

Communicator

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Engineering

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Innovation
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Research



Creativity is thinking up new things - Innovation is doing new things

In motion
 INNOVATION
 development
 growth
 Speed

Results
 Goals



ISSUE 2 2016 INNOVATION SPECIAL

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If you are not a member of the NCI Agency, but would like to receive a printed version of our Communicator magazine, please let us know at: communication@ncia.nato.int

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Transforming Training in NATO

Words from the GM

A key premise of the 2012 Agency reform was not just savings, but efficiency and effectiveness. In the NATO Communications and Information Agency, we determined at the outset that we would be ready to invest in order to reap rewards. I have established a fund that will constantly challenge existing processes and – with minimal investment – deliver fast, tangible results.

The NCI Agency's Innovation Programme looks internally for fast, high-impact projects that bring innovation to the Agency, improving our efficiency and effectiveness. Where feasible, the results are immediately shared with customers. For example, the trial to improve the recruitment process by using video interviews was successfully piloted in the Agency and is now being used at NATO Headquarters as well. This is just one example of how a modernized IT can support the HQ 'New Ways of Working' and '50/50' initiatives.

As NATO's C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance) provider, the NCI Agency is at the heart of a wildly innovative field of technology. Not only is current technology innovative, but the way technology is being used, the services being provided and the business models implemented have transformed organizations over the last few years. Ten years ago the iPhone, Android, and businesses like Airbnb and Uber did not exist.

Investing in innovation

Through the Innovation Programme we have introduced digital signatures inside the Agency – a critical step to speed up internal administration across the Agency's 30+ locations and chains of command that frequently run across several countries. We have also introduced big data analysis tools and techniques, using them to support our own business, as well as the analysis we provide for Allied Command Operations (ACO). We have also started innovative approaches to managing software licenses across the NATO enterprise more efficiently, resulting in significant savings, which are passed on to our customers.

So, can investment in innovation be a good way of cutting costs? The first results from the Agency's Innovation Programme indicate yes. Agency customers have also expressed their enthusiasm for a number of the initiatives that have been piloted under the programme.

Innovation must be seen as an investment in NATO's future. I see it as a parallel to training; if we do not invest and take some risks, we will not be prepared for tomorrow.

The challenge for the Agency now is how to build on these successes, instill innovation across our organization and continue to deliver innovation, which will keep making the Agency and our customers more efficient and effective.

- MGEN (rtd) Koen Gijsbers, General Manager -



A handwritten signature in black ink, appearing to be 'K. Gijsbers', written over a horizontal line.



Managing innovation: Efficiency, effectiveness, improvement



Innovation is everywhere. From tech start-ups to governments, from blue-chip companies to charities, from boardrooms to kitchens - it seems that everyone wants to innovate. Many Nations have recognized the impact of innovation on their defence forces; funding for defence innovation is increasing among Nations, with several establishing defence innovation centres to reduce costs and develop new services.

Since 2014 the NCI Agency has run a small internal Innovation Programme, established by the General Manager and run from Service Strategy. The main objective of this programme has been to target ways in which the NCI Agency can deliver services more efficiently and conduct business more effectively.

As a new Agency, distributed across the Alliance and its theatres, collaborating remotely – through our digital signature pilot – was crucial to forming a single Agency culture, as well as to work effectively. We've also sought to allow staff to be productive more often, in more places. From keeping people connected while travelling, to making it possible for recruitment candidates to be evaluated anytime, anywhere.

Inspiring forward thinking

Internal innovation at the Agency allows us to introduce change within our community, and if successful to share these innovations with customers. Innovation isn't only about technology, it's also a state of mind. This is why the Agency's Transitioning into Leadership course includes a module on innovation, to inspire the current and future leaders of the Agency to be forward thinking, and to encourage innovation in their staff.

Disruptive technology

We have also used our Innovation Programme to understand the challenges of bringing disruptive new technology into NATO environments, such as using mobile apps in operational theatres. Through innovation, our Joint Intelligence, Surveillance and

Reconnaissance Service Line staff developed the first NATO mobile app to be used in theatre. It was developed to understand:

- What development environments to use
- How to work with commercial app developers
- How mobile apps can use information from our static, classified networks
- How to deploy and update apps and still comply with NATO security requirements

We've learnt a lot, we need to apply it much more, and we have to do it in conjunction with industry, following NATO processes. We have developed NATO style guides, for a consistent user interface for our future applications. This leaves developers free to focus on the business logic, while consistent, intuitive apps reduce training needs and increase responsiveness. The Innovation Programme funded small and medium sized enterprises and other partners in last year's cyber security technology incubator. This was an open opportunity for organizations to offer innovative solutions to current technical challenges. Over 50 organizations submitted ideas. After evaluation by cyber security experts from the Agency and Allied Command Transformation, seven were taken further and within a few months had delivered tangible solutions. The technology

incubator approach is well-suited for fast-moving technologies where it is difficult to predict technological advances over the duration of a NATO procurement programme.

Technology: one part of innovation

As staff learn on their innovation training module, technology is only a small part of innovation. In adopting an enterprise approach to Software Licence Management, people and processes are leading to significant savings in software costs, which began with an innovation-funded pilot combining external expertise with significant work from our Acquisition staff, aided by Service Strategy and Core Enterprise Services. While innovation has been a rapid journey in these first two years, learning much along the way, there are still many challenges left to solve, and two key questions that are unique to NATO:

- How can we innovate but remain interoperable?
- How do we encourage innovation to meet the future challenges?

Over the next two years we hope to find some innovative answers to these questions.

