The convergence of convergence*

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When people hear the word*convergence*, they usually think of the harmonious blending of two or more technologies. A good example is the mobile phone, which has evolved to the point where it includes not only basic components such as a camera, audio/video recorder, calendar and web browser, but also an assortment of apps thatdo everything from warning you of an impending weather event to measuringhow many calories you're burning to whether or not you might have sleep apnea.

At last count, Apple owns over 200 patents for technologies contained in its iPhones.Yet technology convergence is just the tip of the iceberg. If you're not already on board, you need to be gearing up for convergences of multiple trends in science, health, society, government, economics and finance, and many others.

For example, socio-economic convergence includes digital wallets that use not only currency-denominated credit cards from traditional banks, but also block chain-enabled cryptocurrencies such as bitcoin. Chinese internet and technology conglomerate *Tencent* has been leading the way in this area for several years. With its *WeChat* platform you can gather some nearby friends, make a restaurant reservation, order from the menu ahead of time, catch a ride, and get seated with your food and drinks brought to your table immediately upon arrival. And you don't have to wait for someone to bring you the check because everything's paid forin advance.

Much more is on the way, and there's serious money behind it. The USA's National Science Foundation's recently launched a Convergence Accelerator Program, which includes an Open Knowledge Network (OKN). OKN is different from most online communities in that it usesanontology based on *semantic triples* (one concept linked to another via a particular type of association), with provenance and timestamps added. This is a huge step forward in maintaining the veracity and value of sharable knowledge bases.

Domains initially slated for convergence under this program include biomedicine, geoscience, finance, and smart manufacturing. You can learn more about where all of this is headed in the US National Research Council paper: Convergence: Facilitating Transdisciplinary Integration of Life Sciences, Physical Sciences, Engineering, and Beyond.

Systems integration vs. disintegration

Systems integration aims to seamlessly stitch together many different components, whether formulating a highly complex genetically-based cancer treatment protocol, or designing, building, operating and maintaining a large commercial jetliner. As we attempt more of these complex, large-scale integrations, we learn that nondeterministic properties and system behaviors can and often do emerge. Consider the recent case of the Boeing 737MAX aircraft. On paper, it was an efficient, air-worthy design. Yet something went horribly

wrong. The knowledge in the minds of the design engineers which was also embodied in the maneuvering system software was not fully integrated with the knowledge of the human pilots.

To make matters worse, a definite path to recoverywas in-place. But it wasn't obvious to the pilots, who had only a few frantic moments to respond to the dreaded "stick shake" (a haptic interface used to indicate an impending stall) along with conflicting sensor data.

Airbus had a similar disaster in which a response to strong turbulence that worked in the simulator resulted in the tail fin being ripped from an Airbus 300 aircraft, killing all 265 people on board. A few years later, the tail fin was ripped away from an Airbus 310, but with no injuries. These incidents have made people even more mindful of possible similar disasters playing out on a smaller scale but in greater numbers in driverless cars, autonomous drones, etc.

The reality is that the more systems and subsystems we attempt to stitch together, especially when we extend the interfaces into the socio-economic, legal, political and cultural realms, the greater the unpredictability. This is the dark side of convergence. Doctors only have so many cadavers to operate on. Airline pilots can only go through a limited number of hours of simulator training. Insurance companies can cover risks only up to a point while keeping premiums within reach.

But surprises on the upside can and do happen. Let's take a look at how as managers and leaders we might help organizations plan for and achieve greater success through convergence by turning risks into opportunities, and by inspiringbreakthrough innovation.

Where to start

Here's a simple yet powerful guideline to keep in mind: don't even think about what a technology can do *for* you until you first determine what it can do *to* you.Here are three steps to help you not only make that determination, but use it to your advantage.

1. Review and refresh your strategic plan through the lens of convergence. This must go beyond making probability-based predictionsto applying foresight as well.[11]

Take inventory of your current and planned technologies, along with anticipated changes in the social, political, economic, and other environments. Determine the potential positive or negative impact of each major trend, along with an estimate of where each is currently positioned on the traditional "S" curve. Is it in the early buildup, exponential growth, or leveling-off phase?Put together a prioritized list of trends representing the greatest risks and opportunities for your enterprise.

You can do this at a high level by building a matrix for each trend, with impact factors (cost, environmental, legal, political, reputation, etc.) as rows, and the various stakeholders (investors, customers, community, etc.) as columns. Since the number of cells in the matrix can quickly grow to a hundred or more, prioritize them by using a color code such as "green" to indicate strong capability and opportunity, and "red" to indicate a stern warning that you

[11] https://www.kmworld.com/Articles/Columns/The-Future-of-the-Future/Critical-capacities-for-navigating-in-turbulent-times-124616.aspx

need to avoid or mitigate the risk. Step back and look at where the reds and greens might cluster together to form either a potentially dangerous or opportunistic convergence.

2. Develop scenarios for each major convergence you've identified. Look at past history – what worked, what didn't work, and *why*. Use the scenarios to envision a series of development roadmaps to the future, and select those that best fit your organization's capacity and appetite for risk vs. opportunity.

3. Re-balance your strategy along with the resources needed to execute. Be sure to apply enterprise of the future principles and practices such as anticipatory business intelligence, Theory of Change, agile methods, and engagement of all stakeholders.[12]

Pay particular attention to the *HCI*: the all-important point where humans and computers intersect. Not just the *human-computer interface*, but the even more important HCI: *human-convergence implications*. One example is the social amplification of technology, where a seemingly innocent decision gets blown out of proportion as it goes viral across the social media sphere.

Don't forget that you're dealing with complex, adaptive systems. But it need not be overly complicated. There are simple metrics you can use to measure and manage the degree of complexity. The McCabe cyclomatic complexity metric typically used in software and communication networks can be applied to almost any complex system, including the human physiology and biological ecosystems.[13]

It's easy to get overwhelmed by all the moving parts. These three steps will help you get above the noise and see the big picture for what it truly represents: creating opportunity in a world in which others only see danger.

*This article is based on an article of the same authors on the subject published in KM World July 2019

[12] Arthur J. Murray, *Building the Enterprise of the Future: co-creating and delivering extraordinary value in an eight-billion-mind world*, Applied Knowledge Sciences Press, 2018.

[13] Thomas McCabe,*A Complexity Measure*, IEEE Transactions on Software Engineering (4): 308–320 (December 1976).