INTERNATIONAL RISK ASSESSMENT AND HORIZON SCANNING SYMPOSIUM 2007

19 - 20 MARCH 2007,
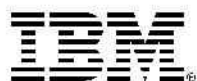**SHANGRI-LA HOTEL, SINGAPORE**

NATIONAL SECURITY
COORDINATION SECRETARIAT

S. RAJARATNAM SCHOOL
OF INTERNATIONAL STUDIES
A Graduate School of Nanyang Technological University

DSTA
Defence Science &
Technology Agency

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INTERNATIONAL RISK ASSESSMENT AND HORIZON SCANNING SYMPOSIUM 2007

REPORT OF A SYMPOSIUM ORGANISED BY
THE CENTRE OF EXCELLENCE FOR NATIONAL SECURITY
THE NATIONAL SECURITY COORDINATION SECRETARIAT AND
THE DEFENCE SCIENCE & TECHNOLOGY AGENCY

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EXECUTIVE SUMMARY

On 19-20 March 2007, the Centre of Excellence for National Security (CENS), the National Security Coordination Secretariat (NSCS) and the Defence Science & Technology Agency (DSTA)—supported by corporate sponsors IBM, Hewlett-Packard and Intel—jointly organised the inaugural International Risk Assessment and Horizon Scanning (RAHS) Symposium at the Shangri-La Hotel, Singapore. The symposium unveiled the innovative RAHS technology system and brought together a stellar cast of international and local thought-leaders on RAHS concepts, methodologies and technologies to promote sharing and learning about RAHS. The symposium was also complemented by a state-of-the-art technology exhibition that profiled the latest developments in RAHS technology and featured a total of 12 exhibitors which included the likes of prominent industry players such IBM, Hewlett-Packard and Microsoft.

The first panel touched upon the way in which RAHS evolved and related to Singapore's context. The opening speaker, How Khee Yin, provided an update on the Singapore Government's RAHS project and demonstrated the value of the RAHS system for networked government and threat anticipation. The second speaker, John L Petersen—one of the two primary RAHS project consultants to Singapore—examined the backdrop against which RAHS became pertinent, as well as provided a number of insights that should be of particular concern to analysts and decision-makers. The third speaker, Dave Snowden—the other primary RAHS project consultant—incorporated a "narrative" approach as well as insights from complex adaptive systems theory, to outline the theoretical underpinnings of RAHS. Snowden also spoke on behalf of Alicia Juarrero and examined the issue of complexity as it relates to RAHS.

The second panel looked at some of the more promising extant RAHS concepts and methods. First, Paul Ormerod proposed that the new techniques drawn from the concept of cognitive maps could be applied to geo-political risk assessment. Second, Paul Saffo outlined a few simple forecasting "rules of thumb", which he opined could be extremely helpful in creating forecasts that are credible and persuasive. Third, Gary Ackerman introduced his concept of the *Threatscape*, which he argued could be an innovative heuristic for organising and conducting threat identification exercises. Fourth, Max Boisot presented the Information-Space or I-Space: a conceptual framework that relates the speed and extent to which knowledge is diffused and structured within a target population. Fifth, Gary Klein argued that conventional solutions to the issue of poor problem detection are inadequate and suggested a reliance on experience, which would allow people to develop and follow hunches systematically.

The third panel focused on the technological aspects of RAHS. The first speaker, Bernardo Huberman, discussed a new methodology called *BRAIN* which uses market dynamics to aggregate and reveal information useful for forecasting future outcomes. The second speaker, John Lowrance, introduced the analytical concept of "structured" arguments, in which the collaborative web-based program *SEAS* was developed to operationalise the idea. The third speaker, Michael Stein, looked at ways in which coherent associations among words and other media annotations can be mined to better understand the content and the interrelationships of the communications and analysis reports. Finally, the fourth speaker, Jeff Jonas, argued that organisations needed to integrate and sustain enterprise perceptions in order to circumvent problems that typically arise from an information-rich operating environment.

The final panel explored the different country and domain options for RAHS. First, Rupert Lewis shared about the U.K's experience with horizon scanning and how the British government had become interested in horizon scanning. Second, Alex Wolfson introduced Nokia's concept of the *WorldMap* and related Nokia's experience with this methodology. Third, Gregory Sherman discussed the utility of Canada's Global Public Health Intelligence Network (*GPHIN*) as a health surveillance tool. Fourth, David Martin examined how an understanding of financial markets could provide a cognitive awareness of unexpected threats, opportunities and networks. Fifth, Heinrich Stuckenschneider introduced Siemens's concept of *Pictures of the Future* and explained how such a concept can be used to anticipate and shape the future.

Other than panel presenters, the symposium also hosted two distinguished lunch addresses by Jaron Lanier and James Surowiecki. While Lanier considered the ways in which technology influences social behaviour to impact security, Surowiecki spoke about the ability of crowds to forecast and assess outcomes accurately, in what he termed as the "wisdom of crowds" phenomenon.

Last but not least, the symposium featured an Open Space Forum (moderated by Jerry Michalski) whereby participants' responses to the thoughtful presentations at IRAHSS 07 were articulated and captured. In particular, these responses were organised according to the following six themes: (i) overcoming mental filters; (ii) scanning for signals; (iii) social structures and dynamics; (iv) balancing the priorities of the "single" versus the "whole"; (v) leveraging on corporate efforts; and (vi) promoting networked government and horizontal sharing.

For more information on the symposium's contents, other than this report, speakers' presentations can be accessed at http://www.rsis.edu.sg/cens/irahss/contents.html.

OPENING REMARKS BY AMBASSADOR BARRY DESKER

AMBASSADOR BARRY DESKER, DEAN OF RSIS

Ambassador Barry Desker, Dean of the S. Rajaratnam School of International Studies (RSIS), warmly welcomed guests and participants of the inaugural International Risk Assessment and Horizon Scanning Symposium.

Ambassador Desker observed that the current threat environment is marked by complexity and uncertainty. Thanks to what the journalist Tom Friedman calls the "democratizations" of finance, information and technology, many nations are becoming increasingly vulnerable to a range of asymmetric threats such as trans-national terrorism, financial shocks, pandemics and supply chain fragility. Indeed, this is a world where events and their impact spread around the globe faster than ever before.

Ambassador Desker noted that one of the most recurrent aspects of human history is the persistence of strategic surprises such as Pearl Harbour, 9/11 and the SARS crisis. The taproots of these intelligence failures are almost always the lack of information sharing among government agencies or what is commonly referred to as "stove-piping" or "silos", as well as rigid mindsets within societies that can only parochially perceive information from one fixed frame of cognitive lenses. It is evident that the traditional responses and mechanisms of national intelligence and security agencies are not enough.

It is in this context that Ambassador Desker introduced the Risk Assessment and Horizon Scanning process or RAHS in short. The RAHS process, as envisioned in the Singapore context, encompasses a unique combination of cutting-edge concepts, methodologies and technological solutions, and aims to provide policymakers with anticipatory knowledge of the nature of potential upcoming issues so risks may be minimized and opportunities maximized. By detecting "faint" signals, networking and linking the various governmental and private agencies, and fostering shared and informed analysis based on methodological diversity, it is envisaged that RAHS will empower people with greater foresight to minimize the possibility of strategic surprises.

OPENING ADDRESS BY DEPUTY PRIME MINISTER PROFESSOR S JAYAKUMAR
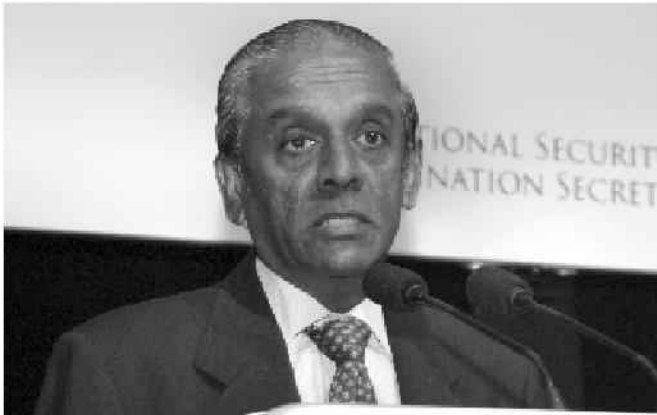
DEPUTY PRIME MINISTER, PROFESSOR S JAYAKUMAR

Professor S Jayakumar, Deputy Prime Minister (DPM), Coordinating Minister for National Security and Minister for Law, noted that historically, for over 15 years, the Singapore Government has been using scenario planning as a useful way to think about the future. However, scenario planning alone does not provide a complete answer or a comprehensive solution, especially in an increasingly global environment. On its own, traditional scenario planning would have had little likelihood of success in anticipating events like a 9/11 or the SARS crisis. For such complex, non-traditional threats, other models and approaches are needed. To this end, a coherent and systematic Risk Assessment and Horizon Scanning (RAHS) framework was initiated. This framework combines complementary approaches to help detect weak signals of major-turning events that could have a serious impact on Singapore.

