Report on
IPS-CSC Forum on "Enhancing Public Service Through Policy Automation"
Part II

By

Tan Simin, IPS Research Associate

and

Arun Mahizhnan, IPS Deputy Director

In the last issue, we introduced the fundamentals of policy automation technology, which is defined as "the use of computer systems to automate the interpretation and application of policies", and explained how the deployment of such technology could help improve the service delivery process through automation, and the use of natural language in policy automation suites. We also looked at a case study of how policy automation technology has helped the New South Wales government better implement its child protection policies and enable caregivers to better determine if a certain child is in need of help.

In this issue, we look at three other case studies that showcase the use of policy automation technology in the fields of healthcare, talent management and the management of Singapore's national electricity market. A summary of the Forum's discussion session also follows.

Policy Automation in Hospitals

Mr Ho Khai Leng, Group Director of Integrated Healthcare Information Systems (IHIS), spoke on the application of policy automation in Singapore healthcare. The two key clients of IHIS are the National Healthcare Group (NHG) and the National University Health System (NUHS). The NHG is an integrated network of nine primary healthcare polyclinics, acute care hospitals (e.g. Tan Tock Seng Hospital) and national speciality centres such as the National Skin Centre, with a total staff of about 9,000. The NUHS is comprised of the National University Hospital, the medical and dentistry teaching schools, as well as research centres such as the National University Cancer Institute and the National University Heart Centre. The staff strength of NUHS stands at about 7,000.

Compared to the hospitals of the past, the "Digital Hospital" which has arisen from the innovations of the past decade no longer has to contend with hard copy documents that require processing, storage and transportation. Instead, the Digital Hospital of today has

benefited from technological breakthroughs that have enhanced consultation rooms and laboratories with clinical systems for filing and easy access, as well as transmission to other parts of the hospital. Diagnostic imaging can now be performed through electronic devices connected to the clinical system.

Technology is now so advanced, Mr Ho said, that business rules can be applied in the day-to-day care of patients. The key advantage of using policy automation in clinical decision support systems, he said, is that one could define within the system "sentinel events", which are preventable occurrences which may have an adverse effect on a patient (such as severe drug reactions), for the physician's reference. Finally, the use of policy automation also allows the hospital to track the outcome of a patient and to share pertinent information on the case with other clinicians. The result is an improvement in the clinical process as well as clinical outcome through documentation and follow-up.

There have been at least two successful implementations of policy automation in Singapore hospitals. The first system, called ARUS-C (Anti-microbial Resistance and Utilisation Surveillance and Control), was developed to implement hospital-wide guidelines on the use of antibiotics. The system provides electronic decision support for the prescription of antibiotics in order to reduce unnecessary and inappropriate antibiotic use. The system also tracks antibiotic use and its effect on patients, and allows for the the monitoring of clinicians' compliance. The system, which was implemented in Tan Tock Seng Hospital, has seen shorter patient recovery periods. The second was the Adverse Drug Events Alert and Surveillance System, or ADEAS, which was designed to improve the safe use of medication through the detection of medication error and Adverse Drug Events. The system works by automating the detection process through the congregation and cross-matching of electronic medication orders, laboratory results and diagnosis codes, patient demographics and medical records, a process that is made possible by computer algorithms. This allows doctors to write better prescriptions based on the peculiar circumstances of the patient.

Challenges /Learning Points

Mr Ho also related some challenges or learning points that were encountered in the process of PA implementation. First of all, there was the issue of governance. Clinical rules are neither legislated nor published, so some amount of consultation was necessary in order to have the appropriate and scientifically-proven rules laid into the system. There was also a question of who would oversee the rules, as medicine is a multidisciplinary field and a position of responsibility to oversee medical input, and to ensure that it is not contradictory, is needed. Second, there was the issue of clinical challenges. Biological systems are complicated, and clinicians are required to consider a whole host of factors in the process of

decision-making, such as a patient's symptoms, medical history and genetics, along with the historical and geographical trends of disease occurrence and published data on medicinal effectiveness. Lastly, there was the issue of maintenance. Rules have to be kept current, and care must be taken so that rules do not conflict with each other.

