MIS Quarterly Executive

Volume 23 | Issue 2 Article 7

June 2024

MISQE Insight on Leveraging Computability for Competitive Advantage

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The computability of functions, firms, even whole markets is accelerating. I define computability as the level of knowledge of the item multiplied by its level of digitization. In this MISQE Insight, I explain the law of computability, demonstrate how computability creates competitive advantage and provide advice for senior leaders on how they can increase the computability of their firm for increased value creation and capture.

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Introductory Comments

Tasks, functions, firms, even whole markets are becoming more computable at an accelerating rate, and thereby changing the core economics of functions within firms or even of entire firms. This MISQE Insight introduces and builds on the idea of the law of computability and analyzes its practical implications for executives as well as providing suggested actions.[1] Simply stated, the law of computability is the product of two factors: 1) the level of knowledge of the phenomenon of interest multiplied by 2) the level of digitization of the phenomenon of interest, giving the computability of that phenomenon. (See the formula below.) The wave of AI and Generative AI (GenAI) is speeding up the computability of the world—and those firms that can harness the benefits of relative computability can win competitively in the marketplace. In this MISQE Insight, I explain how computability changes the nature of competition and organizations. The summary message is: Firms that have a computability edge on activities that create value for customers win in the marketplace by creating growth and keeping more profitable customers. CIOs can help their organizations make the link between these new technologies and the productivity of their firms.

The computability formula:

F(Computability of [X]) = level of knowledge of [X] x level of digitization of [X]

Where level of knowledge = progression from categorization to correlation to causation, and level of digitization = progression from visual/verbal description to data categorization to functional twin.

1 I first wrote about the idea of the law of computability in *'Law of Computability' Powers the Bionic Era*, Insurance Thought Leadership, August 23, 2020, available at https://www.insurancethoughtleadership.com/emerging-technologies/law-computability-powers-bionic-era.

Why We Should Care About Computability

By computability[2] I mean a deterministic or probabilistic process (usually mathematical) that takes inputs and transforms them to create an output in a reasonable time that is judged by humans to be "worth it." Here's an example of making a task more computable. If you are a student of the U.S. property casualty insurance market, you know that computationally intensive insurers like Progressive Corporation tend to have a lower loss ratio and a lower expense ratio, which means their combined ratio is often under 100%. As Warren Buffet pointed out, if you have a combined ratio under 100% you are buying dollars at a discount, and all the money Progressive makes in investments is free and clear except for taxes. Computability is at the core of Buffet's empire, exemplified by his investment in GEICO (The Government Employees Insurance Company), a U.S. auto insurance company. Relating Progressive to the law of computability, it was an early adopter of computers. While others were thinking in terms of risk categorization (the first level of knowledge)—e.g., we don't insure motorcycles—Progressive was thinking in terms of correlation (the second level of knowledge)—e.g., if you are a 60-year-old male who is buying a $15,000 Harley Davidson who drives it only at the weekends, you are probably a good risk. Other firms have tried to catch up, but Progressive continues to push forward with its computability edge.

In 1997, Progressive was the first firm to launch usage-based car insurance under the brand Snapshot. Snapshot customers share their driving data with Progressive and are given a lower rate if they drive safely and don't drive many miles. Moreover, Progressive gains a more detailed model of customer's driving behavior. It has now tracked over a billion miles of driving behavior digitally, enabling it to develop better correlation and causation models and providing it with a computability edge over competitors.

The Game Changing Impact of AI and Generative AI

From one point of view, AI is the art of inventing new analytic techniques and representation schemes to conquer increasingly difficult tasks. When I was doing my doctoral work in the mid 1980s, expert systems (an early form of AI) were all the rage. Expert system methods and tools enabled a deeper codification of expertise through think-aloud-protocol analysis,[3] together with flexible programming tools that allowed for easy programming of the heuristics of experts in a friendly, late-binding computing environment. This dance between algorithmic technique and representation method has always been a key part of problem-solving progress.