The RAHS framework is also rooted in a strategic review that Singapore completed in mid 2004. While ever since 9/11, the security baseline for Singapore had been raised considerably in many areas, it was still necessary to prepare the government and the wider society for potential strategic shocks and surprise events like terrorism and SARS. In this regard, RAHS is a process that would help uncover environmental elements that are not obvious from the start, which could be missed by dependence on one particular approach.

Professor Jayakumar emphasized that RAHS hinges critically on a collaborative approach that links ministries and agencies across the government. Indeed, it already has, and will continue to, show promise in connecting silos, challenging mindsets and developing a "need-to-share" instinct. This is in contrast to the "need-to-know" mindset, where departments safeguard information within agency silos. In this way, RAHS has provided a strategic opportunity to change mindsets at the various levels of government and embrace a "whole-of-government" approach. The Deputy Prime Minister ended his speech by noting that the international RAHS symposium would be an excellent medium to share ideas and perspectives that extend the boundaries of knowledge on RAHS. The symposium will also underscore that international cooperation is a critical element in the success of RAHS.

PANEL ONE: SINGAPORE, RAHS AND THE CIVIL SERVICE INITIATIVE

SINGAPORE'S RISK ASSESSMENT AND HORIZON SCANNING PROJECT: AN UPDATE

DR HOW KHEE YIN, DEPUTY DIRECTOR, DSTA

The first speaker, **How Khee Yin** of the Defence Science & Technology Agency (DSTA), started his presentation by tracing the genesis of the RAHS system, highlighting that it was in July 2005 that Singapore started to embark on the development of the system. Noting that the world was becoming increasingly complex and uncertain to operate in, How remarked that analysts require newer and better capabilities to aid their decision-making processes. To this end, the RAHS system was designed to be the technological enabler that would help to network multiple agencies together so as to analyse and make sense of real-world complex issues. In particular, the RAHS system would provide a suite of software services—such as collaborative networking, advanced data analytics, model building, matching and perspective sharing—to help support human analytical processes.

How clarified specifically that the RAHS system is not designed to be a fully automated mechanism whereby data is entered into the system and a "solution" appears at the other end. The system, he noted, can only work if the right questions are being asked—and such questions come from only people, not computers. As such, the human component must remain an ineluctable part of the process, in which the RAHS system is designed to augment human analysts, rather than to replace them.

As to how the system can help the analysts, How said that the system enables analysts to spend less time on non-critical tasks such as "search" functions and devote more time to the more value-added activity of "analysis". The system also enables analysts and other key players to share perspectives and not just information.

The overall operating principle of the RAHS system is that the analyst is never alone. In fact, the analyst is just one click of the mouse away on the launch bar from being part of a larger network both inside and outside of the analyst's own home organisation.

If there is, however, a failure of the RAHS system, How noted that it will not be just a simple matter of technology. Given that the system is designed to be a synergistic effort between human analysts and computers, the two elements must work together in order for the system to be successful.

The projected deadline for the RAHS system to be operational is the end of 2007. The most pressing task at the moment is to ensure that outside agencies and partners are brought into the process as it is being tested. Already, one of the primary testing areas is in the maritime security sector.

RAHS—AN IMPORTANT IDEA WHOSE TIME HAS COME

MR. JOHN L. PETERSEN, PRESIDENT, THE ARLINGTON INSTITUTE

The second speaker, **John L. Petersen** of the Arlington Institute, stated that, as a futurist, he believed that mankind is in a period of epic change. In particular, the origins of an emerging new world had become apparent to him in the mid 1980s when he was working at the National Security Council Staff of the White House. It had seemed to him that with the increasing complexity and interconnection of the milieu in which we live in, there should be some emergent capability that could help deal with large amounts of dynamic information and make sense out of what was going on. Those ideas thus formed the origin of the LISA system and, subsequently, DIANE, which became the core technology underpinning the RAHS system.

Elaborating further on RAHS, Petersen described it as an attempt to develop the capability to monitor large amounts of information from multiple feed sources and to relate these data to "sense" early indicators that point towards the potential emergence of a significant event on the horizon. It is envisioned that the strategic early-warning capabilities of RAHS would help provide analysts with additional time that would be critical in responding to highly disruptive events.

Moving on, Petersen pointed out that there are currently three issues that should be of particular concern to analysts and decision-makers:

1. A convergence of trends is occurring that can cause a major world-level change in as little as six to eight years. These trends include issues such as unprecedented levels of population, explosions of information and knowledge, changes in global climate, energy supply disruptions, the growing sophistication of terrorism, the threat of a global epidemic and a major upset of U.S. financial institutions. The convergence of these trends almost guarantees that there will be strategic surprises.

2. The world is already moving into the third generation of technology and the nature of its future trajectory is still very unclear to most. The first generation of digital and electronic technology was about performing older tasks in a more effective and efficient manner (e.g. the typewriter became the word processor). During the second generation, it was about technologies that could do multi-tasking and combine a series of tasks or functions into one machine. Now, with the onset of the third generation, technology is increasingly allowing people to do things that they had not conceived of in the past.

3. There is an unprecedented level of information sharing and social networking that exists today. It is possible that this may lead to a new global consciousness. Indeed, Petersen wondered if such a trend would lead to the development of a global "brain".

HOW RAHS CAN MAKE NETWORKED GOVERNMENT A REALITY

DR DAVE SNOWDEN, CHIEF SCIENTIFIC OFFICER, COGNITIVE EDGE

The third speaker of the panel, **Dave Snowden** of Cognitive Edge, began by remarking that his own involvement with the basic concepts of the RAHS project dated back some seven years ago, to his previous work with DARPA (Defense Advanced Research Projects Agency) and, in particular, the GENOA II project.

Given that a significant part of the RAHS process is focused on conditions of high uncertainty, where scenario planning and attempts to increase the accuracy of event prediction are inappropriate at best, Snowden argued that the best approach is to ground RAHS with an understanding of the "narrative" and its relation to human cognition, as well as insights from complex adaptive systems theory.

Elaborating further, Snowden noted that more than 98 per cent of human history related to man being hunter-gatherers. In that environment, man communicated and learned through the telling of stories. This was not an existence that could be termed as analytical.

Based on the understanding of how human learning evolved in that environment, Snowden argued that it is most sensible to build systems that people can work with. It does not make sense to build highly idealized systems that may appear to be excellent on the surface but are not designed to allow people to work with them.

Snowden added that one of the problems in dealing with intelligence analysis and policymaking is that there is an underlying assumption that if people see data that is relevant to their problem, they will react to it. The reality, however, is that people are not rational decision makers in that sense. More often than not, people will look at the data in front of them and compare them to what they already know. The knowledge that people hold in their minds is pattern-based and if the new data available do not fit such patterns, they will either reject or ignore them. Essentially, patterns are how people store information, process it and use it to interpret the world around them.

Another major cognitive issue, as pointed out by Snowden, is the problem of retrospective coherence. Put simply, this refers to the proclivity of people to believe that by being able to understand what happened on hindsight, this new "knowledge" can then be used for foresight. Indeed, this is the basis of how most commissions of inquiry work. The problem with that approach, however, is that hindsight does not lead to foresight. While it is possible to "connect the dots" backwards, the ability to do this does not instruct us on how to "connect the dots" forward.

