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Global Movement Management: Commerce, Security, and Resilience in Today's Networked World¹

Executive summary

The health and well-being of modern society depend on highly integrated, complex economic systems that serve to move people, cargo, conveyances, money and information around the world every day. These systems include, for example, immigration, aviation and transit systems for the movement of people; maritime, trucking and air cargo for the movement of goods; pipelines and electric grids to transport fuels and energy; and the Internet and other communications networks to move information and to enable financial flows. Collectively, these systems comprise a circulatory system for the global economy: what we refer to in this paper as the “global movement system.”

Global movement systems embody a unique intersection of public and private interests. They are largely owned by the private sector, and users are mostly companies and the general public. At the same time, the functioning, availability, security and stability of these systems are essential economic “public goods,”¹ in which governments have significant economic, national security and public welfare interests. Society expects global movement systems to be like water, electricity and other utilities: People simply expect them to work and to be available on demand. When they fail, consequences are rapid, widespread and significant.

Twenty-four hours a day, seven days a week, the global movement system shuttles goods and services, capital and labor, and bits and bytes around the globe to provide the substance of daily life: jobs, wages, food, electricity, education, news and information, and leisure and entertainment. As a result, nations and economies are becoming increasingly integrated and interdependent. The United States relies on the rest of the world to supply two-thirds of its oil and to finance 44 percent of its public debt.² China relies on exports for 36 percent of its gross domestic product (GDP).³ The primary engine of India's recent economic growth

¹Please visit www.ibm.com/gbs/government to request a complete version of the paper, including all references and figures.

has been information technology outsourcing, even though it accounts for only 5 percent of India's GDP. Tourism accounts for almost 20 percent of GDP⁴ in many Latin American countries.⁵ Emerging markets' share of global exports doubled from 20 percent in 1970 to 43 percent today and emerging markets hold 70 percent of foreign exchange reserves.⁶ Africa has recently emerged as a major petroleum exporter and is developing strategic economic relationships with China and India, providing commodities for their rapid industrialization.

Global movement systems as exploitation targets

At the same time, however, the same systems can threaten societies and economies if they are exploited by malicious actors to inflict harm or if naturally occurring disruptions are managed poorly. The tight integration of global systems means that disruptions that may seem small or localized at first can rapidly magnify, spill over into other systems and cause serious harm that is difficult to envision or predict.

These challenges are the natural result of the networked nature and sheer complexity of today's modern global economy. The effects are well described by chaos theory, which asserts that even relatively simple systems that obey known rules and behaviors can display unpredictable outcomes depending on the slightest variations in the nature of an event or disruption. As individual movement systems become increasingly networked, interconnected and interdependent, small disruptions and events can create an even higher level of unpredictability.⁷ Making matters worse, the transmission of disruptions around the world is occurring at an ever faster pace.⁸

Countries today are not alone in facing and influencing the challenges and opportunities of complex internetworked global systems. Fifty-one of the top 100 global economies are companies, 300 multinational corporations account for 25 percent of total global assets, and more than 40 percent of total world trade occurs within corporations.⁹

Individuals have also gained new prominence on the global landscape. As a result of globalization and technology, individual actors can intentionally cause disruptions and inflict damage on a massive scale that was previously the sole domain of nation-states. The September 11, 2001 terrorist attacks undertaken on U.S. soil by 19 individuals at a cost of approximately US\$500,000 caused an

estimated US\$80 billion in damages.¹⁰ The attacks shut down the entire U.S. aviation system. Cascading effects rippled around the world, affecting many countries and industries.¹¹ As then U.S. Secretary of Defense Donald Rumsfeld lamented, “The cost-benefit ratio is against us! Our cost is billions against the terrorists’ cost of millions.”¹²

The 9/11 hijackers exploited U.S. immigration systems, benefited from poor information sharing within the U.S. government and used our own airplanes as weapons against our centers of finance and government. The 9/11 terrorist attacks drew the world’s attention to the following:

- The efficiency, security and resilience of the global movement system are integrally linked in today’s highly networked and interconnected global economy.
- The drive to improve efficiency has made global movement systems more vulnerable.
- Much of the physical infrastructure in global movement systems is in poor condition due to age, everyday wear and tear, deferred maintenance and underinvestment in new capital projects.

The 9/11 attacks heightened awareness of the fact that while global movement systems are the lifeblood of the global economy, they also present important vulnerabilities and serve as a potential pathway for pathogens and disruptions.