Policy Automation in Government: Managing Foreign Talent

Ms Ang Mui Kim, Director of Information Systems and Technology Department at the Ministry of Manpower (MOM) and also Director of the Economic Cluster at the Infocomm Development Authority of Singapore, spoke on the Employment Pass Online (EPOL) system. The MOM is responsible for the entire workforce in Singapore, providing advisory support to local firms, handling employer-employee disputes and managing the foreign workforce in Singapore across different industries. The Ministry is also responsible for workplace safety and health.

A system is needed to bring in "the right talents" with the needed skill sets for the promotion of targeted industries and Singapore's future economic growth. In the process of implementing the system, MOM had consulted business owners to find out what their expectations of the system were. Due to shorter business cycles, growing customer expectations, the emergence of new performance benchmarks and the Prime Minister's recent announcement that Singapore was going to allow another 100,000 foreign employees into Singapore,[1] the workload for MOM was projected to increase significantly. The question for MOM was, how could the Ministry manage the increase in workload without sacrificing customer satisfaction?

The Ministry found that the three items that employers valued in their interactions were responsiveness, accessibility and competency through transparency. When an application is rejected, employers want to know the reasons for the rejection. This required a paradigm shift on the part of the Ministry in the ways in which applications are processed and employers informed. The Ministry shifted from what Ms Ang termed as the "Government-Knows-Best" approach to a "Market-Centric Approach". Instead of implementing policies in a top-down approach, consultations with employers are now undertaken in order to understand their needs. The Ministry also shifted from a "Gatekeeper Model" to a "Risk Management Model" where instead of checking every document submitted, the Ministry takes a more calibrated approached by creating risk profiles for each industry and manages these risks accordingly. Finally, the Ministry has also shifted from a regulatory model to one

[1] The number has since been revised to 80,000, according to the Prime Minister's 2010 National Day Rally speech.

where informed decisions are facilitated. This involves the implementation of certain online tools for employers and potential employees to make better decisions with greater transparency.

The implementation of Business Rules Management technology resulted in faster processing times for work pass applications, with a reduction from the previous five weeks to a week, which is among the fastest in the world. Three quarters of all applications are processed within three days including the process of consultation with other agencies, and 30 percent of applications are processed within the same day. The system is also "Anywhere, Anytime"; applicants can choose to be informed via Short Messaging Service (SMS) on their phones as soon as the outcome is ready. The system also provides one-stop access to applicants, with a whole suite of services, some involving two dozen government agencies and banks. MOM's approach has also been customer-centric, with customer feedback acted upon. For instance, an e-payment facility was incorporated based on feedback from users. Higher consistency and accuracy has also been achieved despite the higher volume of complex processes involved. Users have demonstrated such great confidence in the system that the Ministry has opened up new functions for users, and user numbers have been increasing every year.

Ms Ang noted that technological innovation has helped the Ministry to be more transparent with regard to work pass applications. One of the tools MOM provides on the web is the Employment Pass/S Pass Self-Assessment Tool, which potential employees may use to check their eligibility prior to application. The Ministry has also benefited as it has seen a 20 percent decrease in application rejection rates.

Employers are also being aided by another MOM application, the Quota Calculator for Work Permits and S Passes. The application allows employers to see at a glance if they are eligible to employ more foreign staff after they enter existing employment information such as the number of work permit and S Pass holders employed, the industry the company is engaged in, etc. The employer will also be able to see the amount of levies he/she would have to pay with the engagement of another foreign employee.

Within the EPOL system, complexities are managed through 30 policy and risk management matrices which are built in accordance to existing policies and operational guidelines (Figure 13), and which can be customised for a wide array of professions and industries. Policy matrices are based on existing rules and regulations, such as the class of permit an applicant is eligible for, and the allowable work duration for that particular pass. After the application is submitted, the applicant's identity is first verified, after which the system allocates the case with a certain number of points. Then, the case is processed through

these 30 matrices which will then issue a recommendation for acceptance or rejection. A Vetting Authority approves or rejects the recommendation, after which the case goes for a final review. At each stage, there is the possibility for a processing officer to make interventions and perform manual reviews. With this system, policy change can be rolled out in a period as short as three months.