It must also be understood that people tend to learn better from negative experiences and that negative experiences tend to imprint on human learning faster. Snowden explained that this is an issue of survival, in which the avoidance of failure is more important than the imitation of success.

With these perspectives in mind, Snowden opined that the RAHS process is theoretically firmly grounded—in the sense that it is a systematic process of trying to frame the context within which information must be understood.

Reflections on Alicia Juarrero's "Attractors, Parameters and Fitness Landscapes"

Moving on, Snowden spoke on behalf of **Alicia Juarrero** (who was not available) and examined the issue of complexity as it relates to the RAHS process.

In the area of complexity, Snowden noted that while it is evident that environmental patterns can be observed; their outcome cannot be predicted ahead of time. A good analogy to illustrate this point is the formation of snowflakes. Despite all the current knowledge about water and the principles of freezing, the final form of each snowflake is basically unpredictable, other than the fact that it will have six points organised over three axes.

In other words, although it is possible to simulate complex situations, it is virtually impossible to predict their future trajectories. Complex situations are non-causal and they will never happen the same way twice even with what appears to be the same set of variables in play.

In conclusion, perhaps the most important part of the RAHS process is that it is not just about having a huge amount of data or seeing the data. Rather, it is about seeing the patterns that form within the data and working with them. So while it will be impossible to predict discrete events in the future, it is possible to anticipate the type or nature of problems that may emerge.

HOW THE DESIGN OF DIGITAL SYSTEMS INFLUENCES HUMAN BEHAVIOUR IN ORDER TO INCREASE OR DECREASE SECURITY THREATS

MR. JARON LANIER, INTERDISCIPLINARY SCHOLAR-IN-RESIDENCE, UNIVERSITY OF CALIFORNIA, BERKELEY

Jaron Lanier of the University of California, Berkeley, began by stressing that there is a need to observe the social side of technology and to treat crowd behavioural patterns with caution. The Internet, for example, is highly vulnerable to abuses and the virtual environment in which it operates in allows for incivility. It is also the breeding ground for "false crowd wisdom" as individuals behave differently in a virtual environment. In addition, there might be an unhealthy tendency to simply believe what has been posted on the Internet and not critically assess the content of the material.

Lanier then moved on to discuss ways in which technology influences social behaviour to impact security. The first key point that Lanier made is that digital technology tends to be binary in nature. Such a characteristic works well in settings where solutions to problems could be presented in a binary form (e.g. "Yes or No" and "Open or Closed"). That said, in an open-versus-closed system scenario, no one has yet been able to define a stable solution that is neither open nor closed—an "Antigora" in Lanier's words. This might pose a problem to security management: on one hand, closed systems are not economically viable while, on the other hand, open systems

are vulnerable to abuse and could amplify the impacts of "small groups of bad guys".

The second point that Lanier articulated is that crowds are not necessarily good at giving multi-parameter results. Their prediction might not accurately depict reality and could either arrive "too late" or even "too early". For the former, he provided the example of global warming in which the general masses or the market forces cannot be depended on to assess and address its effects. As for the latter, Lanier likened it to a situation where crowds act so fast that chaos occurs as a result. He also warned that when crowds speculate, internally self-fulfilling prophecies might generate as a result—the Netherlands' Tulip Craze of 1936–1937 being a case in point.

Third, there is not enough evidence to either support or prove that economic and human factors breed civility in the Internet world. A myriad of activities occur in the virtual environment and there are as many "kind" online groups as there are "mean" online communities.

Fourth, Lanier speculated that Information Technology (IT) advances in the future might create social instability. Given the phenomenal progress of technology, it is plausible that information might eventually be made fully accessible and free for usage as a result of Moore's Law. He highlighted that when this happens, many interfaces and "Antigoras" may well be made redundant. Ironically, closed systems may even emerge as businesses or social structures that attempt to set boundaries on proprietary work.

In conclusion, Lanier offered the following suggestions for consideration:

- More research on user interfaces that encourage civility should be conducted.
- Governments could encourage the use of such "civil" user interfaces.
- Proposals to fill the "Antigora" gap should be explored.

A NEW APPROACH TO THE ANALYSIS OF GEO-POLITICAL RISK

**DR PAUL ORMEROD, FOUNDING DIRECTOR, VOLTERRA CONSULTING**

The first speaker, **Paul Ormerod** of Volterra Consulting, remarked that in this deeply inter-connected and inter-dependent world of the 21st century, effective geo-political analysis is essential to both governments and multinational corporations. The speed with which information, and thus risk, flows through the global networks puts a premium on an organisation's ability to anticipate future developments and incorporate these developments into the strategic decision-making processes. Unfortunately, though, extant geo-political analysis has had a relatively poor record of success, even over short time scales. Given this current gap, Ormerod argued that new techniques drawn from the concept of cognitive maps should be applied to geo-political risk assessment. Unlike traditional geo-political analysis methods, these techniques are dynamic, incorporating the complex feedback loops of the real world. They produce a series of scenarios that allow agents to test the robustness of their strategies and also to pose a series of "what if" questions.

Ormerod also argued that while the ability to predict shocks to the system has never really transpired, one could perhaps anticipate—that if a shock does happen—where it would have the most impact on the system. By using a limited number of key variables and determining the factors and situations that drive these variables, the location of the shock to the system could be plausibly observed.

To illustrate the applicability of these techniques, Ormerod used the issue of China's long-term stability as a test example. By identifying and mapping four critical variables—the state of the economy, military developments, party dynamics and social unrest—one can locate the points where shocks to the Chinese system would be the most dangerous, and then develop ways to mitigate them. This method also has the advantage of allowing policymakers to easily understand critical and complex situations in a timely manner.

NEVER MISTAKE A CLEAR VIEW FOR A SHORT DISTANCE: SIMPLE RULES FOR EFFECTIVE FORECASTING
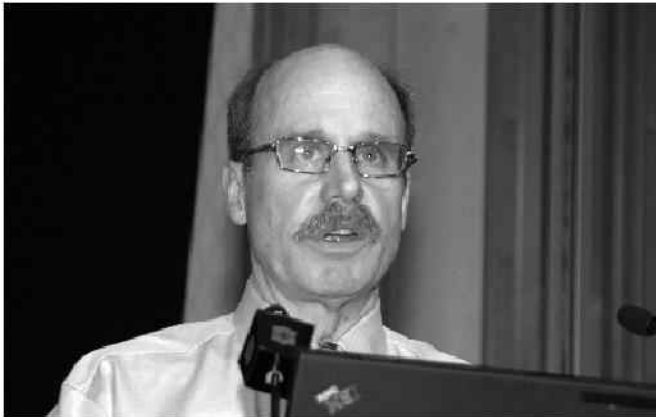
DR PAUL SAFFO, TECHNOLOGY FORECASTER

Paul Saffo, a technology forecaster, noted that forecasters have always struggled to match their predictions to the actual reality. No matter how good the forecast, reality is almost certain to surprise. Worse still, the forecast will be ignored because it is simply too outlandish.

Nevertheless, despite the vast level of uncertainty that forecasters faced, Saffo outlined a few simple rules of thumb, which he opined could go a long way towards helping create forecasts that are credible and which could actually be persuasive enough to move decision-makers to sensible action. Briefly, these precepts are:

- Know when not to forecast
- Go wild
- Change is never linear
- Cherish failure
- Look back
- Hunt for "Prodromes" (early symptoms)
- Be indifferent
- Prove yourself wrong
- Don't be worse than wrong

The basic theme under-girding the nine "rules-of-thumb" is essentially the notion that when limitations of forecasting are recognized and acknowledged, the chances of producing better insights are higher.

MAPPING THE THREATSCAPE

DR GARY ACKERMAN, RESEARCH DIRECTOR, NATIONAL CONSORTIUM FOR THE STUDY OF TERRORISM AND RESPONSES TO TERRORISM

Gary Ackerman of the National Consortium for the Study of Terrorism and Responses to Terrorism began his presentation by noting that there has been much misapplication of existing tools for strategic threat assessment. What is needed, in his view, is a new heuristic for organising and conducting a diligent threat-identification exercise.

