively. Advanced software tools aiding this activity enable dynamic exploration, with drill-downs into specific projects to view activity history for individual project team members. In addition, benchmarking the individuals', teams', or entire company's performance measures with those of industry peers or open source projects yields contextual insight and lets companies proactively set targets and create improvement initiatives.
5. **Follow up with ad hoc querying.** Ad hoc code exploration and mining your source code repositories narrowly or widely can provide additional insights on the causes of the pattern.

With this five-step process, data can be used as input for management both at the organizational and individual levels. On an organizational level, data-driven decision making based on evidence sourced from the digital artifacts can be used for both structuring and enablement:

- **Structuring.** By understanding the teams that perform well, management can seek to fortify and

expand the high-performing areas. This can be done through hiring in certain locations or by relocating teams to sections of the organization that are doing better than others.

- **Enablement.** By understanding why certain teams perform well, management can seek to implement similar conditions throughout the organization. This might include adjusting development practices, composing teams with certain types of personalities, and/or relocating teams structurally within an organization.

On an individual level, knowing the contribution individual digital workers have made allows for more effective talent management, including the creation of appropriate reward structures for existing staff. Furthermore, better understanding the cohort of high-performing staff can make future recruitment more effective.

In a leading fintech company, data retrieved from its digital artifacts took center stage in the fostering of a culture of superior software development (see sidebar, "Creating a Culture of Software Development Excellence"). Although this is a company where software is the core business, the example applies to all organizations that have a digital component in their business model.

Leveraging Digital Artifacts for External Information Superiority

When outsourcing started to gain popularity, the prime reason was cost efficiency. Today, the reasons behind outsourcing arrangements extend to include capacity issues, enhanced service quality, access to intellectual capital, and the enablement of transformational change. However, while cost efficiency is easy to measure, most firms find it difficult to measure the innovation extracted from the relationships. In fact, according to a survey by Deloitte, 65% of all companies don't even try to measure the value created through innovation in their outsourcing relationships.[4]

Being able to inquire into the code base gives companies an advantage when managing sourcing arrangements based on principles other than cost efficiency. According to the Deloitte survey, 89% of all firms leverage current providers for additional services beyond those originally included in the outsourcing contract.[5] As shown by the experiences of a large international company with more than 5,000 contract developers (see sidebar, "Vendor Management: Understand Your Relationships"), when requesting additional service provision, it's critical to understand where value is generated.

Figure 1 offers a real-world example of the insights that can be generated by following the digital trace. The figure shows the performance gap between two different teams sourced from the same vendor. On the graph, the horizontal axis displays the net lines of code added to in-scope projects over 12 months, while the vertical axis shows the net amount of quality problems (i.e., vulnerabilities or severe deviations from best practice) introduced by a given vendor in the same period. As the values are net values, it is possible for a vendor to have removed more code than it added over the

Creating a Culture of Software Development Excellence

A leading fintech company provides a software platform that has been widely adopted in financial services firms across the world, running at the very core of their businesses. With over 40,000 users of the software globally, development excellence is critically important to the company's mission. To that end, it established a group within the company to promote software excellence. The objective of the group was to spread best practices and help everyone achieve the highest standards.

Using software tools that ran deep analyses of the code base of the company's product, software engineers managed to track the quantity and quality of source code change contributions over time at the project and individual developer levels. To assist managers in taking action based on the information, the findings were visualized and made available to different stakeholders across the company. In addition, the company used a software engineering analytics solution to conduct special analyses, following the digital trace to the high-performing teams and individuals. This helped management understand the conditions and individual and team-based characteristics that made these units particularly efficient.

Subsequently, software tools were also put in place to identify and quantify deviations from the intended future structure of the software and to monitor progress toward correcting those deviations. These custom queries were eventually added to the company's software build processes in order to flag deviations before they entered the main code base.

Vendor Management: Understand Your Relationships

A global financial services firm with more than 5,000 contract developers was asking itself what exactly it was getting out of its relationships with numerous outsourcing vendors. The firm decided to follow the digital trace to investigate the impact of three factors: vendor, location, and price.

Using advanced software tools to inquire into the code base, the firm soon discovered that different teams from the same vendor showed very different results when it came to code changes (i.e., quantity, type, quality, and impact). Being aware of differences like these across vendors and locations allowed the firm to act proactively in contract negotiations by presenting vendors with hard facts about their contributions. Moreover, it allowed the firm to look into its own role in enabling the different teams to contribute. Through dedicated efforts to better exploit the capacities of the low-performing teams, including simply informing them what the client organization considered "good practice," the firm managed to rapidly address some of the performance imbalance.

When inquiring into the importance of the contract workers' location, the firm found that location mattered in ways that were previously unknown to management. Some countries that management had previously classed as similar simply owing to their geographical proximity (e.g., different countries in Eastern Europe) were found to have the highest variations in performance levels. Furthermore, the performance levels for each location varied with the type of work done. For some tasks, the performance was balanced, while for other tasks, specific locations displayed very abnormal (high and low) performance patterns. By understanding how these variations could be attributed to cultural fit with the task, historical exposure to similar work tasks, differences in time zones, or simply availability of individuals who were skilled in relevant techniques or tools, the firm could act with much finer precision when sourcing contractors for future work tasks.