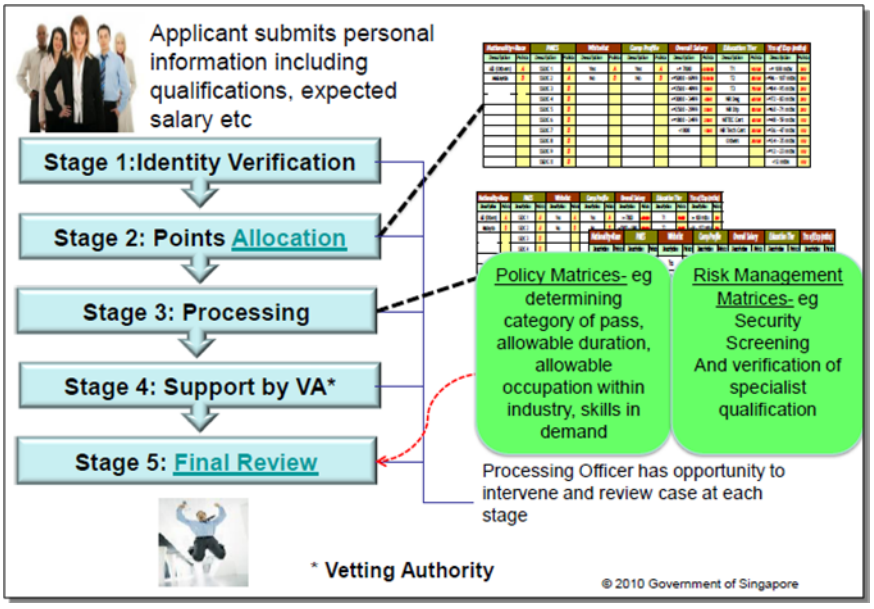

Figure 13 The EPOL process

The Business Rules Management System which MOM employed, Fair Isaac's Blaze Advisor, has helped to increase the Ministry's business agility through greater responsiveness. The technology led to shorter system development life cycles. The system is also easy to maintain and the technology's user-friendliness has also led to an effective management of business rules, quicker policy implementations and implementation flexibility while staying dynamic and sensitive to industry requirements.

Outcomes MOM achieved included greater productivity. The Ministry has been able to handle twice the volume of applications with half of what was needed earlier in terms of staff strength, and at thrice the speed.

Policy Automation in the Energy Market: The Case of the National Electricity Market of Singapore

Mr Kenneth Lim, Senior Vice President of Market Operations and Information Technology at the Energy Market Company Pte Ltd., introduced the National Electricity Market of Singapore (NEMS) which commenced operations in 2003. The National Electricity Market comprises of the wholesale electricity market and the retail market. The Energy Market

Company or EMC is the operator of the market and is responsible for pricing and scheduling. The pricing team at EMC sends out price signals into the market based on demand and supply to regulate the flow of electricity into the market as well as detect any bottlenecks in the transmission grid.

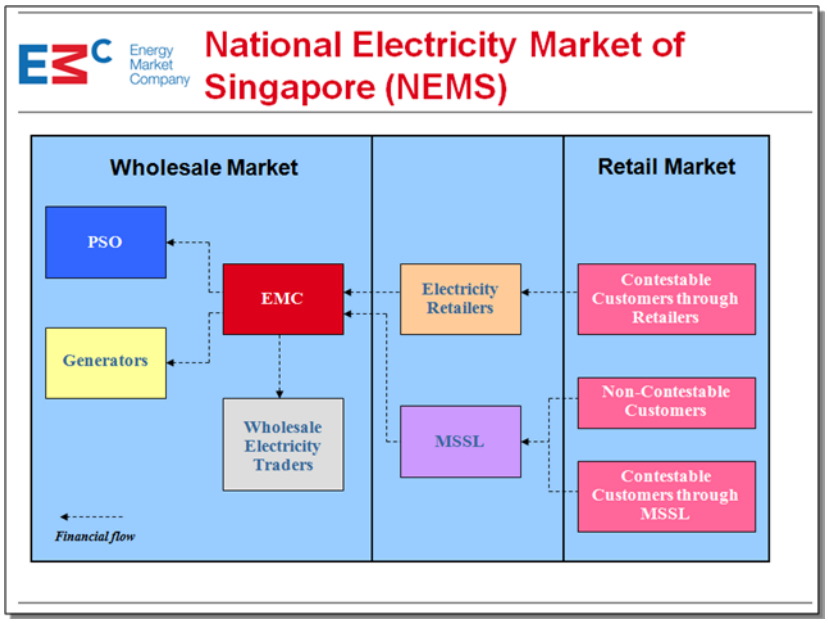

Figure 14 An overview of the National Electricity Market of Singapore (NEMS)

Apart from pricing, EMC also performs financial settlement in the wholesale electricity market as part of its role as market operator. The EMC is also responsible for market evolution – among other functions, Figure 15 – through the Rule Change Panel, which implements any market rule change. Other functions of EMC as market operator include the provision of market information and market education, and surveillance functions which ensure that market players do not breach existing rules.