Professor Pat Winston, the director of the MIT AI Lab in the 1980s, was on my doctoral thesis committee, and once said, and I'm paraphrasing not quoting, "much of the progress in AI comes from advances in how we represent the task—not just the algorithms." He cited work at the lab that was trying to recognize tanks on the ground from satellite images (the USSR hadn't yet been dismantled and the cold war was still raging, so the need was obvious). If memory serves, the recognition success rate initially was under 20%. But the researcher introduced 16 primitives, which he called a "vertex language," so that software could look for corners, or two parallel lines or two corners together—all configurations of possible parked tanks. By adding these primitives—i.e., augmenting the representation of the problem—the recognition went over 80%.

I see the n-dimensional semantic matrix of GenAI as a profound extension in representation. The transformer engine at the core of these language models provides a brilliant algorithm to navigate and create value from the tokenization of over a trillion words. This breakthrough combination of advances in representation and analysis, along with vast new computational power, has radically enhanced the computability of language, images and much more.

2 I want to acknowledge the amazing work of Stephen Wolfram and his ideas of computability, which have deeply influenced my thinking. Note also that my definition of computability is less rigorous than Turing Computable functions.

3 Ericsson and Simon's masterwork on protocol analysis is still the best guide for this technique. See Ericsson, K. A and Simon, H. A. *Protocol Analysis, Revised Edition*, The MIT Press, 1993.

A good example is the customer service model employed by Jerry,[4] a U.S. company valued at $450 million with over five million customers that serves as a one stop-shop for car owners to get insurance and refinancing. Jerry receives over 200,000 messages a month from customers. With such a high volume, the company struggled to respond to customer queries within 24 hours, let alone minutes or seconds. Jerry installed a GenAI solution in May 2023, and within a month it moved from having humans answering only 54% of customer inquiries within 24 hours or less to the AI solution answering over 96% of inquiries within 30 seconds. Jerry estimates this transformation will produce $4 million in annual savings. By making its customer service function more computable, Jerry was able to save operating costs, provide better service and change the scalability of its business. Moreover, Jerry believes it can handle millions more customers without increasing staff numbers.

GenAI Provides Opportunities for a Computability Edge

Today, the most fertile place for IT leaders to look for a computability edge is in the domain of GenAI. I have grown increasingly unsatisfied with the characterization of "knowledge work," which is too broad a definition for our purposes because both a carpenter and a lawyer are knowledge workers, but GenAI increases dramatically the computability of the lawyer's job. So, we created a new category of work that we call "WINS," standing for the creation or improvement of Words, Images, Numbers and Sounds. This category includes software, movies, ECG analysis etc. In our recent *Harvard Business Review* article,[5] we noted that firms whose cost base is dominated by WINS workers (such as software engineers, consultants, accountants and so on), and that are already highly digitized, will be the ones "in the crucible of radical transformation" (see Figure 1). Their tasks, functions and organization will likely be transformed through increased computability in the next 36 to 60 months.

Focus GenAI Efforts on Operations and Innovation

I believe that the most important near-term area to focus GenAI efforts on is to seek out operating leverage in high WINS tasks. For example, marketing, customer service, software development, sales support, training and recruiting, are all areas where any firm can improve operations and reduce costs. Consider a prototypical profit and loss statement for an organization with a physical product and that looks for WINS leverage points across different functions. Deploying GenAI would mean that requests for proposals can be rapidly analyzed and responded to, sales people can have interactive training and sales simulations with difficult customers, and training is easier, faster and more responsive to the learner's needs. There are cases and studies demonstrating significant productivity improvements for each of these different functions. If you apply these improvements to each function in our prototypical profit and loss statement, you will likely almost double the profitability of the firm. I know it's only an arithmetic exercise at this point, but it is the role of management to assess the potential gains from deploying GenAI and make them real. Figure 2 illustrates potential savings line by line in a prototypical profit and loss statement suggesting a 10% improvement in each, which is conservative given the measured impact in case studies or research papers that have rigorously measured the impact of GenAI.

