SIEMENS DIGITAL INDUSTRIES SOFTWARE

Simcenter: the heartbeat of the digital twin

Adopting a digital mindset to deliver and scale future innovative solutions

Executive summary
The American researcher and professor, Brene Brown, stated, “Vulnerability is the birthplace of innovation, creativity and change.” Tomorrow’s organizations will achieve consistent solutions by applying an empathy-rich, servant-leadership model, seamlessly integrating data, collaborating on ideas and speeding decision-making, building a foundation of trust. Engineering innovation is used here as a backdrop for highlighting how Simcenter™ software enables the creation of customer-centric consumer goods by using a comprehensive digital twin that delivers correct, consistent and fast solutions. Digital empathy is achieved when you can fully replicate the physical experience.

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Abstract

I have had the opportunity to review a few critical attributes of Simcenter and by relating that to my global experience across industries and companies that are undergoing digital transformations, I see how this built-in engineering excellence supports creating a digital mindset. We will need that in the future to competitively, consistently and rapidly deliver the right solutions.

The digital movement continues to add to the pressures and the promises. I believe organizations that invest in innovative technologies will thrive and sustain their operational excellence, enhance responsiveness to personalized quality and meet ever-changing customers' expectations. They will have figured out the critical ingredient in their success.

Looking closely at Simcenter capabilities creates confidence in its market leadership because it provides a flexible, open and scalable portfolio of the best predictive simulation and test applications that support customers at every step in their engineering/product excellence journey.

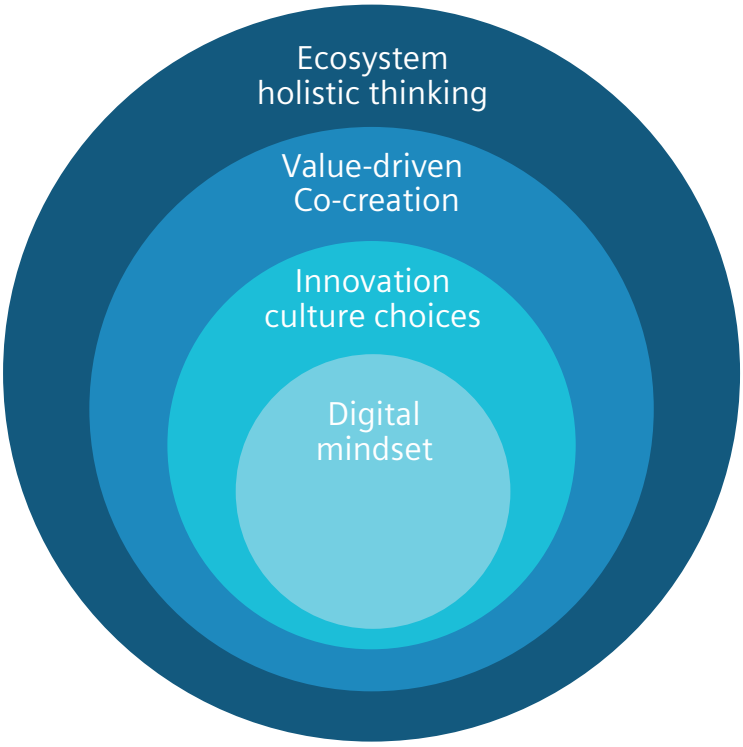

Figure 1. Scaling innovation delivery.

Innovation enables future success

To set the stage for Simcenter, part of the Xcelerator™ portfolio, the comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software, I am going to use the seven critical dimensions for project management innovation scaling that I contributed to *Innovation Project Management* published by Wiley (Harold Kerzner (2019), 14-16).

The role of executive leadership – To scale innovation, organizations are finding it is critical to make the right decisions starting with executive leadership. Fast decision-making requires working groups that take the right degree of risk every day to ensure that organizations of the future possess the critical insights for the executive team. Using Simcenter provides an integrated simulation and testing solutions to predict product performance while allowing easy downstream and upstream collaboration. By utilizing a few levers, executives can create an environment for effective stakeholder engagement that is embedded in managing enterprise risks across the ecosystem.

Achieving the right balance between alignment and autonomy – Innovation requires a good degree of autonomy. Using Simcenter creates an advantageous environment for creativity, the flow of ideas and making sure companies produce the innovations needed to meet top consumer priorities.

Simcenter consistently facilitates rapid decision-making and provides rich insights to leaders and executives.

