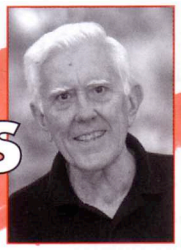
Outside the Lines



Problems cannot be solved by thinking within the framework in which the problems were created." – Albert Einstein

by Ludwig Benner, Jr. and Ira J. Rimson

The Next 50 Years, Part 3

Imagination is more important than knowledge.[1]

In our two previous columns, we recognized the International System Safety Society's (ISSS) 50th year as an opportunity to examine what might lie ahead for its next 50. We introduced the idea of examining potential risks to the Society's future by undertaking an analysis of the Society, similar to the kind of safety analyses its members perform for others. We planned to define the Society as a system, examine its intended operation, forewarn of risks that could jeopardize its future accomplishments and suggest opportunities to cope successfully with those risks.

We identified two generic categories of risks that might jeopardize the Society's future success. The first includes those posed by external influences and events. The second derives from the Society's internal design and execution of its internal operations. In this column, we describe what we believe to be external risks to the Society.

Our analyses have been based on several premises:

- The ISSS is a service institution. As a service institution, it was created to benefit its members, their clientele and the public.
- As such, it must clearly define its domain[2], mission and functions. A service institution sets its objectives and goals within those definitions.
- Once in operation, it must audit and establish feedback from its activities to initiate adaptive changes to sustain its utility.

External activities and circumstances have posed risks both to the system safety domain and the Society during their history, and can do so in the future. They include, but are not limited to, a lack of public awareness of system safety's capabilities, competitive encroachment on the system safety domain, technical obsolescence, missed opportunities, declining resource allocation to system safety and dwindling academic support. We made no attempt to rank these risks, as they are interdependent in many respects. We believe each merits the attention of the ISSS and its members.

Lack of Public Awareness

The relatively narrow application of current system safety practices poses a risk to the growth of both the system safety and ISSS domains. With a few exceptions[3], in the U.S., system safety practitioners have focused most of their attention on government programs and contracting, and the aerospace and nuclear industries, where system safety application is most mature. Outside of areas where it has been traditionally practiced, potential users have little awareness of the system safety domain: what it is, what its practitioners do and its value to the public. Thus, this inhibits ISSS growth, and system safety's potential contribution to public safety. Ironically, it cannot be proved directly that successful system safety outputs proactively prevent accidents, and a metric to measure negatives has yet to be devised. This risk will persist until exemplars of

[1] Sign hanging in Einstein's office at Princeton.

[2] For the purpose of this discussion, we define system safety's domain as "...the sphere of action, thought, influence or responsibility for minimizing risks in operational systems and products that would interfere with achievement of their designed functions."
We view the ISSS's domain as "...the field of system safety, system safety professionals and system safety practitioners within the domain of system safety."

[3] For example, successful initiatives by Dev Raheja *et al.* in the medical field.

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successful system safety influences are matched to systems' experience, and the results reported publicly.

Competitive Encroachment

A surreptitious, yet significant external risk to the ISSS and its membership is encroachment by other disciplines on the system safety domain. For example, a commonly held perception is that systems are safe if they are reliable. The result of that mindset is to accept reliability and failure analyses as adequate substitutes for system safety programs.

Another example is illustrated by a competitive society that advertises its benefits as:

> "THE professional institution for safety, reliability and risk practitioners — in ALL industries."[4]

Technical Obsolescence

The risk of technical obsolescence of traditional tools used in the system safety domain grows with continually increasing complexity of systems' design and operation in almost all fields. System safety analyses require effective system safety-specific tools to analyze complex interactions among human, machine and software components. The ISSS and its members face the challenge of adapting historic system safety tools to new applications, or devising and applying new tools to cope with these systemic changes.

Missed Opportunities

Opportunities to expand applications of the system safety domain arise frequently. If the ISSS and its membership do not perceive and grasp those opportunities, they risk limiting the potential growth of their domain's sphere of influence. For example, recent risks and hazards that have been inadvertently introduced in the automotive and rail industries are opportunities to expand system safety more widely into civilian applications, systems and products.

Initiatives by others in developing and testing non-traditional system safety methodologies pose a risk of limiting the ISSS's growth if its membership is reluctant to accommodate new technological challenges. MIT's "Partnership for a Systems Approach to Safety (PSAS)" contains both risk and opportunity for the ISSS. PSAS's intended scope overlaps the traditional system safety domain:

> "The increasingly complex systems we are building today enable us to accomplish tasks that were previously difficult or impossible. At the same time, they have changed the nature of accidents and increased the potential to harm not only life today but also future generations.
>
> "Traditional system safety approaches, which started in the missile defense systems of the 1950s, are being challenged by the introduction of new technology and the increasing complexity of the systems we are attempting to build. Software is changing the causes of accidents and the humans operating these systems have a much more difficult job than simply following predefined procedures. We can no longer effectively separate engineering design from human factors and from the social and organizational system in which our systems are designed and operated."[5]

The ISSS can achieve synergy with MIT's and others' innovative ventures by cooperating in their endeavors to the mutual benefit of all concerned.

A new system safety challenge has arisen from the proliferation of substandard and counterfeit products by globalized production, which threatens the competent operation of numerous systems. Continuation of these deficiencies introduces the risk of forfeiting public confidence in producers' competence to identify and control hazards and risks. At the same time, it offers system safety practitioners a unique opportunity to extend their influence globally.

Declining Resource Allocation

Corollary to unawareness and encroachment is the risk of declining resources allocated specifically to system safety. Absence of clear and widespread demonstration of the net value of system safety programs to their sponsors risks the reduction of resources allocated to genuine system safety programs. Shrinking financial support could also affect organizational support of ISSS members and their activities.

Dwindling Academic Support

Research and education are the lifeblood of progress; without them, the risk of declining domain influence is real. Expanding system safety research and education depends in great part on support from academic institutions. To our knowledge, little research is currently being conducted at the university level in support of system safety. Study programs directed toward career opportunities within the system safety domain are limited. They have been recognized by few traditional engineering curricula.[6] Academic curriculum designers have paid little attention to serving the ISSS domain, risking the viability of those few current system safety curricula, and (at least) resulting in fewer potential future ISSS members.

We invite readers to advise us about external risks we may have overlooked. In our next column, we will address internal risks to the ISSS's future success.

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[4] Safety and Reliability Society (U.K.), Website www.sars.uk.org [Capitals in original]

[5] http://psas.scripts.mit.edu/home/

[6] Embry-Riddle Aeronautical University's inclusiveness has been an exception.