Security improvements and performance can work together

Because greater efficiency can make global systems more vulnerable and brittle, many observers assume that the converse is true: that investments in greater security and resilience inevitably must come at the expense of business performance. However, this need not be the case. This paper explains that improvements in security and resilience can help improve overall economic performance. Security and commerce are not in opposition.

Economic performance, security and resilience are mutually reinforcing goals and can be achieved in tandem. In addition, this paper suggests that in a networked economy, business leaders must expand the frame of their investment decisions to give greater weight to considerations beyond their short-term bottom lines and beyond the four walls of their organizations. Company executives need to give greater consideration to their roles in supporting public goods like resilience, stability and the benefits that come with economic interdependence. The same

is true for public sector policy makers, who now must consider a broader range of commercial factors in recognition of the private sector's ownership of and influence over global movement infrastructure. In short, we must learn to realign our thinking to address the networked nature of the global economy.

This paper, therefore, offers a new analysis of the challenges facing countries, corporations and individuals in today's highly interconnected world. It also proposes a comprehensive framework to improve the performance, security and resilience of global movement systems.

Key ideas

The key ideas presented in this paper focus on 21st century risk, intelligent immunity, the Global Movement Management analytical framework, strategic human capital, leveraging unique data assets and skills through technology, and addressing a critical governance gap. These topics are summarized below.

21st century risk – Risk in the 21st century is unique because, for the first time, individual actors or individual events pose viable strategic threats to international systems. Threats are asymmetric. Small groups of malicious actors can create global harm many orders of magnitude greater than their cost of operations. Seemingly small local disruptions can potentially cascade and be magnified through tightly interconnected systems to create far-reaching and more extensive damage than often can be predicted. And this trend is forecast to continue.

Intelligent immunity – We developed a new approach to guide the formation of policies, plans and implementation efforts to address terrorism and other threats to global economic systems. We call this approach “intelligent immunity.” This approach is designed to address the economic and security risks in global movement systems. It seeks to make critical economic systems more resistant to disruption by improving their overall health. Commerce, security and resilience constitute the essential elements of a healthy system. Achieving this requires an integrated and evolving mix of preemptive, preventive, preparatory and responsive measures that leverage human capital, technology and governance in new ways.

The intelligent immunity approach focuses not only on making systems more secure against intentional threats like terrorism, but also on making them more resilient in the face of virtually all manner of disruptions as well as seeking

to improve their overall performance. Intelligent immunity sets the stage for a holistic approach to improve the overall health and well-being of global movement systems while avoiding actions that impede commerce and impair daily functioning.

Global Movement Management framework – A consistent analytical framework is valuable to better understand and assess the complicated systems and subsystems that comprise the global movement system. The analytical framework through which we can understand how to achieve intelligent immunity identifies five key flows – people, goods, conveyances, money and information – as the lifeblood of the global economy.

We broaden and deepen our original Global Movement Management framework to include both the physical and logical aspects of each flow. We provide a robust framework for analyzing the complex global movement systems that make these flows possible, including the global aviation system, maritime cargo shipping, immigration systems and the Internet. The simple yet powerful foundation of the framework is that even the most complex global systems can be reduced to their components, and the systems are more alike than they are dissimilar. Focusing on similarities can provide the means to harmonize decisions, investments and activities to improve performance, security and resilience across the board. The analytical framework can be a valuable aid to guide thinking and action by global leaders to manage risk in global movement systems and achieve common goals.

A strategy to overcome the asymmetric risk posed by terrorism and natural disasters in the highly networked global movement system should link the full range of available tools to achieve these goals. Our analysis suggests three main opportunities to achieve intelligent immunity that involve new strategies for people, technology and governance.

Strategic human capital – We believe that individuals within companies and governments face increasingly complex choices about how to improve performance and address risk. Individual managers and employees face unprecedented volumes of information, new technologies and competitive pressures that complicate their work. At the same time, in a networked economy, decisions made at the individual level can have increasingly global ramifications.

Unfortunately, the critical role of people in managing risk and complexity in a networked environment is often overlooked. From the front office to the front line, people make global movement systems work. We call for a new strategic approach to human capital that transforms the relationship between individuals and their organizations by improving trust and access at virtually all levels. This results in a greater shared ownership of mission and objectives and empowers individuals to make “the right decisions at the right time.” This approach, adopted by individual organizations in the global community, will help promote intelligent immunity across the entire system.