The key becomes finding the right balance between the necessary product quality and safety standards versus addressing what's uniquely valuable to the consumer in terms of customization and choices. This alignment should be just enough to ensure the right focus for achieving the anticipated benefits.

The development of the innovation culture – Without the safety and space that are needed to innovate, organizations will not enable the right amount of innovation. The culture to support innovation must be adaptive. No longer would a classic view of the slow buildup of engineering and development phases of a given product be suitable for generating and testing the best ideas properly and rapidly. Many more iterations are needed. Fail-fast-and-learn will become part of the new DNA of most organizations. The learning culture that Simcenter creates is priceless. This appetite for risk taking and learning fast via generated insights uniquely positions organizations to be highly responsive to customer needs.

Simcenter instills a new sense of trust in innovative cultures by accelerating learning that results from insights.

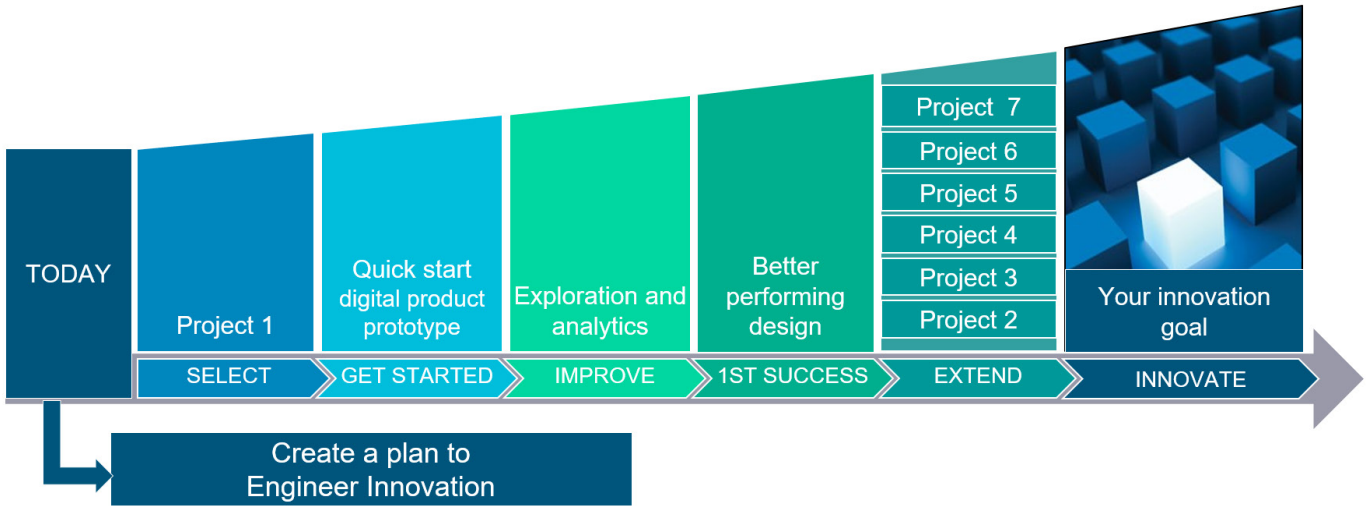

Figure 2. Engineer Innovation Roadmap.

When I review the Engineer Innovation Roadmap in figure 2, I find the next innovation scaling dimension: **The use of projects as innovation labs**. This affirms that more than any time in history, projects will become the best opportunity to innovate. The improve stage in the roadmap highlights the agility needed to apply insights and analytics in simulation as a way to strengthen feedback, transparency and create the right avenues for improvement. By nature, projects are designed to change the business. The right organizational focus will look at projects as labs to test innovation in all dimensions. Using Simcenter facilitates the necessary and rapid experimentation with outcomes, innovating the use of data analytics in making collaborative and more effective decisions. This simulation capability is critical to designing the fitting degree of engineering empathy while engaging with customers, often to gain critical feedback to achieve creative outcomes.

The development of future engineering innovation competencies - To eliminate ambiguity arising out of emerging product trends such as sophistication and personalization, companies must enhance the modeling of product complexity using advanced tools while facilitating collaboration. Such enhancement provides the means to explore the full spectrum of possibilities faster; for instance, the adoption of an integrated simulation and test approach that can deliver technology, efficiency and elegance to products such as in the whitegoods industry. Amongst these top priorities will be the role of a coach. When we look at Simcenter as an element of digital twin threads, we benefit from allowing autonomy, conducting fast experimentation, trying new ideas and executing more dynamically. We do this while we coach, guide, integrate and connect the dots and create opportunities for the enhanced and continual exchange and execution of innovative solution ideas.

