Cybernomics Demystified

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To start with: As the name suggests, Cybernomics is connected with Cyber Physical systems and Economics. Cyber-physical systems (CPS) are orchestrations of computers, machines, and people working together, and economics is that branch of knowledge concerned with the production, consumption, and transfer of wealth. Thus, at the very first look, the subject appears to be fairly complex even to comprehend. In simple words, Cybernomics is the cross-disciplinary field dealing with all aspects of cyber risks.

This short write-up attempts to provide a simplistic point of the view of the subject, without losing sight of its basic features.

much of the interest in the subject of Cybernomics among various groups. Almost every day, news trickles in from many parts of the globe about social networks, and engagement on the platform. Unfortunately, it appears the Cambridge Analytica scandal may not be just a breach, but

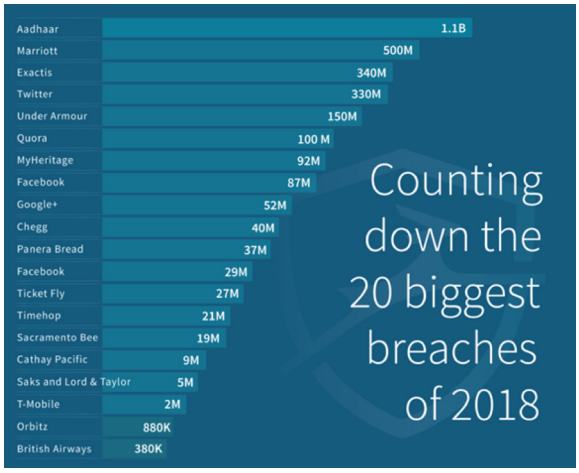

Fig.1.Some of the big data breaches of 2018
[https://blog.dashlane.com/data-breaches-2018]

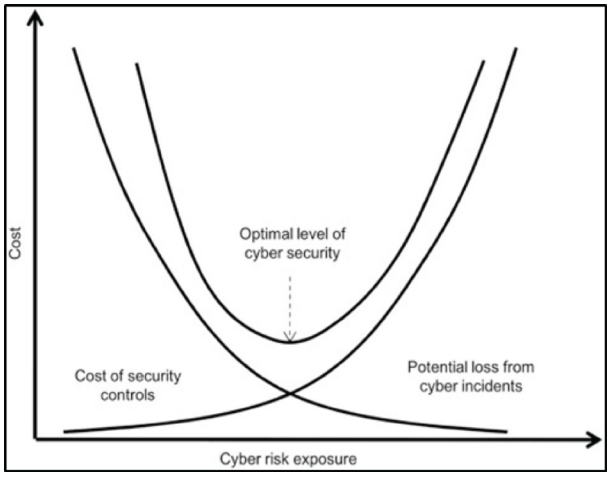

Fig.2. Optimal information security level
[ElAoufi S , Economic Evaluation of Information Security Amsterdam, The Netheralands, Vrije University Press, 2009]

Cyber risks: Cyber risks may arise due to different types of cyber incidents such as cybercrime, IT failure/outage, data breaches and a host of others. As per Allianz Risk Barometer 2019, risks due to cyber and business interruption (Supply chain failures) are at the top among the various types of risks in today's digital economic environment.

These risks are ranked much higher than those due to Natural catastrophes such as storm, flood, earthquake or even man-made disasters such as fire or explosion. That makes up for how Cyber spies, hacktivists and data thieves assault both public and private networks. Major network breaches at cyber giants like Facebook, Google+, Twitter, Quora and business giants like Boeing Airways, Marriott, Cathay Pacific, Orbitz have been hitting headlines repeatedly. See Fig.1.

Probably, one of the biggest data scandals that rocked the cyber world was how a political data firm called Cambridge Analytica collected the personal information of about 80 million Facebook users via an app that scraped details about people's personalities, misuse of user data. It is reported that anonymous sellers could enter any Aadhaar number, a 12-digit unique identifier assigned to every Indian citizen and retrieve numerous types of information on the queried citizen stored by UIDAI (Unique Identification Authority of India),thus compromising the personal information of 1.1 billion citizens across India.

