



International Approaches to Critical Infrastructure Protection

BIC Discussion Paper

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Introduction

Critical infrastructures (CI) have become the central nervous system of the economy in all countries and a key national security concern. Their interdependencies compound the challenge in securing them from various threats. From the available statistics we can safely conclude that threats to Critical Infrastructures from state and non-state actors, driven by diverse underlying motivations, have grown in number and intensity. The challenge to a nation state is to initiate comprehensive steps to mitigate their ill effects. We need to identify a comprehensive yet parsimonious set of steps that can be initiated at national level to address these emerging threats.

Need for a suitable metric

We cannot improve anything unless we can measure it. While it is easy to measure physical parameters like temperature and pressure, complex constructs like security level of a nation or a critical sector are difficult to articulate in social science.

International Challenge

Critical Infrastructure protection is an international concern. Multi-dimensional approach is necessary to achieve success in this venture. Following key questions need to be addressed:

- a) How to identify and prioritize the dimensions of an Index to measure the CI protection initiative?
- b) How to identify and prioritize important indicators under each dimension?
- c) How to measure progress on each dimension?
- d) Is it possible to provide a composite index of a CI's security status at regular interval?
- e) Is it possible to identify areas in need of urgent action?

Recommended Methodology for CI protection

Amongst the various CIs of our modern society all appear important when viewed individually. Delphi methodology may help identification of "critical few" from a comprehensive list. Delphi Method, first introduced by Norman Dalkey and Olaf Helmer during their association with the Rand Corporation in the 1950s is uniquely suited to studying topics with little historical evidence, related to rapidly changing events and of great complexity. In Delphi approach we are interested in collecting the judgments of experts on a particular topic to document and assess those judgments.

Interpretive Structural Modeling (ISM) (Warfield, 1974) can articulate the hierarchical relationships among them in terms of driving power and dependency. This permits short listing CIs that are at root of the hierarchical model for further prioritized action. *Matrice d'Impacts Croisés Multiplication Appliquée à un Classement* (MICMAC) analysis (Duperin and Godet, 1973) can be used to unveil hidden indirect influences among these CIs.

AHP is one of the Multi-Criteria Decision-Making (MCDM) methods and the underlying principle of MCDM is that these decisions have to be made by means of sets of criteria. By applying this principle; Saaty (1980) developed AHP which models a hierarchical decision problem framework that consists of multiple levels of criteria having unidirectional relationships. AHP works with such hierarchy that can combine both subjective (intangible) and objective (tangible) criteria.

Illustrative research approach to derive index of a critical sector

At IIT Delhi, we have attempted in an ongoing research to define a construct of National Information Security Index (NISI) in Indian context using combination of Delphi and AHP. The interim findings of the research and illustrative use of NISI to measure a nation's security index provide us a template for design and computation of a sector specific security index.

Recommendations

The illustrative use of the NISI for tracking India's progress to secure her Cyber Space can be replicated to design Security Index for the prioritized CIs/sectors

The index can be used to track progress in securing these prioritized CIs/sectors

Suitability of this approach to EU and other national context could be considered

Relevance of International Cooperation in CI protections

The threats to the ICT systems of all CIs can emanate across national boundaries and therefore, all nations can benefit from cooperation. For the Horizon 2020, the security of the evolving Next Generation Networks (NGN) could be considered for the international cooperation. The NGN would amplify the threat vectors with their IP protocol based approach to communication and ubiquitous use of smart phones as the preferred mode of online transactions.

The full presentation can be found at <http://www.bic-trust.eu/files/2012/04/6-MChaturvedi.pdf>



About the Author

Air Cmde **MM Chaturvedi** is a retired Indian Air Force officer. His PhD thesis in Information Security area is under review at IIT Delhi. He has about 35 years of experience in managing technology for IAF. An alumnus of National Defence College, New Delhi, he has held various appointments dealing with telecommunication policy issues. He graduated from Delhi College of Engineering and completed post graduation from IIT Delhi. Current interests include vulnerability analysis of evolving ICT infrastructure. Currently he is a visiting faculty at IIT Delhi and Ansal University Gurgaon, besides consultant at Beyond Evolution Tech Solutions Pvt. Ltd., India.