Governing Energy

Titans of the 1940s Today

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Re-watching the 2013 movie, "The Challenger (Disaster)" I was struck by Richard Feynman's response to a comment, that with 2.5 million parts in the Space Shuttle the Presidential Commission on the Space Shuttle Challenger Accident may never find an answer.[i]

> "2.5 million, small potatoes. Really, look I don't know much about space rockets but I know a little about probability; something I developed called ***path integral formulation***—its quantum mechanics. Basically, what it means is you can figure out the probability of something occurring not just when you got 2.5 million events but an infinity of possibilities. Over large, the number of cause will pass for whatever happened to Challenger an explanation can be found. What we doing here if we don't think it's possible?"[ii]

Path Integral Formulation or the sum of all possibilities simply put:

1. Consider all possible paths for quantum particles traveling from one point another including nonlinear paths,
2. Place an "absolute value" type of number for each path and finally,
3. The sum of all possible paths describes the probability of a particle at point B at a given time—"a path integral or sum over histories."[iii]

Clearly, there is more to this quantum mechanics probability theorem than can be stated herein, nor is the expertise of the author and his decades old Bachelor in Physics degree able to address anything but the highest level review of Dr. Feynman's solution.

However, it appears that this construct has merit in our classical physics world of safe operations. As with another 65 year old hypothesis, Requisite Variety, the argument made is that our sophisticated, automated decision making systems MUST be able to address all possible failure paths that a 2.5 million parts or more machine (system) may generate.[iv]

These hypotheses dating back to the time of this author's birth may hold the key to 21st century complex systems management.[v] Moreover, the von Neumann (electronic computing) Architecture, circa 1946 is the basis of the current crop of Smart Devices.[vi]

While constrained by classical or Newtonian physics, massively high performance, economic decision support systems should be able to asymptotically approach Requisite Variety or Path Integral Formulation solutions. Today's managerial and technical systems enable these models.

Unknowable 2.5 million part systems are from a bygone era. Moore's Law is now 50 years old.[vii] Originally applied to semiconductor performance, it has been extended to other technologies and processes.[viii] Other systemic laws apply as well.

Without Moore's Law the number of components and their functions even if advanced (low slope) linearly during the 30 year life of the Space Shuttle of then to the current sophisticated systems would have many more parts and associated functions. With the possible exception of the International Space Station this has not happened.

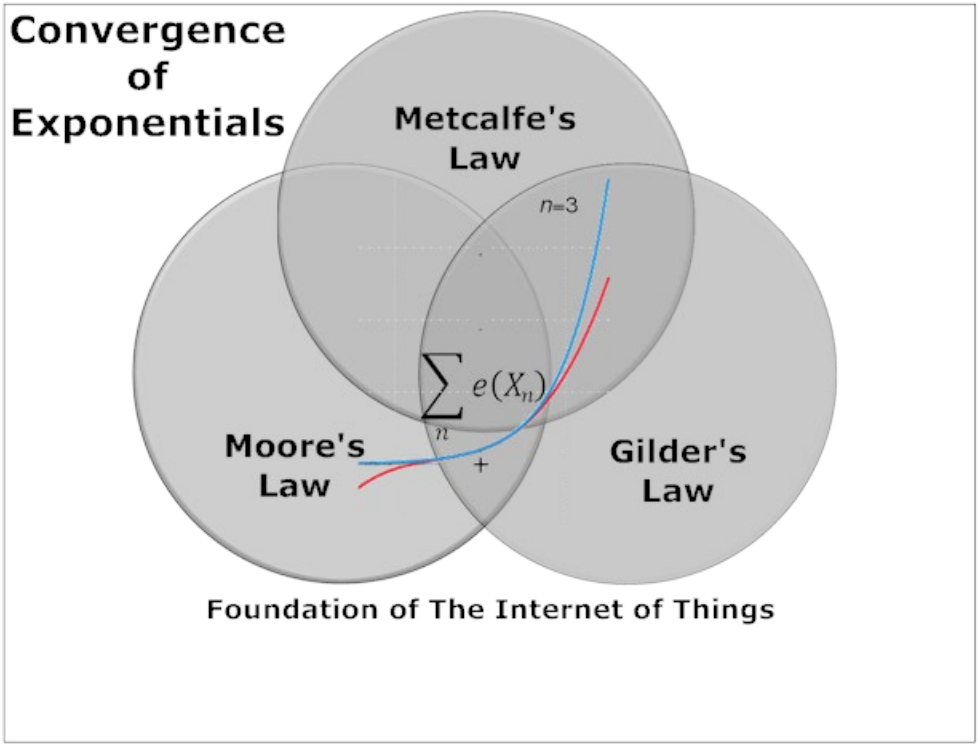
Almost 1,300 Boeing 777 (introduced 1995) are in service and each has about 3 million parts provided by about 500 different contractors and suppliers.[ixx] Over 250 Boeing 787 Dreamliner (introduced 2011) aircraft are in service and each has about 2.3 million parts.[xi] Collectively, for these two aircraft alone, almost 4.5 billion components are in service every day.

