Revisiting Globalization: Technology, Jobs, Trade

SMT Prospects & Perspectives

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In 2004, I wrote a column titled "Globalization: Technology, Jobs, Trade," which was published in the July issue of *SMT Magazine*. Amid the protracted and roller-coaster trade uncertainty between the U.S. and China, and the renewed debate on globalization, I thought a revisit on the topic was befitting. What has changed over the last 15 years? Where do we stand today? Is globalization undergoing a retreat or reverse course?

Globalization was mind-boggling; the more I examined the subject, the more I revealed its complexity and intricacy. Many punchlines were thrown around by various media organizations. But one thing was clear; we were facing a new world characterized by change, uncertainty, flexibility, choice, and opportunity. Today, we are facing yet another new world with no shortage of opinions, views, and positions. Nonetheless, some fundamental principles and primary underlying issues behind the technology, jobs, and trade remain the same.

For example, productivity and the competitiveness-driven environment continue to be relentless. For a given function, the productivity level continues to rise sharply, and the number of employees required to perform an equivalent function continues to decline. To produce more, with less manpower and lower cost, is every operation's goal. The ever-increasing demand for innovation incessantly intensifies. The shortage of engineering talent and the inadequacy in the pipeline of engineering

talent in the U.S. continues. The job market and the shift of the job market in nature, geography, and number on the global scale are profoundly in flux. Then, the "eternal" trade issue with China has moved to the front and center of inside-the-beltway debates, government policies, and business strategies.

Today's new world is not only entrenched with trade issues but also driven by shiny, new technological megatrends—namely artificial intelligence (AI), the internet of things (IoT), 5G, and the associated infrastructure and supply chain. The national unemployment rate reached 3.7%, the lowest since 1969, which is good news. Another major change in the global landscape during the last 15 years is that China became the largest exporter in 2013, replacing the United States.

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The United States maintains its status as the largest consumer in the world. History tells us that the open market and free trade are prerequisites for global competitiveness. In this politically sensitive time, the challenge for the private sector and the U.S. Government's policymaking is how to cultivate and formulate a virtuous cycle to feed the dynamic economy.

Our industry has been affected broadly as well as specifically by the globalization in technology, jobs, and trade. To my recollection, our industry was one of the frontiers (if not the first pioneer) heavily engaged in outsourcing and offshoring that commenced in the 1990s. As we move into ever-advanced manufacturing using IoT and AI and as the miniaturized dimensions drive all sectors of the industry, where is the global competition going? And where does globalization stand?

The intertwined relationship between technology, jobs, and trade is a grand challenge to all of us. Diverse and opposing views about globalization and how it relates to technology, jobs, and trade are abundant as reflected through a plethora of data, manifold surveys, and growing debates. Whether globalization would undergo a retreat or reverse course, and how our industry is going to embrace changes, is important to future success. The critical thought-process goes to the diligent assessment of the core competencies and the sorting out of the priority in functions or products or services. The critical thinking also goes to what to embrace and how to leverage the new, almighty megatrends, such as how IoT is going to drive both product design and operation.

AI hardware, working hand-in-hand with software systems, plays a critical part in this increasingly recognized AI era. The future factory is driven by the nascent Industry 4.0, and its ultimate goal is to achieve the intelligence-teaming manufacturing operating in a truly integrated manner. In manufacturing, such as surface mount, agility, flexibility, reliability, efficiency, and desirable cost are the names of the game.

Many operations or organizations are embracing (or bracing for) President Trump's next tweets. But we can control our destiny by controlling only what we can. We need to understand what Industry 4.0 is, what it requires, and what it takes to achieve it. I believe that is going to take the next several years to develop [1].

Moving forward, to enable AI and its building blocks—machine learning, deep learning, and neural networks—new chips (processor and memory), architectures, and system designs that deliver low power consumption, high performance, low latency, high bandwidth, and fast speed will be the ever-demanding targets. Only by fulfilling these criteria can inference processing in lieu of traditional program processing be achieved [2].

It's equally demanding to assess and optimize for different types of AI workloads—a business

case to justify building custom-designed chips (e.g., application-specific integrated circuit [ASIC]). The increased workload and almost unlimited processing power propelled by machine learning and AI will require the most advanced semiconductors, packaging approaches, and manufacturing prowess ever developed to reach the interconnect density that is and will be needed. Its timely materialization hinges on the successful effort of our industry.

Conclusion

Not being different from the past 15 years, in the long run, innovation and competitiveness are key to a constantly rejuvenating economy. Only a strong economy retains and creates jobs. In an uncertain time that inevitably "picks" winners and losers in the race of new technologies—and one that is filled with debate about trade policies and business strategies—an open mind to pragmatically assess the practical options is the way to go. In closing, this leads me to borrow the following quote from F. Scott Fitzgerald:

"The test of a first-rate intelligence is the ability to hold two opposing ideas in the mind at the same time, and still retain the ability to function," effectively, swiftly, and timely. **SMT007**

References

1. Dr. Jennie S. Hwang, "The Fourth Industrial Revolution (Industry 4.0): Intelligent Manufacturing," *SMT Magazine,* July 2016.
2. Dr. Jennie S. Hwang, "Artificial Intelligence: Super-exciting, Ultra-competitive," *SMT007 Magazine,* September 2018.

Upcoming Presentation

I will present a lecture on "Electronics Reliability: Role of Intermetallics" at IPC APEX EXPO on February 3, 2020, in San Diego, California.

Dr. Jennie S. Hwang—an international businesswoman and speaker, and business and technology advisor—is a pioneer and long-standing contributor to electronics hardware manufacturing as well as to the environment-friendly lead-free electronics implementation. Among her many awards and honors, she was inducted to the International Hall of Fame—Women in Technology, elected to the National Academy of Engineering, an R&D-Stars-to-Watch, and YWCA Achievement Award. Having held senior executive positions with Lockheed Martin Corp., Sherwin Williams Co., SCM Corp, and CEO of International Electronic Materials Corp., she is currently CEO of H-Technologies Group providing business, technology and manufacturing solutions. She is the Chairman of Assessment Board of DoD Army Research Laboratory, serving on Commerce Department's Export Council, National Materials and Manufacturing Board, NIST Assessment Board, Army Science and Technology Board, various national panels/committees, international leadership positions, and the board of Fortune-500 NYSE companies and civic and university boards. She is the author of 500+ publications and several books, and a speaker and author on trade, business, education, and social issues. Her formal education includes four academic degrees as well as the Harvard Business School Executive Program and Columbia University Corporate Governance Program. For more information, please visit www.JennieHwang.com. To read past columns or contact Hwang, click here.