Finally, the insights from studying vendor teams and locations were combined with the parameter of contracting price. With this information, the firm could steer sourcing in general to locations that provided a good quality-price ratio — for example, by scaling up the staff in some Eastern European locations where the cost was only marginally higher compared to Southeast Asia, but the quality and velocity were significantly higher.

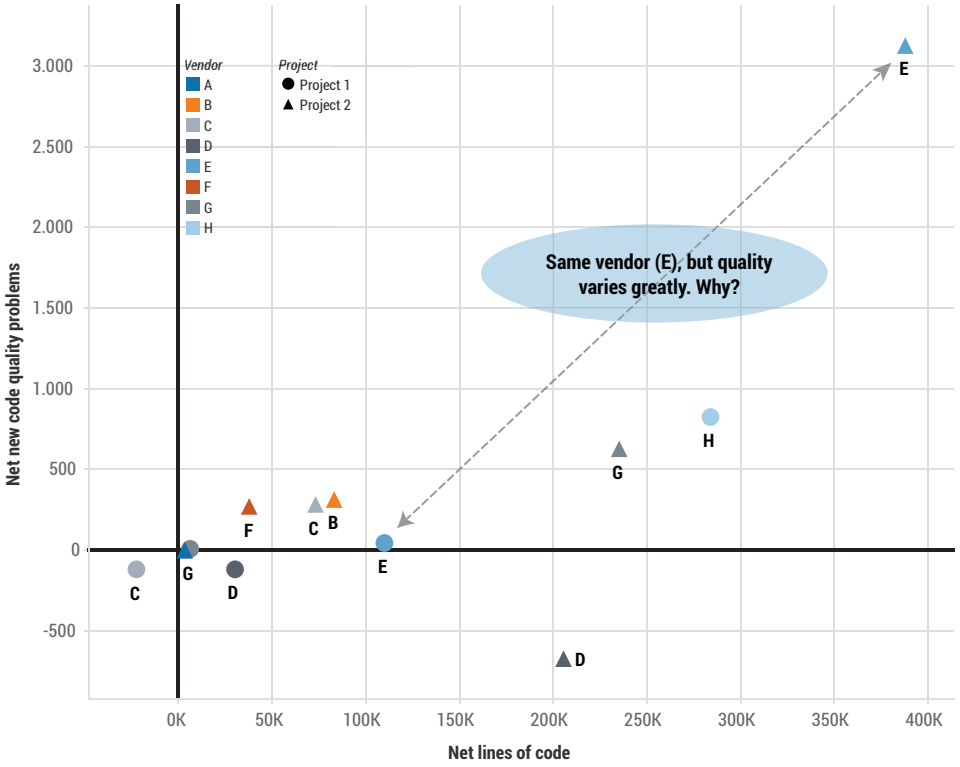

Figure 1 — Vendor performance.

period, or to have removed quality problems introduced by others.

In this graph, we see that developers from Vendor E contributed to both Project 1 and Project 2. While the contributions on Project 1 were of great quality relative to those of most other vendors, the contributions Vendor E made on Project 2 were far worse and do not match the client company's expectations for this vendor. The graph also shows that Vendor D was highly productive and delivered very high-quality contributions on both Project 1 and Project 2; hence it qualifies as a good candidate for future work. This type of data yields information superiority in the interaction with sourcing providers, as client companies can use it to demand certain development teams or establish requirements for consistent quality in delivery.

Figure 2 presents another example of insights that are valuable when deciding how to proceed with sourcing providers. The graph plots the quality of contributions made to the code base by a vendor, relative to the weighted daily rate of the team working for that particular vendor and location. The horizontal axis represents the calculated quality score, where a positive score indicates good quality of contributions relative to the peers in scope, and negative values indicate relatively poorer quality. The vertical axis represents the daily cost per developer, weighted by the amount of contributions made by each individual working for a given vendor in a given location.

In this case, we see that Vendor Z is delivering excellent quality out of Poland at a relatively low cost, whereas Vendor V in the UK is delivering poor quality at a comparably higher cost. Such insights are critical when renegotiating sourcing deals because they allow allocation of suitable tasks to the right locations. They are also important for the ongoing management of existing arrangements so that the quality does not drop over time.

In addition to helping manage outsourcing providers, these types of insights are critical when managing the firm's internal enablement of sourcing providers. Recent research shows that the main contributor to variance in outsourcing relationships originates in the client's behavior, not the provider's.[6] While the latter was true in the early days of the outsourcing industry, with more mature markets and increasing transparency, outsourcing providers' offerings are increasingly homogenous. So in addition to asking what might be wrong with a provider that doesn't deliver, clients should to an equal extent ask why they are not enabling the provider to deliver.

Through further exploration of the digital artifacts, clients can isolate the problematic projects, tasks, and relationships to better understand the issue. It might be