Granted, this may not be a direct comparison—apples to apples, so to speak. However, the analogy is that the level of complexity since 1988 has dramatically increased and society must *understand* this in order to manage complex systems.

In 2004, the author first posited that the *Convergence of Exponentials* would lead to significant change.[xii] In 2009, this construct was further refined and further advanced over the intervening years.[xiii] These converging axioms include:

- **Moore's Law**—the number of transistors (power) on a microprocessor doubles every 18 months
- **Metcalfe's Law**—usefulness of a network equals the square of the number of users
- **Gilder's Law**—bandwidth rises three times faster than the power of the computer

The effect of this convergence in 2015 and beyond is that the *Velocity of Information* (similar to the economic theory, Velocity of Money, it is the frequency at which information is exchanged) is dramatically increasing. This effectively enables modern management decision making to approach the criteria set forth by Requisite Variety and Path Integral Formulation. Effectively, the management tools are available today as technology enables the thinking of 1940s leadership.



The Internet of Things (connectivity among a massive number of smart devices) will continue to present challenges to management to assure safe, environmentally proactive and productive operations. One can argue that the tools to manage this next iteration of the Convergence of Exponentials are readily available.

Does your management say it can't be done and if so what is your response?

About the Author

Dr. Scott M. Shemwell has over 30 years technical and executive management experience primarily in the energy sector. He is the author of five books and has written extensively about the field of operations management. Shemwell is the Managing Director of The Rapid Response Institute, a firm that focuses on providing its customers with solutions enabling operations excellence and regulatory compliance management. He has studied cultural interactions for more than 30 years--his dissertation; *Cross Cultural Negotiations Between Japanese and American Businessmen: A Systems Analysis (Exploratory Study)* is an early peer reviewed manuscript addressing the systemic structure of social relationships.

End Notes

[i] http://www.imdb.com/title/tt2421662/
[ii] http://maximusandme.blogspot.com/2013/11/the-challenger-disaster.html
[iii] http://www.einstein-online.info/spotlights/path_integrals
[iv] Shemwell, Scott M. (2014, December 11). Requisite Variety. Governing Energy. PennEnergy.
[v] http://en.wikipedia.org/wiki/Path_integral_formulation

[vi] Shemwell, Scott M. (2005). Disruptive Technologies—Out of the Box Essays on Business and Information Technology Alignment Issues of the Early 21st Century. New York: Xlibris. p. 127.
[vii] http://www.forbes.com/sites/roberthof/2015/04/17/at-50-moores-law-has-only-started-to-disrupt-everything-we-do/
[viii] Shemwell, Scott M. (2015, March 20). Drilling Moore. Governing Energy. PennEnergy.
[ix] http://globalfastenernews.com/main.asp?SectionID=26&SubSectionID=39&ArticleID=10822
[x] http://en.wikipedia.org/wiki/Boeing_777
[xi] http://787updates.newairplane.com/787-Suppliers/World-Class-Supplier-Quality
[xii] Shemwell. Scott M. (2004, January 31). Desperately Seeking Technology: 21st Century Needs of the Downstream, Petrochemicals, and Retail Petroleum Industry Segments. Presentation to the Intel global sales force. Anaheim.
[xiii] _____ forthcoming). Rapid Response Management: Thriving in the New World Order. Houston: RRI Publications.