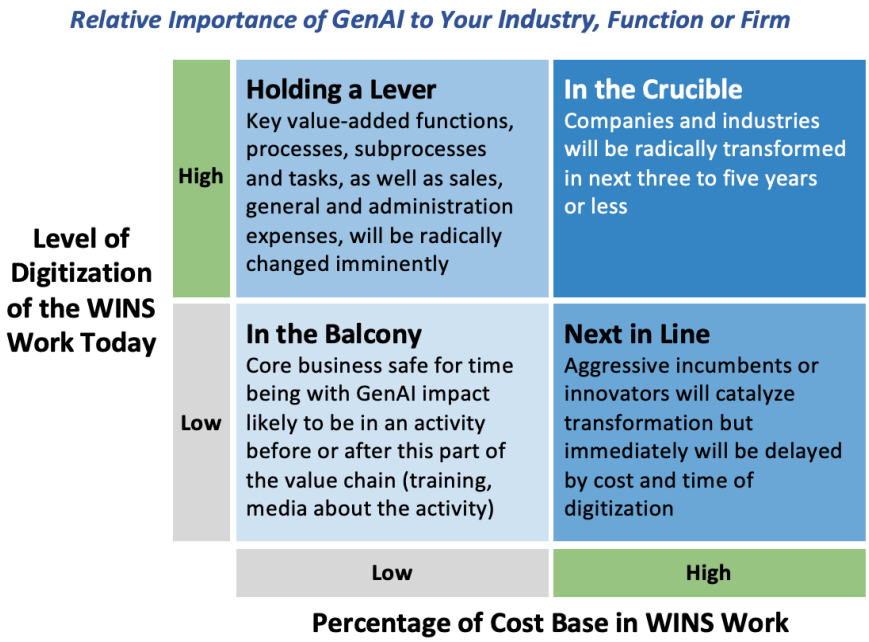
I believe this is why the more aggressive firms like JP Morgan Chase, McDonalds, Walmart, Epic and Saudi Aramco have all invested significantly in GenAI even though it's only been in the popular mindset for about 18 months. Every firm has the opportunity to increase individual productivity—because GenAI is like a power tool for knowledge work. No one would ever put in an electrical outlet today without a power drill; so too with WINS work. The computability of language that the large language models have delivered means a wholesale change in how WINS work gets done.

There are several examples of GenAI enabling innovation. Coca-Cola has used a combination of GenAI and a contest format to source a fantastic

4 For details of Jerry's approach, see Baier, P., DeLallo, D. and Sviokla, J. J. "Your Organization Isn't Designed to Work with GenAI," *Harvard Business Review*, February 26, 2024, available at https://hbr.org/2024/02/your-organization-isnt-designed-to-work-with-genai.

5 Baier, P., Hexter, J. and Sviokla, J. J. "Where Should Your Company Start with GenAI?" *Harvard Business Review*, September 11, 2023, available at https://hbr.org/2023/09/where-should-your-company-start-with-genai.

Figure: 1 Impact of GenAI on Firms



new initiative called "Create Real Magic." Creators are given access to some digital assets, and they submit their GenAI-enabled work to Coca-Cola for evaluation. Thirty are then invited to speak and explore their concept with the firm, which has chosen and launched several of the concepts. With GenAI, language and pictures have become much more computable and the quality of the interaction and ideas has improved.