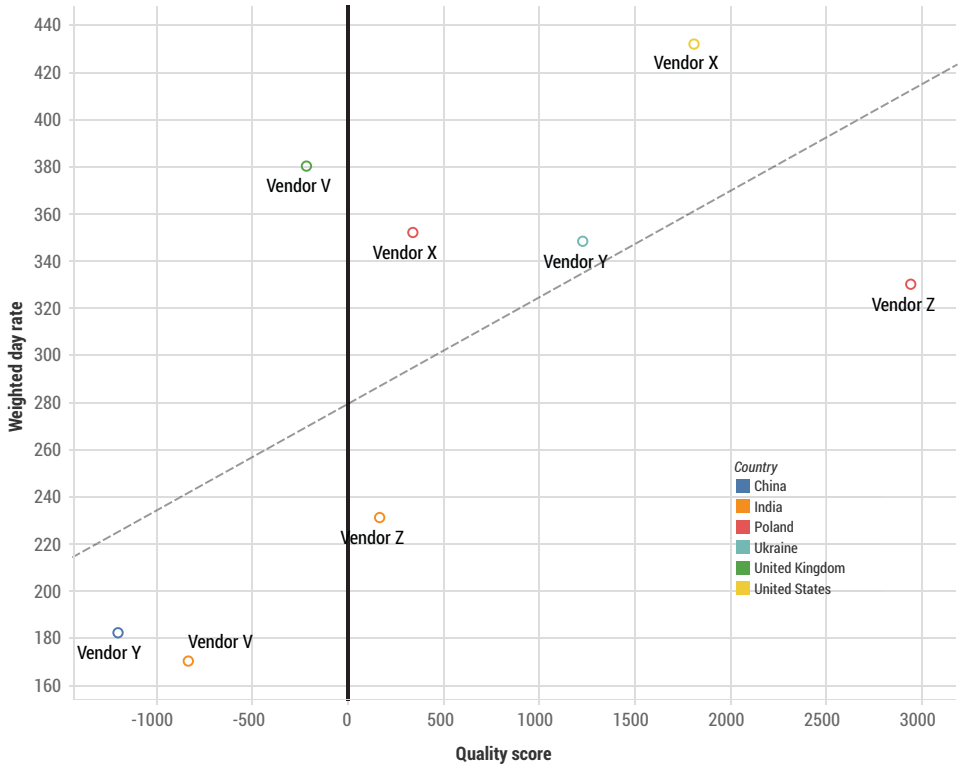

Figure 2 — Cost-quality ratio.

that client planning has been inappropriate, the client doesn't provide the necessary channels for sourcing providers to coordinate efforts, or the client lacks communication skills in a certain area of the organization.

Transparency in performance creates trust in a relationship. By following the digital trace, parties can focus more on relational governance and collaboration than tight contracts with punishments for lack of performance.

Data-driven management is not about identifying scapegoats or playing blame games.

Key Managerial Principles for Following the Digital Trace

Digital artifacts present new opportunities for fact-based management that can meet the increasing need for innovation of products and processes in the digital era. With constantly faster innovation cycles, turning digital artifacts into digital capital for better understanding of internal and external innovation performance is critical. To seize these chances, managers should rely on three key principles:

Focus Efforts Where They Matter

The scarcest resource in a company is managerial attention. While digitization presents an abundance of opportunities to inquire into performance, before getting started, any firm should be sure about what matters and what doesn't. If something makes a marginal contribution to the firm, it might be possible to measure, monitor, and manage it — but it will still not make an impact on the bottom line.

Leverage the Right Tools

The right tools present three distinct qualities. First, they are *dynamic*. This means that the tools can be tailored to specific use cases, guided by the strategic ambitions of the firm. Tools based on generic rules, with prescribed notions of what matters, are of little use because what matters will always differ from one place to the next. Second, they are *actionable*. Actionable tools present insights — typically through visualizations that facilitate pattern identification and management. Actionable tools allow the user to inquire into not only what works, but also why it works. Third, they are *aspirational*. Data-driven management is not about identifying scapegoats or playing blame games. Management is always a matter of searching for better performance and enabling that performance. The right tools drive aspirations for improvement.

The Future Matters, Not the Past

"What gets measured, gets done" goes the saying. When it comes to data-driven decision making, this is a real danger that can severely limit the benefits that can be derived from the digital trace. The digital trace typically leads backward to historical paths. It's relatively easy to measure what work was done in the past. It's too easy to reward or punish based on what has already happened.

What matters for any firm is the future. The right focus and the right tools create the foundation for the right kind of data-driven management. It is important that firms study the past only to form better decisions. Is 10 years of poor performance from a particular outsourcing contractor a good proxy for the next 10 years to come? Probably, yes. But it's still important to recognize that the past is supposed to guide the future — it doesn't guarantee it. How are conditions evolving at a troubled location? Instead of rough management by punishment and rewards, skillful managers will ask why something works better than something else and try to continuously evolve the practice toward the better. At the fintech company discussed earlier, data-driven management was framed as a developmental program to foster a culture of development excellence that was inspirational and aspirational, rather than judgmental.

Parting Thoughts

Digitization is radically changing the competitive dynamics in affected industries, placing the focus on constant innovation rather than fortified positions of sustained competitive advantage. For many companies, digitization constitutes a serious threat because it challenges practices that have made them successful in the past. But digitization also brings new opportunities. Because digital work leaves a digital trace that can be queried to understand who did what and with what effect, digital artifacts can be turned into digital capital for innovation management. Skillful managers exploit digital capital to make informed decisions on how to improve internal performance in IT delivery and to manage relationships with sourcing providers. They proactively use digitization as a springboard to

strengthen their companies, thereby ensuring that their organizations don't become victims of the disruptive forces of digitization.

Endnotes

[1]McAfee, Andrew, and Erik Brynjolfsson. "Dog Eat Dog." *The Wall Street Journal*, 28 April 2007 (www.wsj.com/articles/SB117735476945179344).