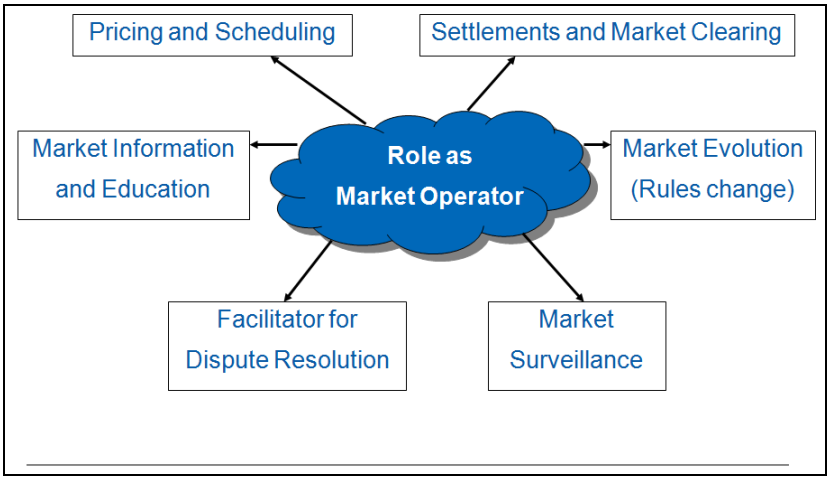

Figure 15 The EMC performs a wide variety of functions in the wholesale electricity market

The settlement process is a complex one, involving multiple stakeholders and payment partners over an extended period of time (253 days from start to finish, see Figure 16). The EMC processes nearly 400,000 records on a daily basis, which total up to $6 billion in transaction value per a year. The value of deploying rules engine technology in this instance lies in the efficient management and deployment of a number of complicated market rules within the energy market.

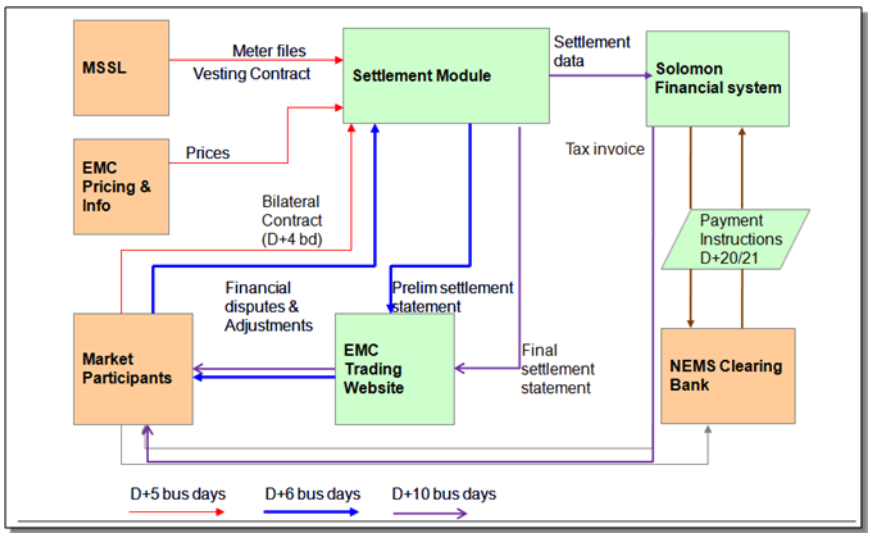

Figure 16 The settlement process

Change Flexibility and Transactional Transparency

While reviewing a previous settlement system, the NEMS had found that incremental policy changes and new market rules required rounds of software patches which may eventually generate conflicts that would undermine the stability and accuracy of the settlement process. The team eventually adopted the Business Process Management (BPM) approach to automate the settlement system, and mapped out procedures and rules in relation to individual business applications in the process.