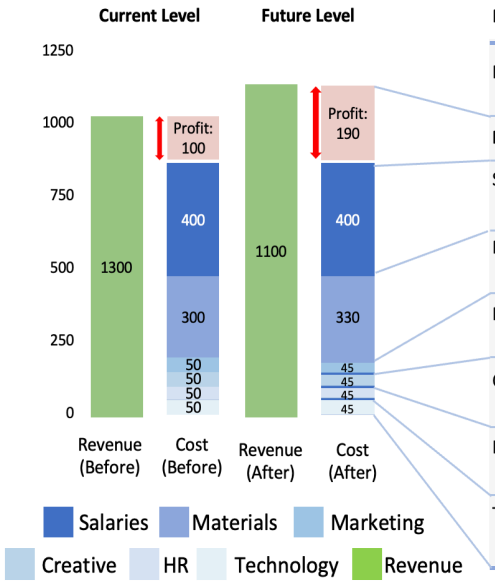
There have also been advances in other areas, such as drug discovery. For example, InSilico has drastically reduced the cycle time for exploring a new treatment from 10 years to four or even three. It used GenAI tools to help it discover the possible treatment, plan testing and get it all the way through to human trials. Moderna and IBM have teamed up to create a new generative AI model for drug discovery that takes the search space from just under 800,000 to over 1,100,000,000—an incredible increase of 1,000 times! We don't yet know if the molecules discovered by the new method will deliver 1,000 times the value, but the possible innovation space is much larger.

Other Significant AI-Enabled Computability Opportunities

With the new GenAI models, which are fast moving toward multimodal models (including text, images, sounds, moving pictures and so on), there are many areas to explore. According to an IDC study,[6] 80% to 90% of all the data saved in an organization is unstructured. These new matrix algorithms enable data, which may only be descriptive or locked into one data schema today, to be used for a model of correlation or even causation (i.e., moving up the levels of knowledge, and thus increasing computability). The early data on applying these new models to WINS tasks shows between 15% and over 50%

6 Goodwin, P. *Tape and Cloud: Solving Storage Problems in the Zettabyte Era of Data*, IDC White Paper, June 2019, available at https://www.lto.org/wp-content/uploads/2019/06/Tape-and-Cloud-Solving-Storage-Problems-in-the-Zettabyte-Era.pdf.

Figure 2: Large Potential Profit Increase from Deploying GenAI



P&L Item	Examples of GenAI-Enabled Improvements
Revenue	Faster turnaround of new proposals, support of inside sales, thought leadership support (10% increase)
Profit Before Taxes	**90% potential increase in profitability**
Salaries	Cheaper sourcing of talent, better leverage of labor (same labor handling 10% more
Materials	(No change in productivity—just increase proportionally to revenue)
Marketing	Generation of content, images, customized messages (10% improvement)
Creative	Creation of unique pictures, videos, scripts (10% improvement)
HR	Faster, more accurate job postings, performance reviews policies, onboarding (10% improvement)
Technology	Generation of first-version software and of testing code (10% improvement)

labor productivity improvement,[7] along with an increase in average quality and much faster onboarding of new talent.

Automation and Computation Compared

In 1950, Otis installed the first fully automatic elevator in the Atlantic Refining building in Dallas, and by the 1970s the vast majority of elevators had become automated. Before then, elevator operators were an essential part of urban life; when the 15,000 members of the elevator's union went on strike, as they did in New York City in 1945,[8] commerce ground to a halt and cost the city an estimated $100,000,000. When that task was automated, not computed, it radically improved labor productivity and eliminated the role.

Compare this example to GE's Power by Hour[9] service for its jet engines. There are dozens of sensors in every modern GE jet engine, and the GE Applied Statistics Lab knows more about the engine on the wing in flight than the pilots of the aircraft do. Not only does GE's approach allow automation, but it makes the engines more computable; so much so that their level of computability not only allows GE to price differently, but it also helps it save many millions of dollars in assets. For example, after the widespread adoption of Power by Hour, the United Airlines/GE repair facility in Fiji reduced its store of CF6 GE engines, costing tens of millions of dollars apiece to service, used for the extended range 747s flying long pan-Pacific routes. In this case, computability led to higher levels of service, strategic pricing flexibility and fewer assets for the same or better levels of service.