Strategic human capital requires leaders to employ emerging techniques for managing in a networked environment. These techniques include improved collaboration, latitude to reach across and outside organizational boundaries, investment in organizational transformation, new and more flexible structures, enhanced technology and, above all, greatly improved training for managerial and supervisory skills across the workforce. To address these challenges, we recommend:

- Taking a strategic approach to front-line employees in global movement systems
- Leading, organizing, training and equipping front-line employees for the new tasks at hand
- Engaging society on a more comprehensive basis in recognition of the new level of personal responsibility that each user has for the system in a more connected and interdependent world.

The goal of this effort is to enhance the individual employee’s understanding of his or her important role in improving enterprise performance and reducing risk. We argue that a significant initiative for investing in human capital and establishing standards for human capital development in the areas of security and preparedness will make companies and governments better able to prevent, withstand and respond to disruption. Increased investments in this approach will allow people to assume higher-order responsibilities and automate tasks that do not require human intervention, further leveraging the time that front-line personnel have to focus on their unique contribution to the safe and reliable operation of the global movement system.

Leveraging unique data assets and skills through technology – Those who have managed and operated portions of the global movement system – on the front lines in

government or in the private sector – almost universally agree that we need to change how we use technology to simplify work processes and make human activity more effective. Despite widespread recognition of the importance of sharing information, companies and governments are failing to fully leverage natural advantages that they possess in information and technology to strategically address asymmetric risk in global movement systems. Global Movement Management sets forth a vision for data collaboration on a significant scale to make it easier for individuals to do their jobs, for companies to improve their performance and for societies to maintain the global economy.

This paper sets forth a technology strategy for global movement systems that includes three major components:

- Adoption of a “micro-macro” approach that unlocks currently trapped data to achieve greater information granularity and that promotes greater information federation/aggregation
- Building the “connective tissue” needed to enable greater collaboration both vertically between individuals and organizations, and horizontally among organizations
- Peer production that results from unlocking information and sharing it more widely, helping to drive innovation to dramatically improve the performance, security and resilience of global movement systems.

In sum: Unlock trapped information, share it broadly and create new knowledge and innovation.

We can improve the use of technology to enable individuals to be more effective in their jobs, especially when they have been given the training and authority to make good use of it. More importantly, we can use technology as a strategic advantage by leveraging our ability to manage information to which dangerous elements do not have access – and to do so on a broad scale in order to prevent, detect and interdict malicious activities.

The sharing of currently trapped data will not occur until tools and services become affordable and widely available for data harmonization and interoperability; permissioning, anonymization and encryption; and data aggregation, analysis and visualization. If such tools become widely available and a significant amount of currently trapped data becomes shared, the resulting

greater awareness of global systems will help enable companies to improve economic performance by identifying opportunities for improvements in critical economic flows. In addition, this same action will help improve security by making it easier to identify vulnerabilities and to spot anomalies. It also will help improve resilience by enabling companies and governments to isolate disturbances, avoid overreacting to disruptions, and restart operations more quickly after an event.

Finally, we assert that greater enterprise visibility can help partners and competitors identify mutually beneficial best practices. Upstream companies can be better equipped to provide warnings of supply shortages or other disruptions before they affect downstream partners. Downstream companies can provide early warnings about demand or delivery disruptions to those upstream. Companies can benefit from greater communication with government and law enforcement officials about intentional threats. Governments can augment counterterrorism efforts with more accessible commercial data while also providing a higher degree of protection for privacy and civil liberties than is currently the case. By freeing up trapped data and sharing greater volumes of information, companies and governments can take advantage of open-source techniques or “peer production” to drive innovation and help make global systems more efficient, resilient and secure.

Addressing the governance gap – Governance is the collection of institutions, rules, standards, norms, decision rights, practices and processes that administer, coordinate and/or direct activity within a system or enterprise. Governance for global movement systems is the means by which a diverse and interdependent community of global stakeholders pursues improvements to the performance of global movement systems. Governance of those systems today is characterized by the lack of a coordinated approach that is necessary to address networked risk. We call this the “governance gap.”

To bridge this gap, participants in the global movement systems need to embrace a more comprehensive set of factors to understand the actual risks, costs and benefits that accrue to an organization in a networked environment. Moreover, participants need a means by which to organize their efforts to address these risks, costs and benefits. Our research shows that organizations have successfully met the challenges of organizing efforts across national boundaries in the global movement system before – for example, for international maritime cargo and for the Internet. These success stories provide a model for establishing a new global movement system governance framework.

Therefore, we call for the creation of a Global Movement Management Organization (GMMO) based on key attributes of these models for success. We envision a new international entity to fill the governance gap that presently limits the effectiveness of international efforts. The GMMO can serve to bring together key stakeholders with a shared interest in strengthening global movement systems and provide an effective forum and process to enable cooperation among regional, national and sector-specific stakeholders.