The need to block off time to think again – Blocking off daily calendar time to reflect on insights learned directly by combining the virtual and physical strengthens the innovative muscles that future organizations need to plan and execute differently. Without the ability to be holistic again and seeing things from the right distance via continual reflection, we would struggle to enable new innovative habits and the associated flow of creativity in our work.

You know how it is today. You get a model from the design team with an analysis request. You are expected to deliver results on a tight deadline. You work to clean the geometry and prepare the simulations. Then you run simulations to validate performance on your computer and get back with results, build a report and send it back. Then at the design review you learn that the design has been changed and you have been using outdated data, then you have to re-do your work. There is a better way. This is where the comprehensive digital twin comes in.

The new ways of working – When the silos between design, engineering and manufacturing are dismantled, we collaborate differently. For innovation to flow, this new way of working needs to be like a river. It must flow smoothly. To realize ideas, there must be no barriers; so it is key to encourage fast execution and seamless access to an integrated design, simulation and testing platform. This requires us to adapt and continually welcome changes to the way we work as we welcome solutions infused by machine intelligence and use artificial intelligence (AI) and the Internet of Things (IoT) to connect us in ways we never thought possible.

As innovation continues to drive the priorities in the C-suite, these seven critical dimensions for scaling innovation show us a natural cascading effect from the intelligent integrated solutions that guide the executive leadership and consumers' decisions. When we gain the Simcenter benefits of executing faster while getting things done innovatively, we find new opportunities for designing, improving and consistently delivering an excellent combination of technology, sustainability and elegance that wins consumer's hearts.

The edge of value-driven co-creation

When I look at how the digital twin brings solutions to life quickly, I am reminded of how combining simulation and testing solutions can create flexibility and collaboration, allowing for mass customization and decision-making autonomy. I see it as design thinking in action. Using Simcenter to strengthen our ability to sense and respond to consumer and user needs immediately and accurately takes on a higher strategic role for functional performance and insights into achieving value.

The key to transforming business model scalability is a digital mindset that uses simulation to handle complexity, ensure decision confidence and stay integrated across the product lifecycle. I still remember the many times we used to fall into the trap of going through a traditional waterfall development of a solution and getting inordinately focused and excited about delivering within the classic constraints of time, cost, scope and even quality; yet we'd find ourselves failing in delivering what really matters. This is where experimenting and incremental delivery powered by simulation shines.

When I review the recent quick pulse check conducted by Rainer Brehm, chief executive officer (CEO), Factory Automation by Siemens, regarding the importance of simulation and automation in business success, the roughly 1,300 votes reflected the following pattern in figure 3.

We can see that a majority of this sample survey believe in the importance of simulation. One could understand how closely these respondents weigh the possibility of achieving quality and value faster, which ultimately minimizes product recalls and adds elegance to solutions.

Customers are satisfied when products meet the needs that matter most to them, such as silent operation, energy efficiency, rapid cooling or heating and vibration control. Similarly, there are other performance attributes that could be achieved by applying this digital twin approach. Using Simcenter enables the realization of a comprehensive digital twin that captures real life multi-attribute performances in one place.

How relevant do you see the need to deal with the topic of simulation for automation in your business?

Figure 3. The value of simulation and automation survey.