[2]Brynjolfsson, Erik, Lorin M. Hitt, and Heekyung Hellen Kim. "Strength in Numbers: How Does Data-Driven Decisionmaking Affect Firm Performance?" MIT Center for Digital Business, 2011 (http://ebusiness.mit.edu/research/papers/2011.12_Brynjolfsson_Hitt_Kim_Strength%20in%20Numbers_302.pdf).

[3]Havelund, Klaus, and Gerard J. Holzmann. "Software Certification: Coding, Code, and Coders." *Proceedings of the Ninth ACM International Conference on Embedded Software.* ACM, 2011 (http://dl.acm.org/citation.cfm?id=2038674&dl=ACM&coll=DL&CFID=731263550&CFTOKEN=72648325).

[4]"Global Outsourcing Survey 2016: Outsourcing Accelerates Forward." Deloitte Consulting LLP, June 2016 (www2.deloitte.com/us/en/pages/operations/articles/global-outsourcing-survey.html).

[5]"Deloitte's 2016 Global Outsourcing Survey." Deloitte Development LLC, May 2016 (www2.deloitte.com/content/dam/Deloitte/nl/Documents/operations/deloitte-nl-s&o-global-outsourcing-survey.pdf).

[6]Schermann, Michael, et al. "The Role of Transaction Cost Economics in Information Technology Outsourcing Research: A Meta-Analysis of the Choice of Contract Type." *Journal of Strategic Information Systems,* Vol. 25, No. 1, March 2016 (http://dl.acm.org/citation.cfm?id=2912528).

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Achieving Information Superiority: A Framework to Measure Business Operating Model Performance

by Tarun Malviya

In today's global socioeconomic landscape, with its multitude of varied and disruptive technological innovations, business organizations are forced to quickly respond and evolve. Continuous business transformation is the new normal. Business executives are expected to make informed and leading decisions against a dynamic business transformation baseline. In such an environment, quantifying the business operation's effectiveness is a challenge and becomes particularly important when many critical operational decisions demand hard evidence. This is where the doctrine of information superiority comes into play. Information superiority is defined as "the operational advantage gained by the ability to collect, process, and disseminate an uninterrupted flow of information while exploiting and denying an adversary's ability to do the same."[1] By definition, information superiority leads to superior decision making and, in Paul Strassmann's view, "the capacity to increase economic value faster than the competition."[2]

Generally, business transformation results in designing a target business operating model (BOM), or in other words, a new "business design." To implement the target BOM is to operationalize the business strategy. With each transformation cycle and new target BOM, there is a shift in decision making depending on changes in the organizational hierarchy and ways of working. To make sure that this shift occurs smoothly and is working as expected, it is imperative to continuously measure the BOM's effectiveness both in terms of current and predicted performance. This ensures that intended strategic outcomes are being realized in the most efficient manner.

An organization's ability to achieve and maintain information superiority can be enhanced by having a framework that structures key information elements across each BOM component and provides a mechanism to measure the effectiveness of business operations. In this article, I propose such a framework, which links business strategy with expected outcomes across key business design components and defines information requirements at each logical touchpoint. I then discuss a scenario that showcases how the framework can be applied to help business executives make leading decisions and maintain an edge over competitors.

Business Design: Purpose and Components

The main goal of the business operating model is to enable the application of a corporate strategy to business operations. It represents how different organizations' components are configured in relation to each other and how they function coherently in order to operationalize the business strategy.

The Business Model Canvas[3] is an industry-recognized way of depicting a company's business model. It contains the following key components:

- Customer segments
- Customer relationships
- Channels
- Value propositions
- Key activities
- Key resources
- Key partners
- Cost structure
- Revenue streams

Typically, the BOM is implemented as a part of overall business design, which — in addition to customer and channel — also takes into consideration another key element of the Business Model Canvas, namely product/service (part of value proposition). Figure 1 depicts the key components of a business design and elucidates the focus of each component.

Across the business value chain, the business operating model provides a complete view of every significant component in the business activity. Typically, BOMs are designed and implemented as part of a larger business transformation initiative.

Figure 1 — A business design and its components.

Dynamic Transformation Baseline: Achieving Information Superiority by Measuring BOM Performance

If you are a senior executive of an organization that is undergoing business or IT transformation, ask yourself these questions during or after the transformation:

- What are the new skills that I need to seek out in the market to hire?
- What are the new processes required to complement new ways of working? How and when do I ensure that the new process is correctly defined and rightly understood? How can I determine that everyone knows their roles and responsibilities in the RACI (Responsible, Accountable, Consulted, and Informed) matrix?
- Is my current technology landscape optimized enough to support business services within the desired cost range?

It is relatively easy to formulate answers to the above questions when there is only one business transformation occurring in the organization. However, this is not the most common case. Generally, there are multiple transformation initiatives occurring at the same time, and depending on their transformation roadmaps, they tend to roll out different target BOMs successively or concurrently. In a scenario like this, it becomes increasingly difficult to answer such questions.

Successive or concurrent rollout of target BOMs leads to a continuously shifting baseline for some or all business design components, thus requiring careful planning and data-driven decision making. Having a framework that baselines the state of each business design component and facilitates continuous measurement assists in executive-level decision making. Using such a framework, executives can:

- **Baseline, build, and monitor incremental efficiency gains.** The framework provides a consistent baseline for measuring incremental performance of each BOM component (e.g., efficacy and efficiency of new processes can be measured as and when they are implemented).
- **Manage risks proactively.** The framework helps in proactive identification of any emerging constraints, dependencies, and risks in relation to other business operating models.
- **Embed synergies between multiple transformation initiatives.** The framework assists in decision making by identifying the need for any change in other concurrent strategic transformation initiatives.
- **Prioritize transformation spending to realize promised cost savings.** The framework provides

a way to focus decision making on prioritizing program funding where it is required the most.