According to Juniper Research, a consultancy based in Hampshire, England, global cost of data breaches is rising nearly 3 percent a year, and hit $2.5 trillion in 2020. The major takeaway

of the study is that any company can be breached and securing user data is highly complex and requires a tremendous investment.

Cyber Insurance: Where there is risk, insurance sector sees business, since insurance always promises financial help when an unfortunate loss of some sort happens. For a long time, insurance was mostly centred on Health, Life, Property and Casualty (P&C). With life eroding and P&C flattening, these traditional sectors are likely to face a slowing growth in the coming years. According to McKinsey's Global Insurance Industry Insights, "the global insurance industry is undergoing turbulent times" with the continuing low interest rate environment, a challenging equity market, and tightening regulatory changes.

These tectonic shifts are forcing insurers to adjust their business models and they are looking at the serious 'Losses' that can happen due to loopholes in design or implementation in cyber physical systems. As per one study, Cyber insurance premiums are estimated to become $7.5billion in annual premiums by 2020.

What goes into Cybernetics: Some of the key aspects which form Cybernomics are

Valuation of digital assets: Valuation is the process of estimating the value or worth of an asset or an investment. Digital assets that need to be evaluated in cybernomics include Intellectual Property (IP), Personally Identifiable Information (PII), Mergers and Acquisitions (M&A) data, customer records, access credentials, encryption keys, business critical IT services, cloud services among others. Unlike traditional economic goods and services, production cost and market value of these assets are not easy to assess or monitor.

Cyber risk management: Cyber risk is a function of the probability of occurrence of a scenario which can cause system damage; it is also dependent on the likely quantity and quality of damage that can be caused by each of such scenarios. Though a range of qualitative and quantitative cyber risk management methodologies are possible, most of them lack in terms of granularity, objectivity, efficiency, robustness and reliability.

Further complications arise in case of Internet of Things (IOT) systems; existing approaches may have to be supplemented with newer models and frameworks. In case of IOT across different verticals such as Health care, Building automation, Manufacturing, Insurance and Finance etc, cyber risk assessment becomes much more complicated and is yet to be explored fully.

Economics of information security: An important aspect of cybernomic analyses is in providing maximum protection of assets at minimum cost. Such optimisation requires special skills in economic modelling of the situation. (Fig.2)

Risk units and risk measurement: Value at risk (VaR) is a statistic that measures and quantifies the level of financial risk within a firm, portfolio or position over a specific time frame. Two major analytical tool used to compute VaR are RiskMetrics (based on financial data points) and MicroMort (concept borrowed from study of medical risks). These aspects as applied to cyber insurance are still to be understood fully.

Enterprise Risk Management: This refers to the framework through which the complex compartmentalized technical issue of cyber risk is transformed into a business issue.

Concluding Remarks: Cybernomics is an emerging multi-disciplinary field, which should be of interest for those working in digital systems as well as those who are in financial systems. Methodologies used in this discipline borrow concepts from many fields including medical, health care and all other high risk application areas. The subject also poses many challenges to academicians and businessmen and is likely to grow significantly as more and more systems adapt digital and networking technologies. ■

Prof G S Mani is a leading technologist in Electronics with a combined experience of more than 45 years in R&D, Management and Academics. After serving in Defence R& D organization for more than 35 years, he retired as Director and Dean, DIAT (DRDO). Later he was a Professor Emeritus for 6 years, Principal of an Engineering college for 2 years and also Adviser to a leading Professional Institution for 1 year. He has been Examiner /Guide / Selection Panelist for PhD in many universities.

Prof Mani received Award from President of India for Import Substitution(1973), Prof. K. Sreenivasan Award of IETE for 'Distinguished contributions in the field of teaching Electronics and Telecommunications'(1998), Excellence in Education/R&D Trophy presented by Governor of Maharashtra (1999), Appreciation Award from DEMA(2000). He was also felicitated by Prof. MGK Menon. He has received Appreciation 'for Notable services and contributions towards the advancement of IEEE and Engineering Profession' from Institute of Electrical and Electronic Engineers (IEEE) USA