

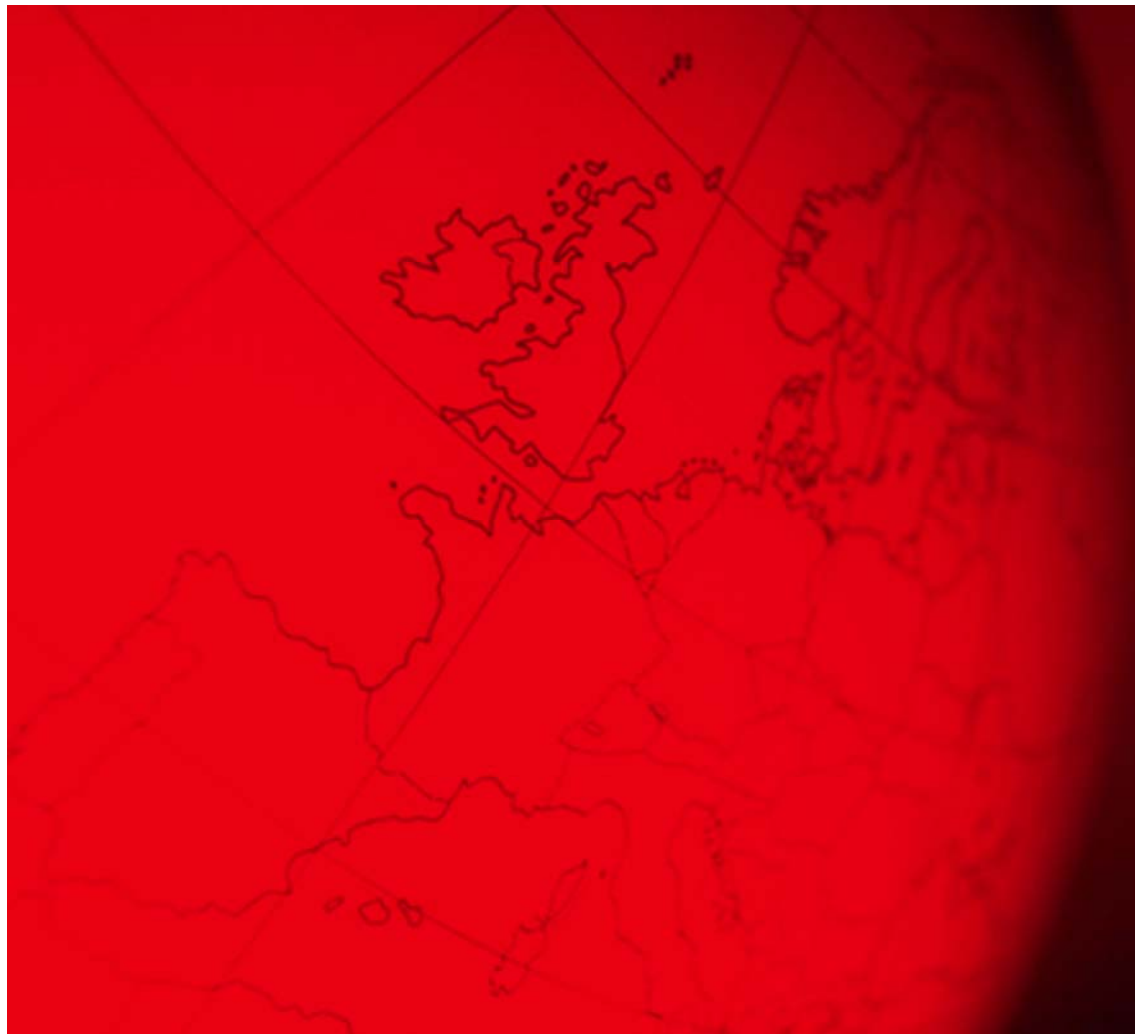
NUCLEUS
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GUIDEBOOK

MEASURING THE HALF LIFE OF DATA



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THE BOTTOM LINE

The ability to process and analyze data continues to become cheaper and more rapid. However, the proliferation of internal and external data leaves decision makers challenged in how to devote finite resources to exploit actionable data. Nucleus found the scientific concept of half life can also be applied to data to measure both its initial and diminishing value, and to plan a data management strategy reflective of that value. The half life of data depends not on industry or data source but on four factors impacting the way companies manage their products' lifecycles.