Mr Lim said that one of the greatest benefits of deploying Business Process Management rules to the system was that of an increased visibility of rules. Both the end-user and IT staff were able to access market rules which they could further verify against the transactions. Another benefit was that rules could be changed quickly as business rules were not coded into system logic. NEMS also saw business productivity gain, as processes that were previously manual were automated. NEMS also achieved cost savings through the hiring of a local technology vendor for customisation of a proven commercial product. The team had managed to reduce system dependency on the database and free up database resources for other critical processing. Second, the externalisation and modelling of business

requirements into a workflow further gave the team more time to think about improvements that could be made.

The Necessity of Change Management

The process, he said, had a lot to do with change management, which had to do with the management of expectations as well as stakeholders. The team observed that end-users actually showed signs of discomfort when rules were placed in their hands. The project also saw technology and product management challenges, as there was a choice to be made between products, some of which are more technical, and some are more user-friendly. The team had to be aware of the limitations and strengths of each product. In terms of product life cycle management, the team had to ensure that new modules work with the existing rule-based system.

Mr Lim concluded his presentation by noting that the deployment worked because there were clear and concise market rules. For the team, the success of the project was a proof of concept for untested technology. They have learnt to leverage on proven experiences for reviews. The team had also found that the process was not merely about the technology involved, but that people and business processes were integral to the success of the project.

Discussion

Rules Engines versus Policy Automation

Following the discussions, IPS Director Ong Keng Yong invited Mr Lai to give his perspective after hearing the case studies. Mr Lai noted the overwhelming response shown by the previous presenters to technological innovation, and observed that the field has seen a “generational change” in a short time. However, he also noted that three of the systems that were presented were actually systems based on rules engines, which required an additional step of complex programming before rules could be interpreted and implemented.

Kerry Holling, who had earlier spoken on how policy automation aided the New South Wales government in tracking cases of child abuse more effectively, noted that in his case, the implementation of the Mandatory Reporter Guidelines system took only three months as programming was not necessary. All that needed to be done was the input of rules and conditions into the system. He observed that the Policy Automation tool allows for a quick turnaround from policy change to “practical change”, a characteristic that was appreciated in a situation where a brand new policy area and rules were still being drawn up.

How do we know policy automation is not snake oil?

Tan Tarn How, IPS Senior Research Fellow, had two questions for the panel. He observed that the skill of judgement is a complex skill that is difficult to code well, and he wondered if a "black box" situation with clearly stated rules but unknown complexity may be a better environment for staff training. Second, he asked the panel if there is a difference between "applications with checklists" and "rules-based applications". He illustrated the difference by saying that while surgeons may have checklists in order to perform their work, they are still the ones who make decisions on how to conduct an operation. For him, the surgeon's work fell into the former category. While he saw technology working well for the NSW and MOM examples, he was unclear about the latter two case studies. The former, he said, were instances where laymen clients needed help to navigate the rules. In the case of the latter, however, users of the system were few and tended to be experts.

Mr Holling replied that when someone is obligated to contact government services what they contact is not a "typical call centre". Staff members manning the hotlines are case workers who use their professional judgment to determine if a case should be escalated. Although one may suspect that these case workers would feel disempowered by the new system, the feedback he had received indicated that they actually became more confident of their judgements as the system helped to maintain consistency. Ms Ang noted that in the case of MOM, the rules that were being used are very detailed, so there is a very high volume. She agreed with Mr Holling that the new technology provided consistency, took away routine checking on part of end-users, and freed up staff time for appeal cases or other cases which did not fall under the rules.

Mr Ho noted that in hospitals, where patients typically see a specialist doctor for only 10 to 15 minutes a session, there is a lot of information for the doctor to review, such as medical history, allergies, medical alerts, results of various tests, etc. etc. Medicine is "organ-based" at the moment, and oftentimes a patient has other medical conditions which the doctor may not be aware of. Policy Automation frees up the doctor's time for a more detailed examination. The doctor's judgement, intuition and professionalism are not compromised as they can make the decision to override the system. On the back end, he noted, any overrides made by a doctor are reviewed for system improvement.

Mr Lim said that the key to process automation boils down to creating transparency and consistency in operations. At the end of the day, he said, users have the confidence that accuracy is being delivered all the time. The sheer value per transaction requires this kind of confidence. He also noted that many potential investors also desire this transparency and the stability of the electricity market.

Integrating Policy Automation into Policymaking

A participant observed that operations should ideally be based on a combination of policy interpretation and intuition. He felt that the point of any automation process is to deliver a consistent answer based on policy at every single instance. A second participant felt that technology should not be considered *post facto,* after policies have already been formulated. Instead, technology should be considered within the policy formulation process as there will be an increasing need for quick policy implementation that "monolithic systems" are unable to handle.