With that in mind, Ackerman introduced his concept of the "Threatscape", which he defined as a multi-dimensional possibility space, with axes representing various aspects of future threats such as time, harm agents, malevolent actors, geographic scope and so forth. In that sense, horizon scanning can be conceived as equivalent to the process of mapping the multi-dimensional Threatscape.

Ackerman explained that there are five main guiding principles on understanding the Threatscape and how it will "look". First, an analyst needs a creative mind, as anticipating threats involves both art and science. Indeed, there is a need to maintain multi-perspective thinking at all times as well as exhibit a certain willingness to embrace uncertainty.

Second, the analyst must define the parameters of the threat. For example, is the threat being mapped to a single location or an entire country? In defining the parameters, Ackerman cautioned against reductionism, which may cause the analyst to risk missing interactions with wider system elements. That said, some examples of parameters include dimensions such as time, harm agents, harm precipitators, type of harm and locus of harm.

Third, the analyst should build the Threatscape one dimension at a time (e.g. weapons capabilities versus a time frame), while the fourth and fifth steps involve combining these dimensions and using "seeds" to map the Threatscape. The sixth and the final step is to analyse the Threatscape.

Ackerman concluded his presentation by reminding the audience that the nature of threat morphs over time. As such, if a particular map is to be useful, it must remain dynamic.

THE INFORMATION SPACE

Max Boisot of Birmingham Business School presented the conceptual framework—the Information-Space or I-Space—that explores the speed and extent to which knowledge is diffused and structured within a target population.

According to Boisot, three types of knowledge can flow: embodied knowledge, narrative knowledge and abstract symbolic knowledge. Embodied knowledge is the most limited, flows the least and cannot be widely shared (un-diffused). Narrative knowledge, on the other hand, is considered structured knowledge because it has a context that can be codified and hence can be more widely shared (diffused). The last category is abstract symbolic knowledge, which flows the fastest and most extensively. This type of knowledge is easily shared and codified due to the wide understanding of the symbols connected with it.

Boisot argued that in order to do effective sense-making, it is essential that there is a timely integration of the three types of knowledge into a coherent pattern. But the question is: how is timely integration possible when they each reach different members of the audience at different speeds?

To that, Boisot used the I-Space paradigm to elucidate how knowledge moves from the un-codified and un-diffused realm to the codified and diffused domain that helps it become absorbed. The social learning process essentially starts with scanning, before moving towards problem solving, where codes are developed and knowledge is structured. The structuring in turn allows for greater codification, which permits more diffusion, and, eventually, the knowledge is being absorbed. Meanwhile, the effectiveness and the efficiency of the learning process will be a function of how much prior knowledge different stakeholder groups already share.

Boisot concluded his presentation by emphasizing three key points: (i) there is a need to be diverse in scanning; (ii) there is a need to move away from just scanning codified sources so as to gain better perspectives on contextual issues; and (iii) one should not codify prematurely as a response to anxiety. In other words, uncertainty is to be absorbed into the system.

COGNITIVE ASPECTS OF PROBLEM DETECTION

DR GARY KLEIN, CHIEF SCIENTIST, KLEIN ASSOCIATES (LEFT) & DR MAX BOISOT, PROFESSOR OF STRATEGIC MANAGEMENT, BIRMINGHAM BUSINESS SCHOOL (RIGHT)

The final speaker of the panel, **Gary Klein** of Klein Associates, began by saying that there had been a number of investigative studies on individual and team problem detection. Based on the findings of these studies, Klein noted that there are a number of typical "solutions" that supposedly help mitigate the issue of poor problem detection. These solutions are: (i) to gather more data; (ii) to use information technology to analyse data; (iii) to reduce judgment bias; (iv) to keep an open mind; (v) to appoint an internal "devil's advocate" to challenge orthodox or dominant group thinking; and (vi) to encourage analytical vigilance.

Klein critiqued these so-called "solutions" by noting that the only effect of these approaches is to make analysis and assessment more "comfortable", with no evidence that these approaches have actually led to better results. For example, the strategic failures of Pearl Harbour and 9/11 demonstrated that what is required is actually better analysis, rather than more data. Meanwhile, an over-reliance on technology not only obscures true input-output relationships, it also encourages analytical passivity. Klein also noted that there is no extant evidence to suggest that de-biasing methods actually work while experimental findings reveal that even those who keep an open mind do not necessarily end up with good analytical results. With regards to the "devil's advocate" approach, Klein noted that the process usually ended up with increased support for orthodox opinions as the group ironically feels more confident after incorporating a dissenting element. "Authentic" dissenters are also difficult to clone and if even they exist, they are usually marginalised.

In response to these inadequacies, Klein suggested a reliance on experience, which would allow people to develop and follow hunches. Klein also opined that managers should provide an environment (one that allows the time and space) that encouraged analysts to follow their hunches.

PREDICTING THE FUTURE

Noting that prediction of the future is an important challenge faced by many organisations, **Bernardo Huberman** of Hewlett-Packard presented a new methodology that uses market dynamics to aggregate and reveal information useful for forecasting future outcomes. These are markets where the chief asset is information rather than a physical good.

Calling the methodology "BRAIN", the method identifies participants that have good predictive talents and extracts their risk attitudes via a market mechanism. The participants are then asked to perform forecasting, in which their results would be aggregated in a non-linear fashion, taking into account their earlier evinced risk characteristics.

Huberman argued that the BRAIN methodology could be an extremely useful forecasting tool as it taps into the forecasting potential of the market. The factoring of individual risk attitudes also means that BRAIN can correct for the biases that public information often induces in such forecasting exercises. Indeed, BRAIN induces participants to be truthful while avoiding the pitfalls of small groups.

To test the BRAIN methodology, Huberman said that Hewlett Packard had conducted a series of laboratory and real-world experiments. The results of the experiments evinced that the BRAIN method outperforms both the best predictive individuals and the answers generated by information markets.

STRUCTURED ARGUMENTATION AND BRAINSTORMING BY ANALYST TEAMS

DR JOHN LOWRANCE, PROGRAM DIRECTOR, ARTIFICIAL INTELLIGENCE CENTRE, SRI (LEFT) & DR BERNARDO HUBERMAN, DIRECTOR OF HP INFORMATION DYNAMICS LAB, HP (RIGHT)

The second speaker, **John Lowrance** of Stanford Research Institute (SRI), began by remarking that, over the past 10 years, SRI has been conducting research and development focused on producing software tools to aid teams of intelligence analysts. One of these efforts has been to focus on developing an analytic tool that records the reasoning of analysts in "structured" arguments, thereby making it easier for them to communicate, explain and compare their respective viewpoints. Structured

arguments, according to Lowrance, is a new analytic methodology that records analytic products within simple structures that make them easy to understand and explain both the end product and the lines of reasoning used to reach it.

In order to operationalize the structured-argument methodology, an innovative, collaborative web-based program, known as "SEAS", was developed to enable individuals, groups and organisations to track their lines of thought in analytic products. SEAS also facilitated collective reasoning, allowing multiple analysts to simultaneously contribute to common arguments.

Other than SEAS, Lowrance also revealed that another program, called "Angler", has been developed to support divergent (brainstorming) and convergent (clustering and ranking) thinking through collaborative workshops, with participants spatially and temporally distributed. Angler can be seen as a complementary application that encourages creative thought in comparison to the analytic rigor that SEAS demands.

Lowrance concluded his presentation by highlighting that SEAS is already being used to support intelligence production at a number of U.S. government and commercial sites while Angler is almost ready for transition into production. Together, both applications help to amplify human cognitive thought through collaborative analysis and synthesis of ideas.

COHERENCE DISCOVERY IN TEXT AND RELATIONAL DATA

DR MICHAEL STEIN, SENIOR CONSULTING SCIENTIST, BAE SYSTEMS

Michael Stein of BAE Systems noted that people use word associations to communicate concepts and plans in e-mail and other document types. In addition to words, people also communicate their findings in reports via annotations with other types of media such as maps, drawings, images and audio content.

That said, the coherent associations among words and other media annotations or tags can be mined to better understand the content and the inter-relationships among the real-world subject matter of the communications and analysis reports. Indeed, RAHS requires an effective technique for finding hidden or unknown links within data sets in order to externalize tacit knowledge.