So how does having a framework to measure BOM performance help in achieving information superiority? By providing:

- A method for structuring an organization's thinking about information superiority
- An ability to collect and process meaningful information for different components of a business design
- A mechanism for generating meaningful data to drive fact-based decision making

The Operating Model Measurement Framework

The Operating Model Measurement Framework (OMMF) can be defined at two levels: Level 1 and Level 2. The Level 1 view contains only the key summary components, while the more detailed Level 2 contains all Level 1 components and depicts the subcomponents within all Level 1 components. Figure 2 provides a Level 1 view of the OMMF.

The framework in Figure 2 follows a top-down approach and consist of five key elements (see Table 1):

1. Strategic theme
2. Business context
3. Business design dimensions
4. Business design dimensional classification or hierarchy
5. Business design key performance indicators (KPIs)

Figure 3 provides a Level 2 view of the OMMF, while Table 2 describes the business design dimensional classification or hierarchy mentioned in Figure 3.

Information Requirements for the OMMF

Information requirements are defined as the type, amount, and quality of information that a decision maker or knowledge worker needs to do their job. In most cases, information requirements cannot be specified exactly, as they vary with different tasks, vary in time, or depend on the decision maker's/knowledge worker's frame of mind.[4]

For effective use of the proposed framework, each operating model component's information requirements is illustrated in Table 3.

Applying the OMMF

As a part of its five-year vision planning, a large global financial company decided to transform its IT function. The organization had conducted two big acquisitions in the last 10 years. It had made multiple attempts to align and simplify its IT, but it remained fragmented. For the most part, the company used the waterfall method for program execution, and its adoption rate for Agile and DevOps was low, leading to a slower pace of program delivery. The company conceived an end-to-end transformation program for both its application and infrastructure IT suborganizations, with three major aims:

1. Simplify IT platforms and move to cloud
2. Reinvent and digitize IT services and delivery channels

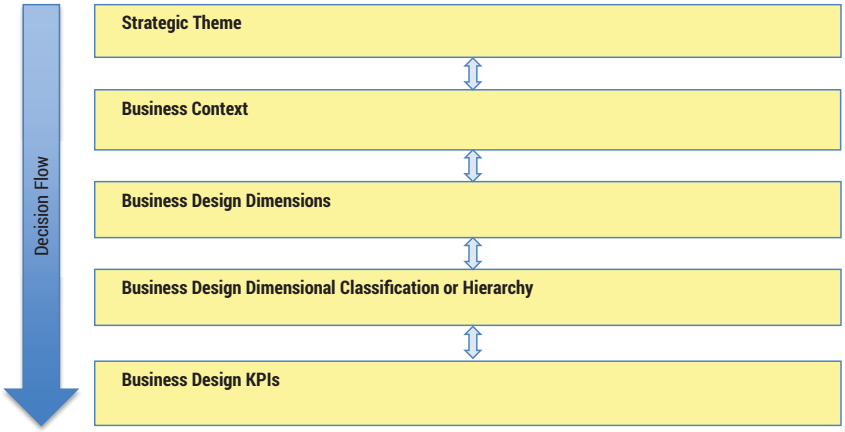

Figure 2 — A Level 1 view of the OMMF.

3. Reduce time to market by adopting Agile and DevOps

Figure 4 shows a few key corporate-level strategic drivers and expected transformation outcomes.

Level 2 framework components pertaining to the Level 1 strategic theme and business context components were extracted from the corporate vision and transformation outcome (shown in Figure 4). Figure 5 shows the applied view of the OMMF.

The organization devised multiple KPIs to ensure that both current and predicted performance is accurately measured. Sample KPIs are shown in Table 4.

The KPI calculation in Table 4 was enabled by the drill-down relationship facilitated by the framework components shown in Figure 6.

Framework Element	Description
Strategic theme	Constitutes the key organizational-level strategic drivers that have led to the business transformation and hence the target operating model design
Business context	Consists of key business transformation outcomes that the program is expected to deliver
Business design dimensions	The business design components: customer, product/service, channel, process, information, technology, organization, people, and location
Business design dimensional classification or hierarchy	Defines the classification method or hierarchy across which information/data will be organized such that both data split and data rollup across the hierarchy result in logical business information
Business design KPIs	Key KPIs that accurately measure the current and predicted state of the target BOM. They are defined in two segments, current and predictive: 1. **Current KPIs** – represent the "as-is" state of the operations 2. **Predictive KPIs** – are diagnostic in nature and predict certain occurrences that may happen in future

Table 1 – Level 1 OMMF elements described.