THE SITUATION

Much has been written about business agility, mostly in terms of manufacturing processes, and companies have been encouraged to benchmark their performance against the performance of their closest competitors. It has historically been assumed that best practices for building agility into business processes were tightly tied to vertical industry requirements and operating models. However, Nucleus has found that best practices in the ways companies access and use data today are often not linked to vertical industries. Instead, they are aligned to the tempo of the company's decision-making processes and the time horizons over which those decisions are implemented. In fact, overachievers are often those that shift the tempo of the traditional decisions of their industry:

- In 1980, CNN challenged the traditional production schedules and sourcing habits of recognized media outlets by identifying a new demand opportunity, 24-hour news, and using stringers and less-produced live product to run circles around leading broadcasters.
- In the early 2000s, Mueller, Inc. deployed dashboards to give both managers and general employees greater visibility into how their performance and trends in operations impacted customer satisfaction on a day-to-day basis. Over time, process improvements largely driven by the visibility from the business analytics enabled Mueller to increase revenue per person by 50 percent, so the company could remain profitable despite an economic downturn while competitors failed.
- In 2010, the Oracle America's Cup team focused on real-time data throughout the race rather than just predictive modeling of design inputs. Crew members receive data updates every half-second via wrist devices, changing the tempo of team decision making and ultimately devolving responsibility down to individual crew members instead of the navigator.
- In 2010, UPC Cablecom changed the way it measured customer demand from ad-hoc quarterly surveys to near real-time activity-based interaction with customers, reducing customer churn by 30 percent in the first 12 months.

These are but a few examples of how companies in different industries have changed their tempo of data capture and analysis to gain significant competitive advantage. They also show that organizations should anticipate the need, as in the case of Mueller, for a data strategy that can support operational, tactical, and sometimes strategic decision making. However, there is no trait of any of these stories that makes them industry specific. Today at the core all companies are manufacturers of some type. They build, sell, and deliver some kind of product to customers – whether that product is a financial service, television program, or prefabricated metal building. The difference in agility and the value of rapid access to relevant and trusted business data depends not on the type of industry but on the characteristics of the decision-making horizons required to deliver differentiated products to the market.

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In looking at the valuation of business data, Nucleus found four key factors that impacted the value of rapid access to data:

- The type of product a company delivers largely determines whether it focuses on tactical, strategic, or operational decision making.
- The average value of business data varies significantly based on whether that data is used to make tactical, strategic, or operational decisions.
- The value of retaining and analyzing historical data for predictive and future planning purposes also varies significantly based on whether that data will be primarily used for tactical, strategic, or operational decisions.
- Most companies will need to be tactical, strategic, and operational in their decision making cadence at different times depending on their product mix, product life cycle, and market conditions. This creates a need for an information architecture that is flexible enough to support all three cadences.

The value of data diminishes based on the cadence of decisions. Decision tempos are tactical (driving process changes in near real time), operational (driving changes that take days or weeks to implement), or strategic (driving changes that become part of a quarterly or longer planning and implementation process). The concept of half life, with diminishing value curves based on a company's decision tempo, can be used to help companies measure the impact of prioritizing their data management and analytics investments.

THE HALF LIFE OF DATA

The subjective measurement of the value of business data can be broadly defined using the scientific concept of half-life. Radioactive materials diminish in volume over time at

different rates based on their characteristics. Just as radioactive matter diminishes in volume over time, the value of data diminishes over time.

Data starts with high initial value and that value diminishes over time at different rates based on when and how it contributes to business decision making. The rate of decline in data value can be correlated to the tempo of its use in a company's decision making processes, which range from tactical to operational to strategic.

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In evaluating the potential value of accelerating access to data, organizations first need to identify where they fit on the curve and whether they are more tactical, operational, or strategic.

ARE YOU TACTICAL, OPERATIONAL, OR STRATEGIC?

There are four primary influencers that determine whether a company's decision making tempo is primarily tactical, strategic, or operational: its suppliers, its market, its level of regulation, and its dependence on intellectual property. These influences apply equally whether the product is a manufactured good or a service.

SUPPLIERS

The more substitutes a company can access, the more tactical it can be. Companies with multiple sources of substitutes across the supply chain can make rapid tactical decisions based on near-real-time information:

- A traditional manufacturer Nucleus analyzed, for example, was able to move to just-in-time delivery processing by accelerating the sales team's access to shop floor and inventory actuals – driving down costs while increasing sales. The data warehousing manager said, *"Data can expire in terms of its usefulness. For us, it's only useful at the point it's consumed and acted upon. Once the decision point is passed the data is no longer relevant and margin gets left on the table. The numbers could be useful in the next situation, but it has less usefulness."*
- Likewise, an airline that invests in sophisticated scheduling analytics can be more cost-effective and competitive in the way it services customers by rapidly pinpointing opportunities for scheduling improvements.
- Another agricultural firm that Nucleus analyzed found that because online retail practices gave it the ability to spot check commodity prices from different suppliers, its expectation of the half life of data dropped significantly.
- Nucleus analyzed a media firm that relied on numerous external and internal inputs to support its production schedule, including previous advertising spends, availability of

substitutes, weather conditions, and other factors to make product decisions on an hourly basis – meaning the average half life of its data was approximately 30 minutes.