Mr Holling agreed with the second participant, saying that the process is really about e-government, a system of governance that would put decisions in the hands of citizens. He noted that in New South Wales, 47 percent of public servants were eligible for retirement within the next five years. Since the prospect of a full replacement of these experienced staff is dim, he said, putting more decisions in the hands of citizens may be the answer to the projected shortfall in staff numbers.

Clearing the Air: What Policy Automation Does and Doesn't

Arun Mahizhnan, IPS Deputy Director, asked Mr Kenneth Lim if it was true that EMC's reputation management was enhanced by the new system. He also asked if EMC saw any cost benefit from the change. He also made an observation, saying that the word "automation" often brings up the fear that little or no human intervention is possible. He asked if there are overrides or provisions for human intervention when a user is frustrated, or when an execution is rejected.

Mr Lim noted that the project team felt that rules automation was a cost-effective alternative to a complete revamp of the system. The added transparency such automation would bring was considered to be another critical benefit. Existing rules, he said, also provide for an override mechanism. For instance, when a market participant raises an objection to a certain transaction and requests for intervention, the necessary steps are already outlined in the rules.

Mr Ho noted that in the healthcare business, the so-called "soft touch" is also important. Even with increased automation, there is still an emphasis on the human touch, which is expressed in the considered way equipment is placed, for example. When means testing was implemented in 2009, a backend check would first be conducted with the Central Provident Fund and the Internal Revenue Authority of Singapore. However, if a patient disagrees with the system's means assessment, he or she can still seek recourse through

an appeal process. He stated that in any automation implementation, there must always be consideration for the end-user.

Ms Ang said that in the case of MOM, human intervention is possible in most stages of the work pass application process. The risk management approach that the Ministry has taken, which relies on historical records and different industry profiles, means that there are different industry "bands" which require different kinds of intervention. She noted that for some bands, applications are sent directly to officers for processing.

A participant from the Ministry of Education asked the panel about the cost-benefit analysis for a rules automation system, and also about its cost. She also asked if there was a minimum work volume threshold to justify the cost of such a system. Her second question was concerned with the visibility of rules. When rules are put out to the public, she said, the public would try to go around these rules. She asked for their opinion on this issue. What could be done, she asked, when faced with challenges from the public?

Ms Ang admitted that within MOM, there were similar concerns before the work pass eligibility self-assessment tool went live. There were concerns that the Ministry would see more appeal and drawn-out cases. However, after the implementation of the tool, MOM found that the rules that were being put out actually "lent some shape to" Foreign Talent policy, and the application rejection rate had also gone down by 20 percent. The Ministry also saw a drop in work volume. The benefit of the system, she emphasised, is that employers can now better plan their manpower resources, and be confident that rules are being implemented consistently.

Tan Tarn How expressed his opinion that rules automation may lead to a streamlining of work processes for agencies, what is more crucial is the impact of any such system on the end-user. There have been many cases where lack of transparency is a concern, but he noted that one indirect benefit of Policy Automation implementation is that agencies are "forced" to make their rules clear and accessible.

Mr Holling likened the Policy Automation process to the Global Positioning System (GPS) installed in a motor vehicle. The GPS, he said, "will direct you from Point A to Point B, but will not drive the care for you."

With regard to cost-benefit analysis, Mr Ho noted that with rules automation there are certain benefits like consistency of outcome and more efficient use of resources that are not quantified in financial terms. From the healthcare perspective, moreover, a wrongly-prescribed medication or treatment can have fatal effects. Ms Ang followed up by saying

that for MOM, the objective of implementing rules automation was merely about work efficiency. The self-assessment tool was implemented after stakeholders indicated that they needed more responsiveness and transparency, which was what the tool offered.

Director Ong concluded the session with a few comments. He addressed the public servants in the audience, saying that public service in Singapore should strive towards more transparency and seek to meet increasing citizen demands for decision justification. To that end, public servants must not only use the appropriate tools but also mentally "tune" themselves to the demand. He urged them to think of the issue through three dimensions: Volume, Complexity and Speed. He noted a significant increase in the number of issues the public sector had to deal with, and how public servants will now have to think about new ways of coping with the challenges.

*****