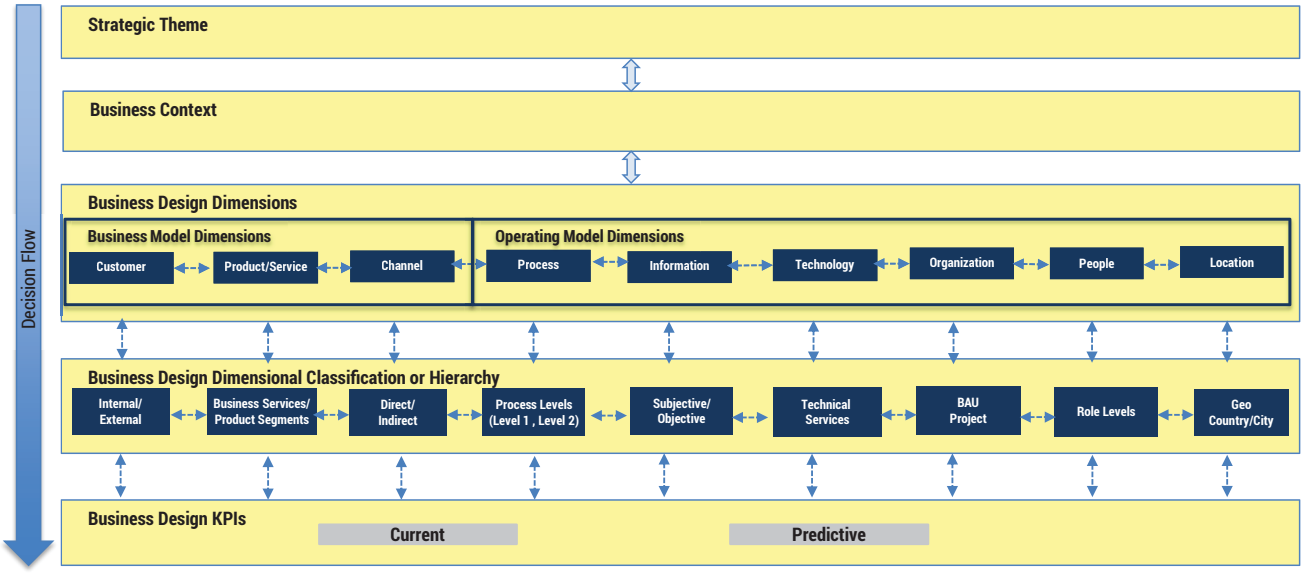

Figure 3 – A Level 2 view of the OMMF.

Level 2 Business Design Dimension	Dimensional Classification or Hierarchy	Classification or Hierarchy Definition
Customer	Internal or External	**Internal** — any entity that is a part of the organization or an employee to whom a set of business services is expected to be delivered based on some mutual agreement **External** — any entity or individual to whom the organization as a whole delivers business services or products under legally binding agreements
Product/Service	Business Service or Product Segment	**Business Services** — any function performed by the organization to deliver a defined package of outputs under an agreement **Product Segment** — logical grouping of products that share common attributes
Channel	Direct or Indirect	**Direct** — a mechanism or a platform through which an organization sells its products or services to the customer without any intermediary **Indirect** — a mechanism or a platform though which an organization sells its products or services to the customer via intermediaries or resellers
Process	Process Levels	Process is a sequence of activities executed to achieve a defined outcome. It can be classified as: **Level 1** — specific process activities that collectively represent a business scenario, or **Level 2** — specific tasks or procedures that collectively map to one specific Level 1 activity
Information	Subjective or Objective	**Subjective** — all information that the decision maker/knowledge worker believes to be relevant[1] **Objective** — all information that is actually relevant to fulfilling their respective tasks[2]
Technology	Technical Service	Any IT service that underpins a business service
People	Role Levels	**Role Levels** — as defined by a standard skills or competency model (e.g., Skills Framework for the Information Age [SFIA]) and deployed in the organization

Note: Table 2 excludes the organization and location business design dimensions, as they are self-explanatory.

[1]Winter, Robert, and Bernhard Strauch. "Demand-Driven Information Requirements Analysis in Data Warehousing." *Proceedings of the 36th Hawaii International Conference on System Sciences*. IEEE, 2002 (https://pdfs.semanticscholar.org/b374/1e1d6c2f283366fad1d504f2bda22b7493b8.pdf).

[2]Winter and Strauch (see 1).

Table 2 — A description of the business design dimensional classification or hierarchy.

Operating Model Component	Information Requirement
Process	• Identify all the new business and IT processes required to support the target IT operating model. • Identify all the existing business and IT processes that require minor change vs. end-to-end redesign or redefinition. • Determine all the new roles participating in the new or redefined processes and ensure the RACI matrix is clearly defined. • Provide training to all the roles participating in the new or redesigned processes. • Ensure all process controls are accurately defined, executed, and appropriately managed. • Institutionalize process performance and control mechanisms to ensure process effectiveness.
Information	• Identify all new information components required to support process execution and decision making. • Thoroughly assess changes to the existing information components. • Understand and define each element of the information lifecycle (typical elements are: create, transmit, consume, archive, and dispose). • Ensure that a governance mechanism is in place to support the information lifecycle. • Define and implement new information policies, if required. • Evaluate and amend existing information policies, if required. • Map all master and transactional data to new information components. • Ensure that the data management strategy is approved and implemented for all new data components.
Technology	• Accurately baseline the current IT landscape (both application and infrastructure). • Identify changes to IT applications and tools. • Develop an integrated strategy that merges process, information, and technology requirements and ensures that technology changes are delivered within the approved budget. • Ensure all impacted IT vendors are governed and managed appropriately within legal constraints.
Location	• Ensure all the impacted locations are considered for the operating model design. • Ensure other operating model components have incorporated location-specific constraints and assumptions in their target state.
People	• Clearly define and document accountability and responsibility for all the impacted roles or new roles. • Ensure accountability and responsibility are understood by the people who will play the new roles. • Ensure that all the individuals who will play the new roles are properly trained. • Ensure an HR impact assessment is done and implementation strategy is defined. (This is done by HR in close collaboration with senior leaders.) • Assess impacts to skills and competencies and update the roles per the competency framework. • Define role-based KPIs and ensure that they are periodically measured.
Organization	• Regularly review the implemented organization structure to make sure that it aligns with the organization goals and continues to deliver the expected results. • Partner with HR to periodically analyze the overall people count in the organization structure to make sure that it aligns with the approved transformation business case.