MARKET

The broader the market opportunity, the more possibilities a company has to benefit from improving tactical decision making. This particularly applies to sales opportunities where breadth (the number of prospects a company can touch) and repeatability (how often they can touch them) can be rethought.

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For example, one media buying company Nucleus analyzed found that the ability to rapidly process vast data sets on social network activity enabled it to rapidly make decisions that optimized its clients' advertising spend. With new data coming in at microseconds, Nucleus estimated that the average half-life of the company's data was fewer than 3 seconds.

A clothing manufacturer in a highly commoditized market estimated that the half life of its inventory position data was approximately 10 minutes, saying, "*When you're looking at inventory positions printing reports is irrelevant – I could print you a report but by the time it's printed it's obsolete. Real-time information in screen format that people can look at and react to is critical because people are ordering by the minute.*" For this manufacturer, the need to constantly update information highlights its tactical mode.

REGULATION

More regulated products drive more strategic organizational planning and decision making. For example, a pharmaceutical development firm may greatly value the integration of new data, but that data's initial value, particularly in areas like clinical trials, is limited on its own and may grow over time as it is correlated with other data. A more regulated firm is less able to make rapid changes in its supply chain without repercussions, so although bringing in new data rapidly is important, that data's half life is longer than a less-regulated organization. Life sciences companies will also exhibit needs for tactical reporting as they commercialize products and manage regulatory reporting requirements for commercial activities.

INTELLECTUAL PROPERTY

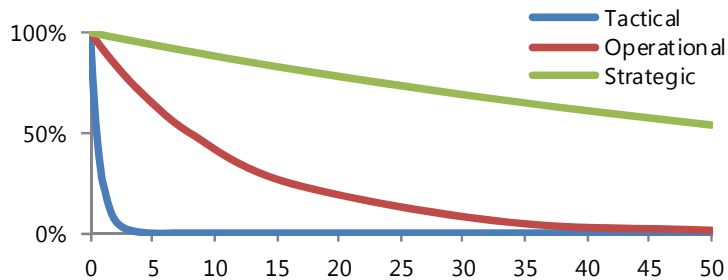
The more products rely on a company's own intellectual property and research and development as a differentiator, the more strategic the company's use of data for decision making. New product developments and innovation pipelines are multi-year commitments that are often driven by deep market research and historical trend analysis. This has created significant challenges for companies increasingly pressured to understand

targeted customer demand so they can reclaim their research and development costs before lower-cost competitors can enter.

TYPICAL HALF-LIFE MODELS

Based on its analysis of 47 companies and their decision making tempos, Nucleus has identified some general assumptions companies can use to evaluate the potential half-life of data sets available to them so they can prioritize data warehousing and analytics investments to maximize value of data with a short half life for tactical decision making while continuing to capture data in a meaningful way for future forecasting and strategic planning.

THE HALF LIFE OF DATA



TACTICAL DECISION MAKERS

In its analysis of tactical decision makers, Nucleus found that the average half life of data is 30 minutes or less. In actuality, the half life of tactical decision makers had a high standard deviation, with some companies self-reporting a half life of as little as six seconds. On average, only 30 percent of remaining data has value after that point for predictive analytics and future planning.

OPERATIONAL DECISION MAKERS

For operational decision makers, Nucleus found the half life of data averaged 8 hours, with a range of one hour to 48 hours. On average, 30 to 70 percent of remaining data has value after that point for predictive analytics and future planning.

STRATEGIC DECISION MAKERS

Companies that Nucleus identified as strategic in tempo made more measured decisions that tended to have longer time horizons. For these companies, the value of data tapered off at much slower rate, showing an average half life of 56 hours. On average, Nucleus

found that more than 70 percent of remaining data has value after that point for predictive analytics and future planning.

PRACTICAL IMPLICATIONS: BLENDED DECISION RATES

In reality no company makes only one type of decisions. In reviewing the data, Nucleus found that companies that self-identified as tactical in reality spent 75 percent of their time making tactical decisions and the rest of their time on operational and strategic decisions. For example, a consumer packaged goods company might be mostly tactical in the way it made supply chain decisions, but a product manager at that company would tend toward more operational and strategic decisions about future product development. The chart below is based on Nucleus's analysis of 47 companies and the estimated time spent on each type of decision by company type. These numbers are the average and companies may experience different results but this table represents a reasonable guideline for each type of company.