With that in mind, Stein argued that coherence discovery—defined as the use of one category of objects to reveal structure in a related category of objects—can prove to be a useful analytical tool. Through coherence discovery, the analyst will be able to detect sets of words and other associations that map directly to explicit concepts, or indirectly to implicit understandings among the people creating these associations.

Among the various benefits of using coherence discovery, Stein noted that its proper application will result in: (i) the identification of unused queries from changing adversary behaviour or analytic failure; (ii) the generation and sharing of alternative analytic models; (iii) the overcoming of the human tendency to attenuate weak signals (tune out regular and predictable noise); and (iv) better detection of anomalous behaviour by comparing known and anticipated behavioural measures. Indeed, coherence discovery has already been applied in the scanning of e-mail communications and industrial trend reports.

PERPETUAL ANALYTICS: "DATA FINDS THE DATA AND RELEVANCE FINDS THE USER"
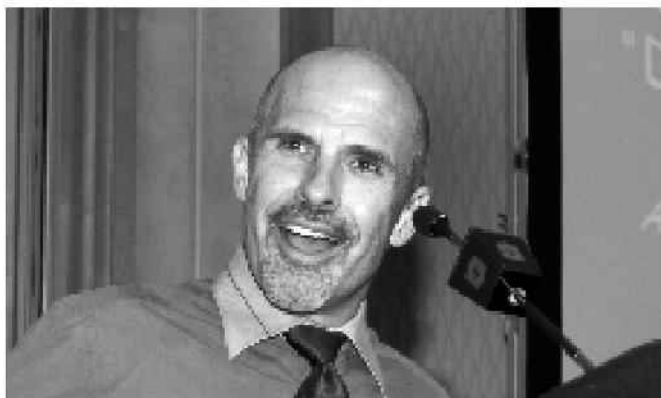
MR. JEFF JONAS, CHIEF SCIENTIST, IBM ENTITY ANALYTICS

The last speaker, **Jeff Jonas** of IBM, began by discussing the problems that typically arise from an information-rich operating environment of organisations that deal with multiple databases of information. The first problem is what he called "enterprise amnesia", which occurs when information in various databases may be related but coded or organised differently. While "enterprise amnesia" can be potentially embarrassing if discovered, it can also lead to tragic consequences, especially when security implications are involved.

The second problem is that of "enterprise un-intelligence", which refers to perceptual isolation during the analytical processes of organisations. Noting that organisations have perceptions, whereby these perceptions happen to be the collected observations that exist across the disparate silos of operational, reference and historical data, Jonas argued that organisations need to integrate new perceptions of the enterprise (or what he called maintaining a persistent context) in real time with historical perspectives. In doing so, Jonas noted that organisations would be able to dramatically reduce false positives and improve the detection of weak signals. Jonas also recommended that organisations process every piece of new data first as a new query.

Finally, Jonas discussed the role of information anonymisation to better share sensitive and private information across databases so as to overcome enterprise amnesia whilst at the same time respecting the privacy of individuals. Jonas remarked that if information can be shared in an anonymised form where the same material result can be achieved, it would not become sensible for an organisation to share information in any other way.

THE WISDOM OF CROWDS: USING COLLECTIVE INTELLIGENCE IN FORECASTING AND ASSESSMENT

MR. JAMES SUROWIECKI, STAFF WRITER, THE NEW YORKER

James Surowiecki of The New Yorker presented on the ability of crowds to forecast and assess outcomes accurately. According to him, the "wisdom of crowds" could be depended on for reliable predictions of the future. Indeed, under the right circumstances, the collective intelligence of a group of individuals could be higher than the smartest person among them.

Surowiecki asserted that organisations could radically improve their ability to solve problems, make forecasts and think strategically by tapping into the collective wisdom of their workplace. To corroborate his arguments, Surowiecki noted that in Jack Treynor's classical jellybean experiment, for instance, only one out of a total of 56 people were able to guess accurately the number of jellybeans in a jar. On the other hand, when the participants came as a group, they did better and were able to give an estimate that was extremely close to the actual number of jellybeans. In another example, audiences of the show "Who Wants to be a Millionaire?" were able to choose the right answer 91 per cent of the time compared to individual experts who only elicited the correct result 65 per cent of the time.

While these examples show the impact of the "wisdom of the crowds", Surowiecki also cautioned that the right conditions should be in place before crowd wisdom can work.

First, cognitive diversity is necessary for better group intelligence as a variety of perspectives and problem-solving heuristics contribute to more informed decisions and accurate predictions. In an experiment conducted by Page and Hong[1], two groups of computer agents were given a challenging problem to solve. The group that performed best was not the one that was solely made up of the best problem-solvers. On the contrary, it was the group that was most randomly assembled and made up of the most diverse collection of individuals that produced the better results. The results of the experiment therefore showed that it was the differences in perspectives that enhanced the quality of problem solving rather than the judgments of the best experts.

Second, there should be independence and aggregation of decentralized information. For group decision or prediction to be meaningful and accurate, Surowiecki stressed that disagreement and dissent should be encouraged. When people are "too connected" to one another, Surowiecki warned that it may result in herding and imitative behaviour and thereby circumvent the positive effects of diversity. On this note, Surowiecki added that leaders should try to limit their own influences and not shape group decisions to fit their own problem-solving framework. Information should be allowed to flow and not derived from a centralized location.

Having delineated the conditions in which crowd wisdom can flourish, Surowiecki went on to note that even small groups can be smart. In fact, according to a Blinder and Morgan study[2], small groups were not only able to decide faster; they were also able to guess correctly the outcomes of several events more than 80 per cent of the time. What is more, the collective intelligence of small groups can also be tapped to circumvent and even remedy some of the problems created by bureaucracies. Surowiecki thus suggested that a variety of aggregation mechanisms should be adopted to help small groups maximize their potential.

1   Scott Page & Lu Hong, "Problem Solving by Heterogeneous Agents" in Journal of Economic Theory, 97, 2001, pp. 123–163.
2   Alan S. Blinder & John Morgan, "Are Two Heads Better Than One? Monetary Policy by Committee" in National Bureau of Economic Review Working Paper 7909, 2000.

PANEL 4: COUNTRY AND DOMAIN OPTIONS FOR RAHS

HORIZON SCANNING: CREATING PUBLIC VALUE IN THE U.K. ENVIRONMENT

DR RUPERT LEWIS, HEAD, UK NATIONAL HORIZON
SCANNING CENTRE (RIGHT) AND MR. ALEX WOLFSON,
SENIOR MANAGER, NOKIA (LEFT)

Rupert Lewis of the National Horizon Scanning Centre, U.K., defined horizon scanning as the systematic examination of potential threats, opportunities and likely developments including but not restricted to those at the margins of current thinking and planning. Horizon scanning may also explore novel and unexpected issues as well as persistent problems or trends.

Interestingly enough, Lewis noted that one of the more ironic problems of horizon scanning is that it is called "horizon scanning". In other words, to experienced civil servants under efficiency pressures and rising delivery expectations, processes that sound like a new management fashion very often only serve to elicit scepticism.

That said, Lewis maintained that there was a genuine interest in horizon scanning within the British government stemming from the experience of the mad cow disease , the foot-and-mouth crisis, as well as the genetically modified food debate. This interest led to the establishment of the U.K. Horizon Scanning Centre, which adopted a mixed model of scanning with the Sigma (a synthesis of best global futures work) and Delta (cutting-edge perspectives of over 250 science and technology experts) methods.

Lewis was pleased to share that press reports on the launch of the centre's scanning methodology have been, by and large, positive. However, Lewis was keen to stress that success for any form of horizon scanning—irrespective of its capabilities—requires analysts to work in close cooperation with clients. It is only by continually interacting with clients that an effective horizon-scanning model can be built and its output promoted.

Lewis concluded by maintaining that the future of successful horizon scanning lies not solely with government participation but also that of businesses and citizens as well.