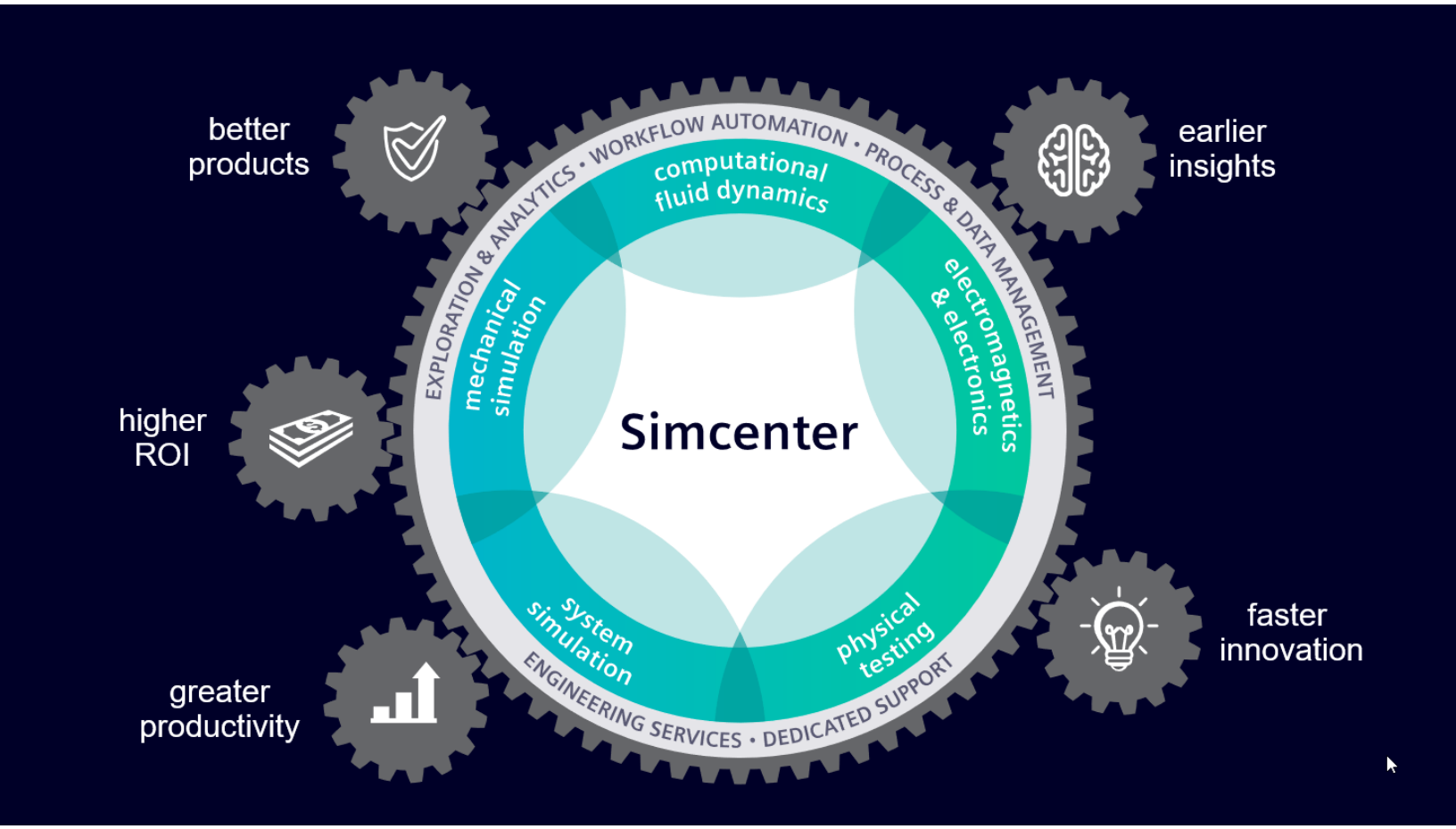

Figure 4. High level capture of Simcenter benefits.

When I look at the goals of many critical business model changes, such as driving faster-to-market targets or achieving green sustainability metrics, I see Simcenter excellence in the engineering benefits highlighted in figure 4 as critical enablers for solutions success. Not only does this link to the strategic role of innovation highlighted above, but it also talks to the timeliness associated with how early insights play a direct role in effective productivity and product quality while achieving the best impact on the bottom line. I have a saying that "projects fail before they start." What contributes most to that failure is a bad start based on incomplete or faulty understanding of context. Simcenter fills this critical gap and creates a dynamic culture that crosses many potential silos, such as the virtual and physical ones.

The Simcenter portfolio, a key part of Xcelerator, covers the full breadth of methodologies for engineering, covering system simulation, mechanical simulation, computational fluid dynamics (CFD) simulation, electromagnetics and electronics cooling and physical testing. These domains of engineering are augmented with design exploration and analytics, workflow automation and simulation process and data management.

Holistic thinking

Whether we talk about consumer goods and retail or the white goods industries, executives are missing a fundamental part of their toolbox when early on they don't use simulation and testing to drive the right decisions by exploring multiple solutions and strengthening fast knowledge transfer. When we start to look at the integrated lifecycle aspect of the holistic digital twin, we see how using Simcenter drives intelligence and effectiveness of decisions while managing biases and expediting innovation.

Having the portfolio view shown in figure 4 directly speaks to the agenda of the C-suite for creating an integrated enterprise-based way of working. As we transform and unlock the potential of digital solutions, the four ingredients to engineer innovation shown in the figure represent what a culture by design could potentially look like. Culture represents what the business does and Simcenter allows us to drive the balance needed between confident decisions, rich insights, speed and connectedness. This accelerates agile scaling.