Table 3 — Information requirements for each operating model dimension.

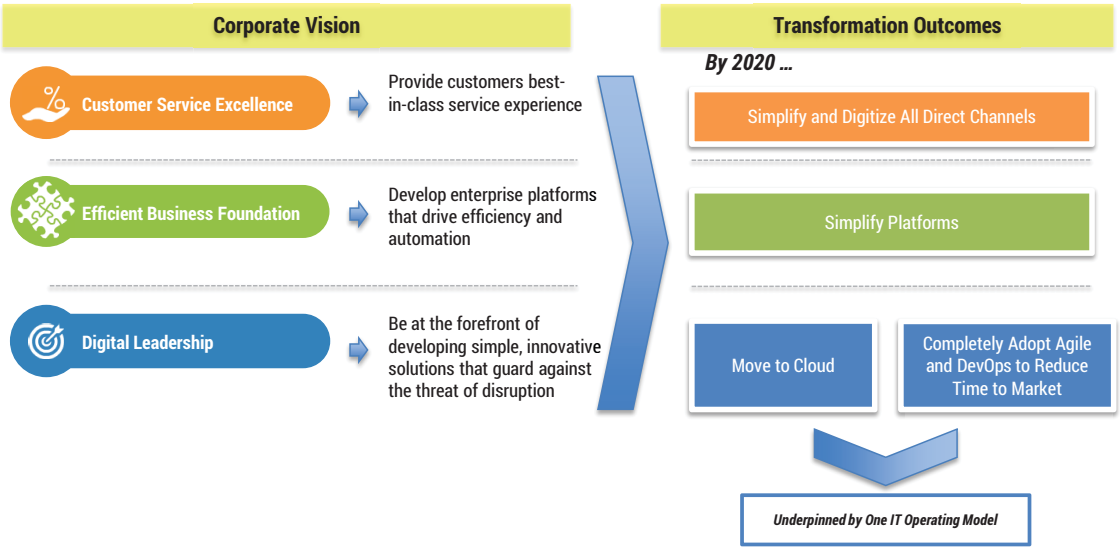

Figure 4 — Corporate vision and expected transformation outcomes.

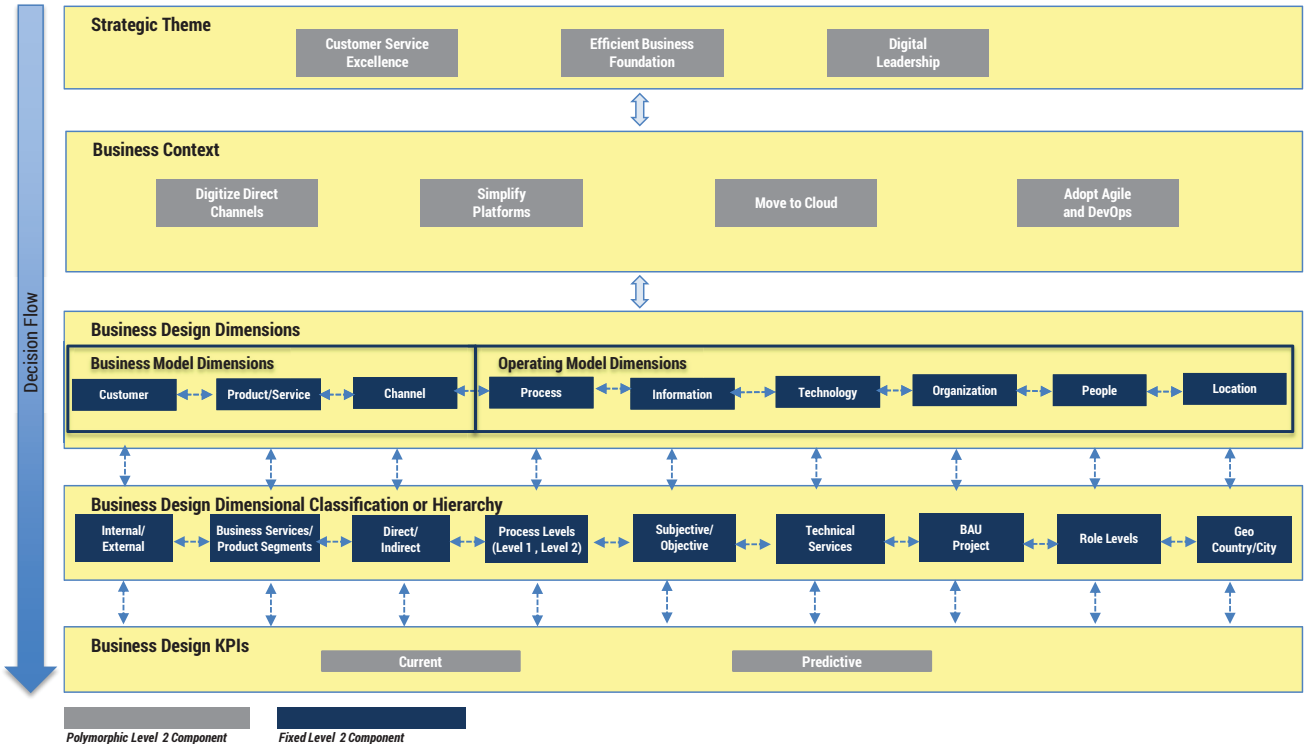

Figure 5 — The OMMF (Level 2 View), applied.