FIVE YEARS OF FORESIGHT IN HINDSIGHT: LESSONS LEARNED FROM THE NOKIA WORLDMAP PROJECT

Following Lewis, **Alex Wolfson** of Nokia shared about Nokia's experience with its WorldMap methodology—employed to reveal future trends in its industry. Briefly, the Nokia WorldMap compiles trends and disruptions in its related macro environment that are of the highest potential impact to Nokia in the next five years in order to: (i) raise awareness about these trends; (ii) challenge Nokia orthodoxies; (iii) stimulate out-of-the-box thinking; and (iv) identify new business opportunities.

Wolfson shared that Nokia started planning its first WorldMap some six years ago in 2001. While Nokia has always kept in mind the fact that it will be impossible to build a WorldMap that is "the exactly right one", it was only recently that the organisation began to see what had been the value and the impact of the process, and where Nokia can seek to improve.

In that light, what has risen to be the biggest challenge has not been about the identification of relevant trends or which trends have been fairly successful, but rather the lack of appropriate action in the company. Many relevant issues can fall between management layers: areas are either too narrow for the most senior executives or out of scope for middle management to address. Future trend spotting does not always get converted into a business opportunity even though some trends are evidently easier to capitalise on than the others.

Wolfson concluded his presentation with the view that good foresight has to be coupled with good management. Among the many things that have to be taken into consideration, it is important that senior management be convinced of the utility of a strategic foresight programme. Finally, groups that are able to take the trends forward have to be pre-identified.

TEMPERING INNOVATION WITH REALITY: RAHS AND PUBLIC HEALTH

DR GREGORY SHERMAN, SENIOR HEALTH ARCHITECT, OFFICE OF PUBLIC HEALTH PRACTICE, CANADA (RIGHT) AND DR DAVID MARTIN, CEO, M.CAM.INC (LEFT)

The third speaker, **Gregory Sherman** of the Office of Public Health Practice, Canada, noted that the health domain is unique in the sense that it is a business like no other. It involves, in many ways and at many times, every person on the planet. It is also complicated and complex in ways that no other realm of human activity can claim. For public health, it is not so much about gathering information from all relevant locations but rather, resolving to know about the information as soon as possible and sorting it out from the noise.

Moving on, Sherman then discussed the utility of the Global Public Health Intelligence Network (GPHIN) as a health-surveillance tool. Noting that GPHIN has received a reawakening of interest with the emergence of the bio-terrorism threat, Sherman was of the view that GPHIN's success should be measured by the time it takes in threat detection.

That said, while the rapidity of GPHIN's health intelligence could be improved through, for example, increasing its sources and having greater context, there remains a need to develop a clearer understanding of the concept of risk. For Sherman, a key cornerstone of any successful RAHS programme has to be a sound comprehension of issues such as the degree of acceptable risk as well as how the society is able to mitigate these risks.

FUSION ECONOMY ARBITRAGE: HOW TENDER IS "LEGAL TENDER" IN THE GLOBAL ECONOMY? SUSCEPTIBILITY OF MARKETS TO NON-ALIGNED MORPHOGENETIC PERTURBATIONS

David Martin of M.CAM began his presentation by stating that an understanding of financial consequences of events provides a cognitive awareness of unexpected threat emergence, opportunity emergence, network emergence and a reconstitution of "knowledge" networks and their participants. As such, Martin argued that an analysis of global finance could be highly applicable to RAHS.

To illustrate this, Martin investigated the practice of arbitrage (how financial markets engineer positions to win in upward and downward trending market conditions) in the case studies of the U.S. anthrax attacks in 2001, government procurement of unmanned air and underwater vehicles and the collateralized debt obligations of banks in the global financial markets. According to Martin, these case studies showed that an analysis

of financial markets produced results expressed in terms of unexpected threats, opportunities and networks.

Martin concluded his presentation by emphasizing three key points for RAHS success and scaling. First, financial markets have pioneered awareness in multi-disciplinary data and validated the utility of horizon scanning. Second, the issue of diversification of RAHS applications will reinforce the need for the integration of dynamic, automated collections and analysis to surface network perturbations of consequence before human experts recognize them—in what Martin termed "cognogentive intentional networks". Lastly, successful horizon-scanning practitioners need to have domain as well as behavioural expertise rather than one or the other.

PICTURES OF THE FUTURE

DR HEINRICH STUCKENSCHNEIDER, VICE PRESIDENT, SIEMENS CORPORATE TECHNOLOGY GROUP

In the final presentation of the panel, Heinrich Stuckenschneider of Siemens discussed the idea of Pictures of the Future (POF), a method that technological company Siemens uses to both anticipate and shape the manner in which future society will utilize technology. Broadly speaking, POF has three main goals: (i) to envision the impact of current developments on mainstream business; (ii) to identify and prioritize key

technologies; and (iii) to communicate topics of interest to the society and customers.

Stuckenschneider explained that the basic idea behind POF was the notion that while people cannot predict the future, people can certainly "invent" it. As pure predictions have a small chance to precisely match future realities, the POF concept tries to turn the situation around: trends and developments are used to create a "picture of the future" which describes an attractive but realistic future scenario. This scenario will then form a basis for a wide variety of goals to eventually realize the POF.

Indeed, literal illustrative pictures of the future are formed from the combination of extrapolation from the present coupled with the "retropolation" (backwards projection) from scenarios of the future. These pictures are then presented to relevant groups within Siemens in order for them to better plan their strategy for the future evolution of their business.

Stuckenschneider ended his presentation by quipping that since we will one day live in the future, we should take active steps to shape it now.

The Open Space Forum (OSF)—an interactive and dynamic process whereby participants are encouraged to come forward with ideas and thoughts relating to RAHS—was held during the symposium. The moderator of the symposium was Jerry Michalski. The pertinent conclusions of the OSF are detailed in this section.

MR. JERRY MICHALSKI, PRESIDENT, SOCIATE

The OSF threw up a number of interesting themes in which a variety of worthy ideas and insights followed. These themes and related conclusions are as follows.

1. How does one overcome mental filters in RAHS?

The discussants highlighted the fact that embedded decision-making models (often the result of past successes that have been institutionalized) sometimes filter out answers too quickly, or put the brakes on promising avenues of inquiry. There is also what is called the "Competence Trap", in which analysts or leaders who feel that they are highly competent often overlook things. Seniority structures in organisations can also have similar ill effects.

To effectively circumvent the problems of mental filters, a number of solutions were proposed. First, small group storytelling sessions could be implemented. It was envisaged that the small group characteristics of these sessions would provide a more conducive environment for sharing. The model for the Swedish military, for instance, included no more than seven people at a time.

Second, the "Six Thinking Hats"[3] model of Edward De Bono could be adopted as a cognitive technique, in which the six "hats" represent six different modes and directions of thinking to be applied.

Third, overcoming mental filters may not be entirely possible given that humans are primarily beings who employ cognitive

constructs that are pattern-based. In that case, what is more feasible is to tune, rather than overcome, these filters. As such, the key is to develop the capability to match the relevant filters to the appropriate situations.

2. How does one decide what signals to look for during scanning?

Given that people are constantly swamped with data, it is important that the scanning process identifies the "right" signals to focus on. In this regard, a number of propositions have been suggested that might help identify the relevant signals to search. First, one can use a repertoire of templates to see which ones best fit the incoming data and then use the relevant templates as guides. Second, one can choose to identify the greatest vulnerabilities. Third, adversarial systems could be closely monitored to ascertain the true levels of risk posed and their possible impacts.

3. What social structures and dynamics can help increase the probability of success in RAHS?

With regards to this theme, the discussants agreed that a networked government would go a long way in promoting the circulation and sharing of information. At the same time, however, a certain amount of confidentiality should be embedded into the system to protect the privacy of the user as well as to encourage more truthful responses. Senior management staff also needs to set the "right" tone by taking the lead in breaking down silos between agencies. Lastly, it was noted that informal networks could actually prove to be a very powerful collaborating mechanism due to the less "intimidating" nature of its communication.

4. How does one balance the priorities of the "single" versus the "whole" in terms of intelligence sharing?

The discussants suggested that secondments—a way to move people throughout cross-organisational platforms while preserving the linkages with their parent organisation—could be a viable solution. The temporary movement of people across multiple agencies would enable them to see the "big picture" perspective while at the same time maintaining a sense of the "local" issues. Furthermore, given that secondment links people from different organisational backdrops, the chances of eliciting fresh perspectives to plug existing intelligence gaps are higher. That said, the discussants opined that secondments should not be too long, as a lengthy embedding period would only serve to "re-localize" the seconded staff into the new organisational milieu.