This holistic thinking highlights the need for the right infrastructure and innovation-centered culture to achieve the most benefits from Simcenter. Tomorrow's organizations are learning entities, and achieving the potential of a comprehensive digital twin with openness, transparency and visualization is central to their success.

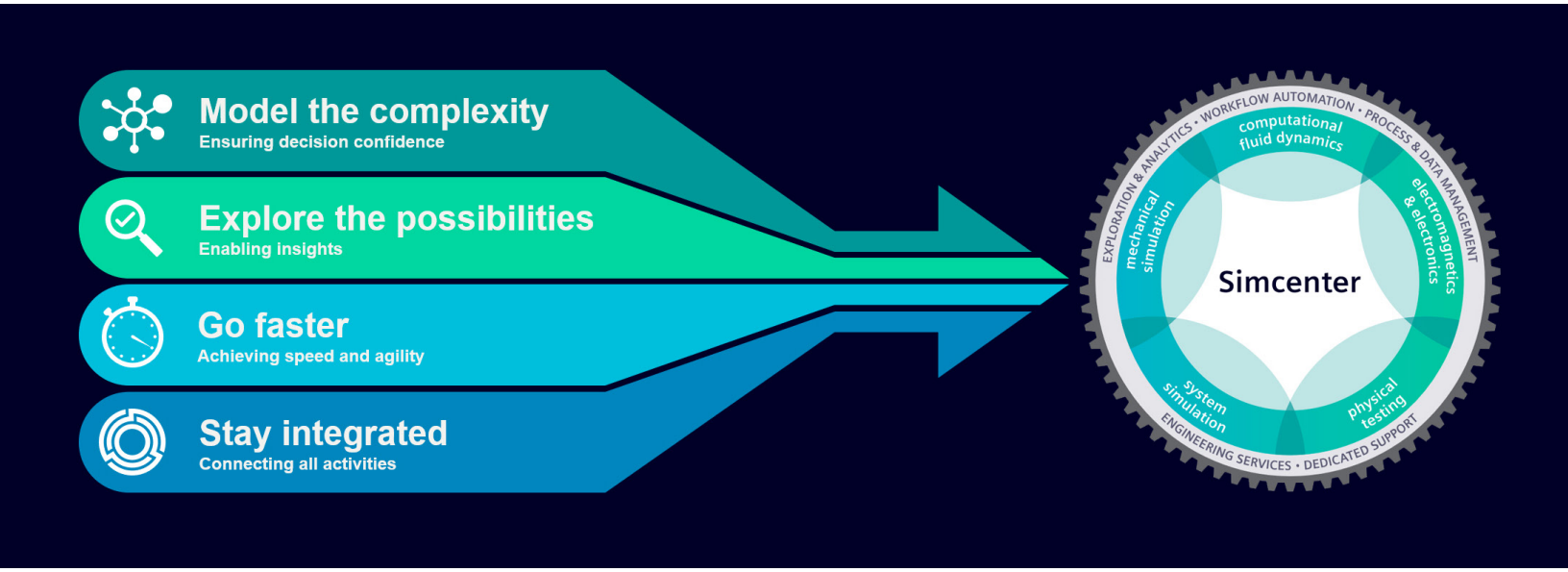

Figure 5. Simcenter enables holistic thinking.

Looking at the future of the digital mindset

Tony Hemmelgarn, the CEO of Siemens Digital Industries Software, recently said, "It is the power of Siemens' simulation and automation that has enabled the 'race against time.'"

As highlighted in the seven dimensions of innovation summarized in figure 6, I can see us succeed in scaling innovative solutions when we put the right focus on creativity and flow of ideas while making it safe and easy to experiment and collaborate. Business outcomes are achieved when we make improving sensing, responding and rapidly engaging with customers as a normal way of working. Continually adapting in the most transparent way possible will empower the digital mindset potential and directly correlate to a much higher success rate for digital transformation investments.

In addition, Siemens advocates an "open" philosophy that accommodates third-party products to interact. This enables a collaborative environment for companies that prefer to keep certain parts of the product development process while adopting new technology. Otherwise, companies are faced with an all-or-nothing proposal which is very difficult to accept.

Another critical differentiator is the fact that Siemens enables their customers the flexibility to deploy solutions in the way that best fits their needs. Essentially, companies can deploy solutions On-premise, on the Cloud or a combination of those, etc. The key that supports all of this is Xcelerator Cloud, which enables companies to decide what works best for them.