BLENDED ESTIMATES

Type of company	Share of time spent		
	Making tactical decisions	Making operational decisions	Making strategic decisions
Tactical	75%	15%	10%
Operational	30%	50%	20%
Strategic	10%	30%	60%

THE COST OF INEFFICIENT ACCESS TO DATA

Nucleus further evaluated these companies based on their efficiency in accessing and analyzing data for decision making, putting them in five categories from poor (which had very inefficient access to data) to excellent (which had nearly perfectly efficient access to data). The time spent searching for and analyzing data for decision making was then evaluated to look at two specific costs: first, the amount of time lost in gathering data that was not readily available, and second, the amount of time lost because of hesitation in decision making because decision makers lacked confidence in the information they were using to make a decision.

Enough data to make a precise definition of data efficiency was not possible for all of the 47 companies. In those cases, Nucleus estimated a smooth transition from poor to excellent. In an example of a predominantly tactical company that exhibited poor data efficiency, the total productivity lost associated with searching for data and hesitating in the decision making process amounted to an average of 30 percent. As would be expected, the time loss amounted to an average of 14 percent and 12 percent,

respectively, for operational and strategic companies. Nucleus found that as companies' data gathering and analysis strategies became more efficient, there was a relatively linear drop off in the lost productivity associated with searching and decision making.

BALANCING STRATEGIC AND TACTICAL DECISION NEEDS

Nucleus found that the most successful companies are looking beyond traditional data capture and analytical strategies for competitive differentiation that doesn't just cut costs but accelerates the tempo of decision making. Nucleus found a few other general assumptions to consider:

- All data will become less useful for tactical or operational use as it ages, but that doesn't mean it should be discarded, as predictive analytics advances are making more and more effective forecasting based on historical data possible.
- Some data capture and analysis will always be most cost effective on a batch or ad-hoc basis. Nucleus found that some data that is valuable for tactical use may also be used when historical trending provides clues to seasonal behaviors or more long-term strategic initiatives. Although it won't have an immediate operational impact on sales performance or cost management, it should be integrated to data warehouses because it can be used for better long-term decision making. Examples of these types of data would be focus group data on aging products, historical seasonal or weather-driven behaviors, supply chain data on products with a long lead time, and data that will drive a change in products that only change on an annual or biannual basis.
- The most important factor is not just capturing data but rapidly putting it into digestible models for general decision makers, not data analysts. Time to market is not about building the data warehouse, but putting real-time data and analytical tools into the hands of tactical decision makers across the supply chain.
- Although the traditional data warehouse is not dead, companies that don't seek more agile alternatives will be trapped in strategic mode and unable to compete in the long-term against competitors that embrace data strategies that drive tactical decision making down across the supply chain while being flexible enough to support all three decision making tempos.
- Companies relying on their industry peers for best practices will be challenged in reforming their thinking to determine the right questions to ask about data efficiency.

CONCLUSION

Making the best decisions quickly is key to success in any industry. However, even the best managers often have to make decisions today based on assumptions or limited, incorrect, or outdated data. When they do, they incur additional costs, either through tactical investments in data gathering, hesitation, or rework if an initial decision proves wrong. Those costs are greatest for companies with tactical decision making tempos but

impact all organizations that must change their cadence of decision making in certain situations.

Managers are increasingly questioning IT's limitations for a number of reasons:

- Consumer experience with search, and application adoption, are more broadly communicated than ever before — and IT's limitations are increasingly questioned.
- IT vendors' marketing investments in big data and analytical intelligence make potential opportunities for improvements in the information management difficult to ignore but challenging to evaluate given the pace of change and the hype factors around big data.
- Without a way to prioritize data collection and analysis priorities, both business and IT managers are challenged to identify the right opportunities to maximize returns on their investment in decision tempo acceleration.
- Many companies will require information support for operational, tactical, and strategic decision making, each of which drive unique response requirements of the data foundation. This dynamic suggests that the ideal foundation is flexible enough to immediately respond to the changing decision tempos driven by changing requirements over time.

The concept of half life, with diminishing value curves based on real world-examples, can provide a reasonable structure for organizations of all decision tempos to comparatively measure their data's initial and diminishing value, prioritize their data management investments based on that value, and drive decision-making conversations across IT and management. Using Nucleus Research m46 - *Measuring the value of data*, May 2012, as well as their company's predominant decision making tempo (tactical, operational, or strategic) and level of data efficiency, companies can evaluate the impact of the half life of data on their overall decision-making productivity and optimize their data capture and analysis strategies to maximize returns on their investment in both technology and labor.