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3 Edward De Bono, Six Thinking Hats, (Back Bay Publishers: 1999)

5. How do governments leverage on corporate efforts to augment RAHS?

Noting that the success of RAHS is also about the incorporation of the private sector into the RAHS process, the discussants concurred that it is necessary that governments do not neglect the RAHS potential of the corporate realm. Indeed, industrial efforts in terms of RAHS have already been relatively established, with major companies such as Hewlett-Packard, Shell, IBM, Nokia and Siemens all introducing some form of the RAHS-like processes into their strategic decision making.

While governments can certainly look towards linking up with private companies with established strategic foresight programmes, it is recommended that the locus of possibilities be widened to include all kinds of organisations (even those with non-profit or altruistic agendas). The discussants also cautioned against forging over-regimented public-private relationships in which companies only tie in with the governmental RAHS process due to legislative requirements. Flexibility is the key.

6. How can RAHS be leveraged to promote networked government and horizontal sharing of information?

The discussants agreed that a common issue area for collaboration should be identified. That said, the size and complexity of modern bureaucracies makes it hard for lateral communication to take place. As such, what is needed is to create social networks or human interfaces to bridge the gaps between institutional stovepipes.

The discussants also noted that it usually takes a crisis situation to precipitate a whole-of-government response. While it may be too late to wait for the next crisis in order to elicit a comprehensive and integrated governmental effort, it remains possible to build networking and collaboration around current pressing issues (such as terrorism, global warming or demographic shifts). Finally, organised sabbaticals to rotate "fresh eyes" within and across governmental agencies could be implemented. In particular, institutionalized rotating stints can help people focus on a "national"-level perspective as well as foster greater inter-agency relationships and understanding.

HEAD OF CIVIL SERVICE, MR. PETER HO

Mr. Peter Ho, Head of Singapore Civil Service and among other things, Permanent Secretary for National Security and Intelligence Coordination, thanked the attendees and speakers for participating in an invigorating and successful two-day symposium.

Mr. Ho commented that RAHS is really about a journey of discovery, in which the IRAHS symposium represents a first step in the journey of a thousand miles. So as a follow-up to the symposium, there will be a series of follow-on workshops that will focus on specific areas such as networked government, national resilience, pandemic surveillance and risk management. It is envisaged that the knowledge gained from these workshops would help shape the next IRAHS symposium.

Mr. Ho also highlighted two other areas in which RAHS will be further advanced. The first area relates to the work of CENS. Specifically, CENS will help to: (i) map out the landscape of RAHS concepts and methods and suggest possible new approaches to focus upon; (ii) broaden the awareness of RAHS and establish a training and education programme which will inform about the value of RAHS to strategic planning and collaboration; and (iii) inaugurate a new future studies programme that will help place RAHS in a broader strategic planning and networked government setting.

The second area relates to the recently announced RAHS Experimentation Centre (REC) and its forthcoming dynamic experiments. Among the various collaborative experiments being planned, they include: (i) proof of concept on data anonymisation with IBM; (ii) using the RAHS system to anticipate maritime security threats with US Joint Forces Command and MINDEF's Future Systems Directorate; (iii) testing the applicability of RAHS in the detection of threats in Operations Other Than War with Swedish Defence Research Agency, FOI; and (iv) collaborative work with US Office of Naval Research, Hewlett-Packard and Carnegie Mellon University.

Mr. Ho concluded by reiterating that RAHS is a process of discovery and that while there may be twists and turns, he is confident that RAHS will move in a forward direction.

Rapporteurs:
Thomas Quiggin, Norman Vasu, John Harrison, Ng Sue Chia

Edited by:
Hoo Tiang Boon and Kumar Ramakrishna

DAY ONE - 19 MARCH 2007 (MONDAY)

0900   Opening Remarks by Ambassador Barry Desker, Dean, S. Rajaratnam School of International Studies, Nanyang Technological University

0905   Opening Address by Professor S Jayakumar, Deputy Prime Minister, Coordinating Minister for National Security and Minister for Law

0920   Overview of Technology Showcase

0925   Coffee/Tea Break

Panel One -   **Singapore, RAHS and the Civil Service Initiative (Tower A Conference Room)**

1010   Explanation of Open-Space Forum by Jerry Michalski, President, Sociate

1020   RAHS video presentation

1030   Introduction by Richard Lim, Chief Executive, Defence Science and Technology Agency (DSTA)

1040   How Khee Yin (Deputy Director, DSTA)
Singapore's Risk Assessment and Horizon Scanning Project - An Update

1110   John L. Petersen (President, The Arlington Institute)
RAHS - An Important Idea Whose Time Has Come

1130   Dave Snowden (Chief Scientific Officer, Cognitive Edge)
How RAHS Can Make Networked Government a Reality

1150   Dave Snowden (Chief Scientific Officer, Cognitive Edge)
Reflections on Alicia Juarrero's "Attractors, Parameters and Fitness Landscapes"

1200   Q&A Chaired by Moderator

1220   Break for lunch

IBM Distinguished Lunch Address (Katong Room)

Jaron Lanier (Interdisciplinary Scholar-in-Residence, University of California, Berkeley)

How the Design of Digital Systems Influences Human Behavior In Order to Increase or Decrease Security Threats

Moderator: Assoc Professor Kumar Ramakrishna, Head, Centre of Excellence for National Security, S. Rajaratnam School of International Studies, Nanyang Technological University

Panel Two -   **RAHS Concepts and Methods (Tower A Conference Room)**

1400   Introduction by Ambassador Lam Chuan Leong, Ambassador-at-Large, Ministry of Foreign Affairs, Singapore

1410   Paul Ormerod (Founding Director, Volterra Consulting Inc.)
A New Approach to the Analysis of Geo-Political Risk

1430   Paul Saffo (Technology Forecaster)
Never Mistake a Clear View for a Short Distance: Simple Rules for Effective Forecasting

1450   Gary Ackerman (Director, Centre for Terrorism and Intelligence Studies)
Mapping the Threatscape

1510   Coffee/Tea Break

1540   Max Boisot (Professor of Strategic Management, Birmingham Business School)
The Information Space

1600   Gary Klein (Chief Scientist, Klein Associates)
Cognitive Aspects of Problem Detection

1620   Q&A Chaired by Moderator

1640   Open-Space Forum, moderated by Jerry Michalski, President, Sociate

1800   End of Day One

DAY TWO - 20 MARCH 2007 (TUESDAY)

Panel Three - Technology and RAHS
(Tower A Conference Room)

0930	Introduction by John M. Poindexter (Consultant, JMP Consulting)
0940	Bernardo Huberman (Senior HP Fellow and Director of Information Dynamics Lab, Hewlett-Packard) *Predicting the Future*
1000	John D. Lowrance (Program Director, Artificial Intelligence Center, Stanford Research Institute) *Structured Argumentation and Brainstorming by Analyst Teams*
1020	Coffee/Tea Break
1050	Michael Stein (Senior Consulting Scientist, BAE Systems) *Coherence Discovery in Text and Relational Data*
1110	Jeff Jonas (Distinguished Engineer and Chief Scientist, IBM Entity Analytics) *Perpetual Analytics: "Data Finds the Data and Relevance Finds the User"*
1130	Q and A Chaired by Moderator
1200	Break for Lunch

HP/Intel Distinguished Lunch Address
(Katong Room)

James Surowiecki (*The New Yorker Magazine*)

"The Wisdom of Crowds": Using Collective Intelligence in Forecasting and Assessment

Moderator: Assoc Professor Ralf Emmers, Head of Studies, S. Rajaratnam School of International Studies, Nanyang Technological University

Panel Four - Country and Domain Options for RAHS
(Tower A Conference Room)