The GMMO can leverage existing international organizations through dedicated and visionary leadership to facilitate three important activities. First, it can align security and resilience with commercial imperatives in global movement systems. Second, it can improve international cooperation and harmonization among public and private stakeholders to strengthen global movement systems. Third, it can integrate security and resilience in a deliberate effort to harmonize risk management activities globally and to enfranchise less developed economic actors through a number of incentivizing mechanisms, including grants, loans, services and training.

Furthermore, as we studied the role of people, technology and governance in the global movement system, several principles that support this GMMO approach emerged: aligning with market incentives, layering horizontal and vertical approaches to improve security, and placing useful information in the hands of front-line employees while helping to ensure that they have the training and authority to act. Improved information sharing will require greater standardization of technologies, tools and protocols. Privacy and other data

protections must be addressed at the architecture and design layer. Finally, mechanisms and metrics to measure, assess and optimize policies and programs are required to help make efficiency, security and resilience initiatives work.

In summary, the performance, security and resilience of global movement systems have always been deeply intertwined. September 11 provided a catalyst to invest in security, but, too often, security initiatives have been viewed as being at odds with commerce. This paper supports the idea that commerce, security and resilience are mutually reinforcing objectives. Importantly, we propose a strategy that employs assets that we have, and the terrorists do not. These include large numbers of dedicated people, the better use of technology to unlock trapped commercial data and dramatically improve information sharing and the formation of international organizations to leverage the combined weight of governments, non-governmental organizations and corporations around the world. This strategy will help to counter the asymmetric risk posed by terrorists and manage the unpredictable consequences of unintentional disruptions. The ideas and recommendations in this paper – promoting intelligent immunity as a means to manage 21st-century risk, applying a global movement management framework, strengthening human capital, making better use of technology and creating a new international governance organization – provide a starting point for stakeholders across virtually all sectors to help build more efficient, secure and resilient global movement systems.

About this paper

IBM first introduced its global movement management strategy in 2005 with “Global Movement Management: Securing the Global Economy.” That paper asserted that, despite the daunting complexity of so many of these global systems, virtually all movement systems are more alike than they are different. We believe that policymakers, business leaders and security professionals should focus on these similarities as the key to developing sound strategies for improving the performance, security and resilience of global movement systems, while also seeking to preserve core societal values.

Reactions to the central ideas proposed in that first paper were overwhelmingly positive. Many of the stakeholders we engaged – homeland security, military and intelligence officials in the United States; customs, ports and border organizations around the world; Congressional members and staff; think tank experts; and members of the business community – acknowledged the validity of the central ideas, especially the need for a common vision and framework. Many called for additional depth and detail as they delved into their specific areas of interest. IBM itself realized a deep connection between risks in the global movement system and IBM’s own ability to deliver products and services around the world as a globally integrated enterprise.

The more we understood the common needs of all stakeholders in the global movement system, the more we came to understand that there is an urgent need for virtually all companies and governments to maintain the health and welfare of global movement systems and strengthen them wherever possible. Further, there is enormous potential to create new markets for products and services that strengthen the global movement system. And finally, a strategic approach to global movement systems can help strengthen public policy, promote more cooperation between stakeholders and guide investment decisions.

As a result, we developed “Strengthening commerce, security and resilience in today’s networked world.” This paper builds on the previous paper in four ways:

- We analyze risk in the 21st century using a new approach for managing the unique risks the global community faces today.
- We provide an updated and more comprehensive analytical framework for analyzing strengths, weaknesses, opportunities and threats in specific individual movement systems.
- We provide examples of how to apply the revised Global Movement Management analytical framework to help guide policymakers, business leaders and the public concerned with strengthening global movement systems.
- And we present a strategy and specific recommendations to build what we call “intelligent immunity” through strategic human capital, technology and governance.

Most importantly, the paper presents a strategic vision to guide the efforts of a vast network of stakeholders that is largely absent from today’s efforts. It is a call to action for individuals, companies and governments to work together to help make the global economy more secure and resilient while improving commerce and protecting privacy. It provides the means for corporations to drive greater harmonization in the global movement system, resulting in lower total costs and higher overall performance. Finally, it also provides government and other regulatory organizations with a means to improve security and resilience without harming commercial interests. There is no doubt that achieving these goals is a challenge with profound economic, human, technological and governmental implications. We invite our readers to engage in this effort to strengthen commerce, security and resiliency in today’s networked world.

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