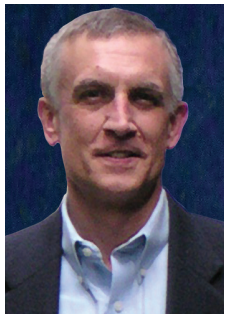
BRADFORD L. GOLDENSE | President
Goldense Group Inc. (GGI)
Needham, Mass.



Product Architecture in The Digital Age

The discipline of systems engineering came of age in World War II when the United States entered the war late and could not get everything done it needed to do quickly enough. A number of disparate disciplines were rapidly integrated into "logical units" under the heading of systems engineering to enable the shortest possible design-to-production cycles.

Systems engineering became the nerve center of product creation. Key responsibilities included requirements management and trade-offs, product architecture, modular design, high-level design, work breakdown structure, communication to individual technical disciplines and supporting departments, and often program management.

The result was a discipline that assured the design principles, parameters, and requirements of new products were implemented in a logical, efficient, and scalable manner — and as fast as possible. Numerous product platforms that have lasted for decades in our country, as well as our corporations and society, originated from the soundness of systems engineering approaches. Just about every engineer, or technical, and scientific professional wishes their products would withstand the same tests of time.

In the late 1980s and early 1990s, industry-leading firms such as **HP, IBM, Corning, Northern Telecom, Motorola**, and **Analog Devices** among others, sought to further improve on systems engineering's output by understanding the impact of product requirements on the variability and volatility of product architectures and designs. An article published by Ashok Gupta in the 1990 winter issue of *California Management Review* best captured the collective findings on requirements. In short, 71% of things that go wrong in product development can be traced to some type of requirements error. In that same time frame, "the power of centralized organizations" was becoming increasingly unpopular in the workplace.

The elevated importance of robust product definition was implemented by migrating it to marketing and product management organizations. Product champions became the stars and the number of technical professionals involved in requirements definition gradually declined, as did their product architectures.

Think about that 71% figure. It implies three out of four errors in product development are at least partially avoidable by up-front planning and analysis. Younger readers may say, "looks like some old fogie is writing the article." But even if only half of those 71% of failures are due to incorrect or incomplete requirements, that would translate to 35%, which is still highly significant.

Things are different now, younger professionals might say. "We can be agile, rational, scrum, and sprint! And software is easier to modify, more flexible, and better all around."

That's all well and good, but the number of designs that are "spaghetti-like" in their architecture has been rising. Sure, the wizards get the rabbit out of the hat and make the product work, somewhat. But are we giving our companies and customers a "best-in-class product?" Missed, incomplete, unclear, and misinterpreted requirements are the ingredients of spaghetti architectures.

We should learn from the recent past and ensure technical professionals are heavily involved in the requirements definition and management process. We should also go back to formally integrating relationships between systems, product architecture, and technical professionals, and the product or marketing organization responsible for requirements.

Numerous studies indicate that people have not changed much since the 1930s. Nobody liked centralized power then and nobody likes it now. However, the best product architectures require organizational tolerance for power. It is worth the effort to build and empower the "logical units" that once emanated from systems engineering and are fundamental to R&D productivity. The return to these logical units creates competitive advantage, modularity, and flexibility. It also has lower internal cost structures, which result in higher profits. Professionals working on projects can now turn sound management science to their advantage in the digital age without centralization. And our products will have a better chance to last generations. md

BRADFORD L. GOLDENSE, NPDP, CMfgE, CPIM, CCP, president of **Goldense Group Inc.** (GGI) (*www.goldensegroupinc.com*), has advised over 300 manufacturing companies on four continents in product management, R&D, engineering, product development, and metrics. GGI is a consulting, market research, and executive education firm founded in 1986.