1340	Introduction by Chan Heng Kee, Dean and CEO, Civil Service College, Singapore
1350	Rupert Lewis (Head, National Horizon Scanning Centre, Department of Trade and Industry, UK) `Horizon Scanning – Creating Public Value in the UK Environment`
1410	Alex Wolfson (Senior Manager, Nokia), *Five Years of Foresight in Hindsight: Lessons Learned from the Nokia WorldMap Project*
1430	Gregory Sherman (Senior Health Architect, Office of Public Health Practice, Canada) *Tempering Innovation with Reality: RAHS and Public Health*
1450	Coffee/Tea Break
1520	David E. Martin (Founding CEO, M.CAM Inc.) *Fusion Economy Arbitrage: How Tender is "Legal Tender" in the Global Economy? Susceptibility of Markets to Non-Aligned Morphogenetic Perturbations*
1540	Heinrich Stuckenschneider (Vice President, Corporate Technology Group, Siemens) *Pictures of the Future*
1600	Session Chaired by Moderator
1630	Conclusions of Open-Space Forum by Jerry Michalski, President, Sociate
1645	Closing Remarks by Peter Ho, Head of Singapore Civil Service and Permanent Secretary (National Security and Intelligence Coordination)
1700	End of Symposium

About CENS

The Centre of Excellence for National Security (CENS) is a research unit of the S. Rajaratnam School of international Studies (RSIS) at Nanyang Technological University, Singapore. Established on 1 April 2006, CENS is devoted to rigorous policy-relevant analysis of a range of national security issues. The CENS team is multinational in composition, comprising both Singaporean and foreign analysts who are specialists in various aspects of national and homeland security affairs.

Why CENS?

In August 2004, the Strategic Framework for National Security outlined the key structures, security measures and capability development programmes that would help Singapore deal with trans-national terrorism in the near and long term.

However, strategizing national security policies requires greater research and understanding of the evolving security landscape. This is why CENS was established to increase the intellectual capital invested in strategizing national security. To this end, CENS works closely with not just other RSIS research programmes but also national security agencies such as the National Security Coordination Secretariat within the Prime Minister's Office.

What Research Does CENS Do?

CENS currently conducts research in three key areas of national security:

- Risk Assessment / Horizon Scanning

  The art and science of detecting "weak signals" emanating from the total security environment so as to forewarn policymakers, the private sector and the public about approaching "shocks" such as terrorism, pandemics, energy crises and other easy-to-miss trends and ostensibly distant events.

- Social Resilience

  The capacity of globalised, multi-cultural societies to hold together in the face of systemic shocks such as diseases and terrorist strikes.

- Transportation Security

  The security of land-based, aviation and maritime transport networks and, increasingly, the total supply chain vital to Singapore's economic vitality.

How Does CENS Help Influence National Security Policy?

Through policy-oriented analytical commentaries and other research output directed at the national security policy community in Singapore and beyond, CENS staff members promote greater awareness of emerging threats as well as global best practices in responding to these threats. In addition, CENS organises courses, seminars and workshops for local and foreign national security officials to facilitate networking and exposure to leading-edge thinking on the prevention of, and response to, national and homeland security threats.

How Does CENS Help Raise Public Awareness of National Security Issues?

To educate the wider public, CENS staff members regularly author articles in a number of security- and intelligence-related publications, as well as write op-ed analyses in leading newspapers. Radio and television interviews have allowed CENS staff to participate in and shape the public debate on critical issues such as risk assessment and horizon scanning, multi-culturalism and social resilience, intelligence reform and defending critical infrastructure against mass-casualty terrorist attacks.

How Does CENS Keep Abreast of Cutting-edge National Security Research?

The lean organisational structure of CENS permits a constant and regular influx of Visiting Fellows of international calibre through the Distinguished CENS Visitors Programme. This enables CENS to keep abreast of cutting-edge global trends in national security research.

For more information on CENS, log on to www.rsis.edu.sg and follow the links to "Centre of Excellence for National Security".

ABOUT RSIS

The S. Rajaratnam School of International Studies (RSIS) was established in January 2007 as an autonomous school within Nanyang Technological University. RSIS's mission is to be a leading research and graduate teaching institution in strategic and international affairs in the Asia Pacific. To accomplish this mission, it will:

- provide a rigorous professional graduate education in international affairs with a strong practical and area emphasis;
- conduct policy-relevant research in national security, defence and strategic studies, diplomacy and international relations; and
- collaborate with like-minded schools of international affairs to form a global network of excellence.

Graduate Training in International Affairs

RSIS offers an exacting graduate education in international affairs, taught by an international faculty of leading thinkers and practitioners. The Master of Science (M.Sc.) degree programmes in Strategic Studies, International Relations and International Political Economy are distinguished by their focus on the Asia Pacific, the professional practice of international affairs and the cultivation of academic depth. Over 120 students, the majority of whom from abroad, are enrolled in these programmes. A small, select Ph.D. programme caters to advanced students whose interests match those of specific faculty members. RSIS also runs a one-semester course on "The International Relations of the Asia Pacific" for undergraduates in NTU.

Research

RSIS research is conducted by five constituent institutes and centres: the Institute of Defence and Strategic Studies (IDSS, founded in 1996), the International Centre for Political Violence and Terrorism Research (ICPVTR, founded in 2002), the Centre of Excellence for National Security (CENS, founded 2006), the Centre for the Advanced Study of Regionalism and Multilateralism (CASRM, founded in 2007) and the Consortium of Non-traditional Security Studies in ASIA (NTS-Asia, founded in 2007). The focus of research is on issues relating to the security and stability of the Asia-Pacific region and their implications for Singapore and other countries in the region. The S. Rajaratnam Professorship in Strategic Studies brings distinguished scholars and practitioners to participate in the work of the Institute. Previous holders of the Chair include Professors Stephen Walt, Jack Snyder, Wang Jisi, Alastair Iain Johnston, John Mearsheimer, Raja Mohan and Rosemary Foot.

International Collaboration

Collaboration with other professional schools of international affairs to form a global network of excellence is a RSIS priority. RSIS will initiate links with other like-minded schools so as to enrich its research and teaching activities as well as adopt the best practices of successful schools.

ABOUT NSCS

The National Security Coordination Secretariat (NSCS) was set up in the Prime Minister's Office in July 2004 to facilitate national security policy coordination from a whole-of-government perspective. NSCS reports to the Prime Minister through the Coordinating Minister for National Security (CMNS). The current CMNS is Deputy Prime Minister Professor S. Jayakumar, who is also Minister for Law.

NSCS is headed by the Permanent Secretary of National Security and Intelligence Coordination. The current PS(NSIC) is Mr Peter Ho, who is concurrently Head of the Civil Service and Permanent Secretary for Foreign Affairs.

NSCS provides support to the ministerial-level Security Policy Review Committee (SPRC) and senior-official-level National Security Coordination Committee (NSCCom) and Intelligence Coordinating Committee (ICC). It organises and manages national security programmes, one example being the Asia-Pacific Programme for National Security Officers. NSCS also funds experimental, research or start-up projects that contribute to our national security.

NSCS is made up of two components: the National Security Coordination Centre (NSCC) and the Joint Counter-Terrorism Centre (JCTC). Each centre is headed by a director.

NSCC performs three vital roles in Singapore's national security: national security planning, policy coordination and anticipating strategic threats. As a coordinating body, NSCC ensures that government agencies complement each other and do not duplicate or perform competing tasks.

JCTC is a strategic-analysis unit that compiles a holistic picture of terrorist threat. It studies the levels of preparedness in areas such as maritime terrorism and chemical, biological and radiological terrorist threats. It also maps out the consequences should an attack in that domain take place.

More information on NSCS can be found at www.nscs.gov.sg

ABOUT DSTA

The Defence Science & Technology Agency (DSTA) was established on 15 March 2000 as the first statutory board of the Ministry of Defence (MINDEF). Its mission is to harness and exploit science and technology for the defence and security of Singapore.

DSTA manages complex defence science and technology programmes and conducts research and development in multi-disciplinary areas ranging from engineering to information technology.

DSTA taps cutting-edge technologies—whether military or commercial—and fosters an environment of creativity and innovation in developing defence applications. It also helps to promote a strong community of scientists and engineers from universities, research institutes, government and industry to meet the nation's defence and security needs.

For more information on DSTA, please visit www.dsta.gov.sg.