7 See: 1) Noy, S. and Zhang, W. "Experimental evidence on the productivity effects of generative artificial intelligence," *Science* (8:6654), pp. 187-192, available at https://www.science.org/doi/10.1126/science.adh2586; 2) Brynjolfsson, E., Danielle Li, D. and Raymond L. R. *Generative AI at Work*, National Bureau of Economic Research, April and November 2023, available at https://www.nber.org/papers/w31161; and 3) Dell'Acqua, F., McFowland, E. III, Mollick, E. et al *Navigating the Jagged Technological Frontier: Field Experimental Evidence of the Effects of AI on Knowledge Worker Productivity and Quality*, Harvard Business School, Working Paper 24-013, September 22, 2023, available at https://www.hbs.edu/ris/Publication%20Files/24-013_d9b45b68-9e74-42d6-a1c6-c72fb70c7282.pdf.

8 *Elevator Strikes*, Wikipedia, available at https://en.wikipedia.org/wiki/Elevator_Strikes.

9 *Power By The Hour (Pbh) Market Definition and Segments*, Business Research Company, available at https://www.thebusinessresearchcompany.com/report/power-by-the-hour-pbh-global-market-report.

GenAI Plus Computability Heralds Next Generation Firms

The next wave, just beginning now, is the addition of intelligence through computable models of customer need and behavior along with the product or service. For example, all major data/information players have announced a robot to help customers navigate their services—from Thomson Reuters to S&P. Major car firms have committed to including a much more capable robot in the next generation of in-car experience than the thin intelligence of Siri or Alexa. Both BMW and Mercedes have announced intentions in this area. In the future, every single service and product will have its own onboard robot for explanation, help and service. These firms will likely have very high labor productivity because so much of their value chain will be computable. Some GenAI-native firms have unbelievable labor productivity. For example, Midjourney, Inc., which offers a generative artificial intelligence program and service to create images and has over $300 million in revenue, is reported to have per-employee revenue of $3 million or more—well above the $1.2 million or so generated by a Goldman Sachs employee. Computability creates massive leverage, and a firm's CIO can link these emerging technologies to business value and a new learning curve that, in time, can create a competitive barrier.

Preparing for the GenAI/ Computability Era

The origins of computability go back to 1938 when Church and Turing postulated (simultaneously but separately) the Church-Turing Hypothesis, a logical machine that could run any algorithm ever conceived of. Computability today means that organizations not only learn faster and digitize faster, but can also reallocate decision rights based on context and competence. There's not a financial services firm today that does not rely on computability to drive its trading operations and inform its strategy when it comes to any trading or investing. The trend to dependence on computability will only grow.

Understanding computability is like understanding quality, because computability opportunities are scattered in every corner of the firm, from legal to long-tail products. This means senior managers must have a top-down and bottom-up strategy for exploiting computability. The top-down initiative is to make sure everyone is trained in the basics of GenAI and computability, and has skills to use the ever-growing number of powerful tools. There also needs to be a bottom-up movement to apply these capabilities at the individual and team level.

This top-down, bottom-up approach is typical of any successful change management approach. But leaders need to keep two additional things in mind for GenAI/computability endeavors. For the first time, people will be in dialogue with their machines—and that requires an openness to creating processes that involve human-machine dialogs. Second, organizations need to understand that they don't need to have full computability to win in the marketplace; they only need relative computability on things that matter. If you can correlate when others can only categorize (think back to the Progressive example), you win. If you have a causal model when competitors only have correlations, you win, and so on.

Concluding Comments

In conclusion, I believe that GenAI and AI are general purpose technologies. Computability has led the way for competitive advantage in many fields since the dawn of the computer, the Internet, smartphones and now AI. Those firms that see the learning, leverage and innovation opportunities in this domain will win. To paraphrase F. Scott Fitzgerald's quote about bankruptcy in *The Great Gatsby*, those who don't adopt a computability strategy will lose slowly at first then all of a sudden.

About the Authors

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John Sviokla (john@gaiinsights.com) is chairman and co-founder of GAI Insights, a firm dedicated to helping organizations, communities and individuals understand and ethically get value from AI and GenAI. He is also an executive fellow at Harvard Business School, a widely published author,

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