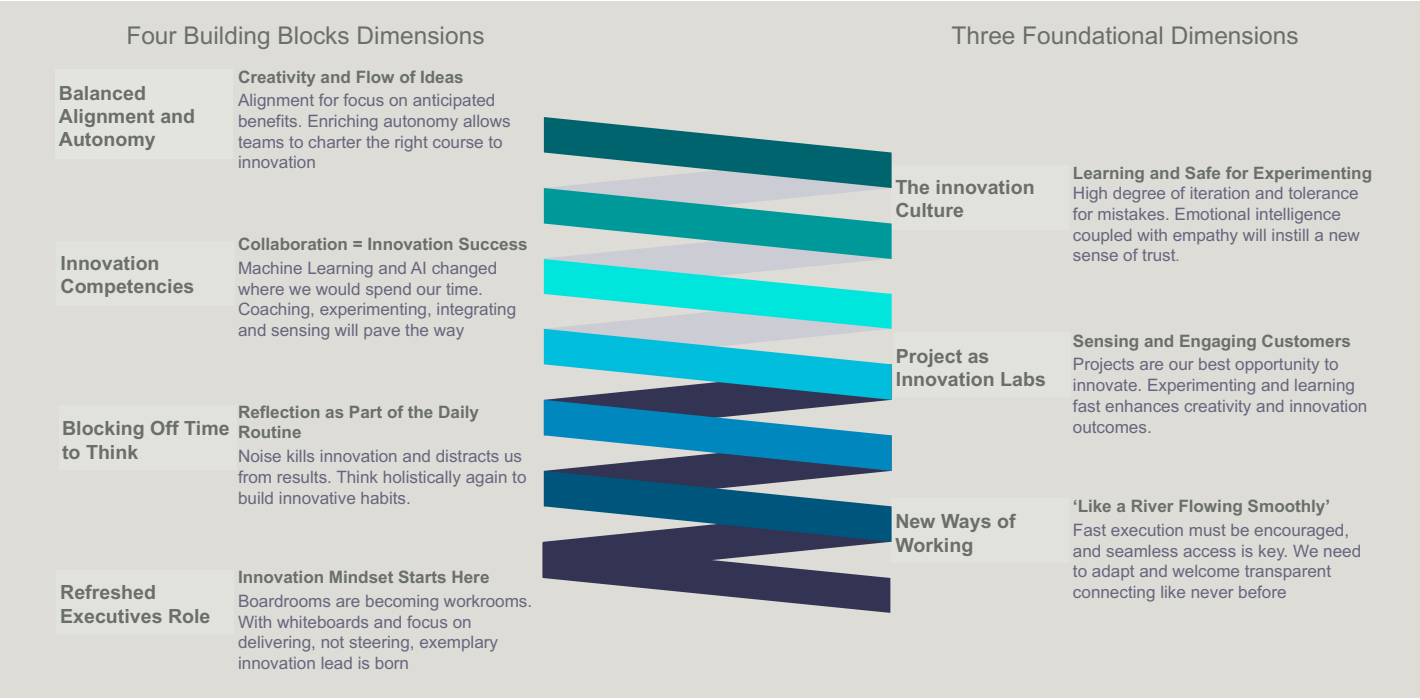

Figure 6. Seven critical dimensions for scaling innovation.

Conclusion

Thanks to the comprehensive digital twin, one can mirror the physical world, enable bidirectional communication and keep stakeholders connected to the products throughout their lifecycle. This makes effective and fast testing possible, saving time and money and boosting the quality of products and services.

Digitalizing the entire process chain allows the creation of a seamless end-to-end flow: from designing and testing the machines all the way to passing on valuable and timely insights to customers. The digital mindset achieves innovation scaling when people and technology come together to resolve many of tomorrow's challenges.

When I consider Simcenter as the beating heart of the digital twin, I am reminded that in order to accelerate innovation over an entire solution life-cycle, a critical ingredient will remain centered on the degree of empathy that we can create around the context and with customer aspirations.

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About Siemens Digital Industries Software

Siemens Digital Industries Software is driving transformation to enable a digital enterprise where engineering, manufacturing and electronics design meet tomorrow. Xcelerator, the comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software, helps companies of all sizes create and leverage a comprehensive digital twin that provides organizations with new insights, opportunities and levels of automation to drive innovation. For more information on Siemens Digital Industries Software products and services, visit siemens.com/software or follow us on LinkedIn, Twitter, Facebook and Instagram. Siemens Digital Industries Software – Where today meets tomorrow.

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