Conclusion

Once a military doctrine, the concept of information superiority is finding greater usage in the business world. For business executives, nothing is more precious than accurate information and its measurability, which enables them to make concrete decisions. By providing an ability to measure different facets of a business operating model against a dynamic transformation baseline, the Operating Model Measurement Framework helps in achieving:

- Greater strategic alignment
- Simplified decision making
- Greater operational efficiency and effectiveness

KPI Type	Metric/Measure Name	Metric/KPI	Metric Significance
Current	Critical applications migrated to new platform (cloud) per application supported	(Number of business-critical applications migrated to hybrid cloud)/(Total number of applications identified for migrations)	Metric measures the cloud adoption rate and subsequent business and technology service maturity as directed by the adopted vision of digital leadership and transformation outcome of move to cloud.
Predictive	Budgetary gap in process definition	(Sanctioned budget for defining all new processes identified)/(Projected budget required to define new process and update existing processes)	Metric measures the budgetary discrepancy in redefining the new processes and updating the existing processes against projected budget.

Table 4 — Sample KPIs.

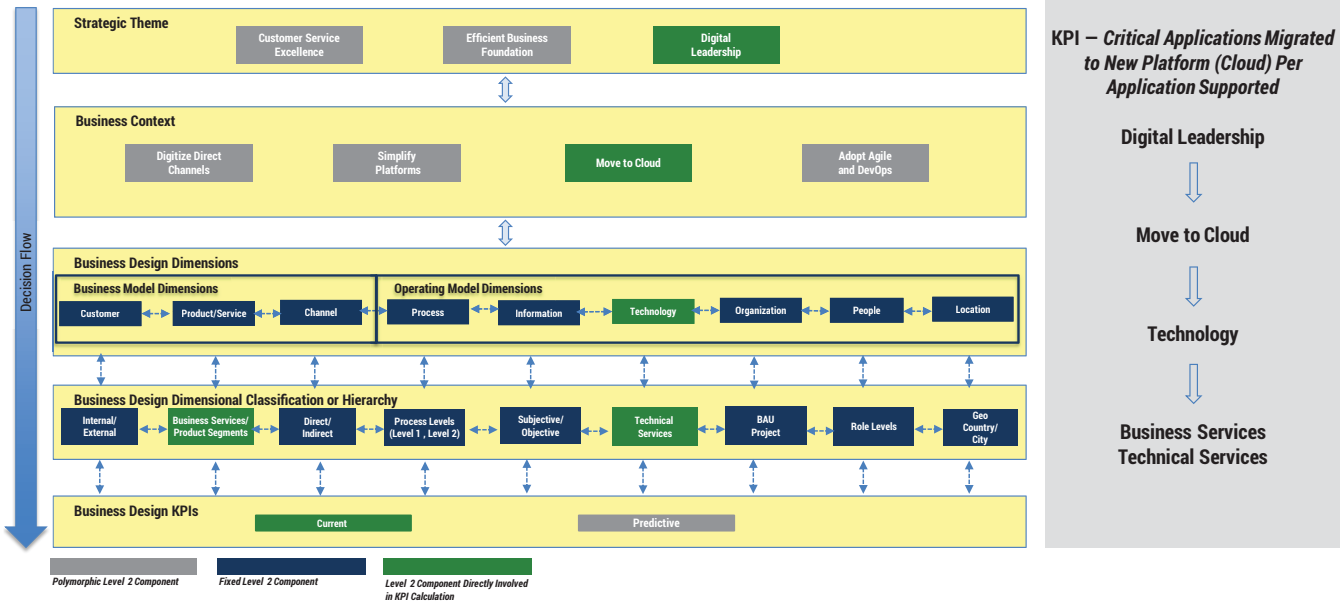

Figure 6 — The OMMF (Level 2 View): drill-down relationship between framework components.

- Increased agility
- Tighter environmental synergies
- Rapid transformation delivery

By supporting executives in making accurate, fact-based decisions, the OMMF can play a role in realizing information superiority.

Endnotes

[1]Joint Chiefs of Staff. "Joint Publication 3-13, Information Operations." Defense Technical Information Center, 27 November 2012 (www.dtic.mil/doctrine/new_pubs/jp3_13.pdf).

[2]Strassmann, Paul. "Governance: The New IS Agenda." *Computerworld*, Vol. 29, No. 9, 27 February 1995 (www.strassmann.com/pubs/computerworld/governance.shtml).

[3]Osterwalder, Alexander, and Yves Pigneur. *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. John Wiley & Sons, 2010.

[4]Picot, Arnold, Ralf Reichwald, and Rolf T. Wigand. *Die Grenzenlose Unternehmung*. 2nd edition. Gabler, 1996.

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