By Dr Michael Street, NCI Agency Innovation Manager

Science, Technology and Innovation

Thoughts from the NATO Chief Scientist



The Alliance currently faces the challenge of addressing current capability shortfalls, threats to its future military superiority and a broadening range of security threats. This challenge is exacerbated by a rise in the accessibility of dual-use and civilian technologies to both state and non-state actors globally. Innovation plays a critical role in addressing these challenges.

In a defence context, innovation applies novel approaches to political, military, and technological elements in order to deliver game-changing improvements to military capability. However, too much time is spent discussing a definition. The real challenge indeed lies in how to implement it.

Innovation starts with a mind-set. It is about focusing on new ways of tackling challenges and being prepared to accept the risk that comes with that approach. As such, science and technology (S&T) is a key element of innovation; it provides the necessary enablers to doing things differently.

Innovation starts with the identification of opportunities; novel ways that might work to do something different. And for this we need to look both at the opportunities of future technologies and for new ways of using existing technologies, and we must look beyond the traditional military S&T boundaries. Opportunities lie outside of our traditional defence and security environment as well as within. We need "technology scouting" to ensure that we can access those promising ideas as required, strengthening the links with our well-known community and building linkages with new partners. In this context, the S&T, military, industry and academic communities need to come together. We need to ensure that we have access to creative thinkers from a wide range of backgrounds.

These identified opportunities then need to be evaluated in a security and defence context. This means assessing innovative ideas and facilitating the exploration of the opportunities they provide. We can do this through rapid

experimentation, using the capabilities offered by our research and experimentation centres, agencies, centres of excellence, and existing military exercises to validate concepts. We need to rapidly evaluate concepts so that we can make informed decisions in a timely manner. Innovation should not be about yesterday's technology for tomorrow. The NATO S&T umbrella offers Nations a proven approach to sharing the risk of innovation, particularly in the evaluation step, by pooling resources. Further, there is much to be gained from having a common understanding of potential innovative solutions, and this is implicitly delivered through collaborative evaluation.

The last step is perhaps the most challenging: implementation. The most promising solutions remain only inventions and good ideas until they are used. And once again this brings us back to mind-set. For innovation to be successful, we need to explore ways of maturing these ideas and getting them quickly fielded, into the hands of our armed forces where they are needed.

Innovation serves as a visible approach to strengthening the Alliance, reinforcing a collective commitment to approaching an uncertain future as one. The NATO collaborative S&T programme of work has proven that NATO-wide collaboration is an effective means of promoting the implementation of good ideas while leveraging the Nations' individual investments. Looking to the future, NATO S&T will continue to serve as a key enabler of innovation through international collaboration, working with valued partners such as the NCI Agency.

By MGEN Albert Husniaux, NATO Chief Scientist

Innovation

A hand is shown holding a glowing blue hexagon with the word "Innovation" written in white. The background features a blue and white hexagonal pattern with various scientific and technological terms like "Engineering", "Science", "Development", "Research", "Proc", and "Gen" scattered around. A decorative leafy branch is visible on the right side.

Innovation, Resilience and Warsaw

What is the relevance of innovation to what NATO Heads of State and Government will be discussing at the Warsaw Summit in July?

A key theme for Warsaw is resilience. The Allies will examine gaps in critical NATO and national infrastructure, including IT, and outline plans to address them. The aim is to ensure that – in an era of hybrid and cyber warfare – the Alliance can maintain the capacity to access the right information, rapidly consult and make decisions. After all, what is the use of having an expensive Unmanned Aerial Vehicle (UAV) capturing an incident at a border, if you can't transmit that data to the Ambassadors when they need to decide on a response? The problem is that the notion of resilience is not static. In today's world of fast-paced technological change, what is resilient today could be obsolete tomorrow.

Never rest

Military history offers many examples. NCI Agency General Manager Koen Gijsbers often quotes the example of the Stelling van Amsterdam. A massive, 40-year state-of-the-art project in the fortification of Amsterdam. It redefined what was possible in the area of fortification and was judged to be impenetrable. The only problem was that by the time it was complete, aircraft came into use and the concept of sitting behind mass fortifications was rendered obsolete by aerial bombings.

What is the solution? Embrace the notion that true resilience is dynamic and hinges on a permanent, agile ability to innovate. To give one example, a leading global bank replaces its entire IT infrastructure every three months. Their logic is simple: even with the best-in-class defences, they believe that in three months their network will have been compromised in one way or the other. This modern 'cyber' mind-set translates both into boardroom attention and budgeting; even though they are a bank, 30% of their operating costs go to IT.

Three steps to true resilience

1. Mindset: Accept the premise that today's solution could be outdated tomorrow and seek continuous improvement. Hubris is perhaps the greatest challenge for any organization dealing with technology. Today, that is pretty much every organization, including NATO.

2. Abandon the notion of perfection: Another example from Dutch history – the Dutch East India Company dominated trade in the 17th century because they opted for one standard ship design that could be mass produced. It was not the fastest, not the biggest, nor did it have the largest number of canons. But because it could be produced rapidly, in large numbers, it gave the company dominance. Their innovation was to standardize, speeding production vs. aiming for 'the perfect ship'.

3. Engage industry at the outset: The 2014 Wales Summit already provided the way forward for this through the NATO-Industry Cyber Partnership. Taking this initiative forward, the Agency conducted a pilot cyber incubator in 2015, which resulted in the development of – in partnership with both large and small companies – ground-breaking new technologies in the space of three months.

The pilot concluded that greater mutual understanding through real-time collaboration with industry can both speed up and de-risk acquisition. It allowed the Alliance and its private sector partners to gain more clarity on the other's view of specific cyber challenges that are highly relevant to NATO. So we can do it – the challenge is to make this not an exception or a pilot, but a continuous process.

What is the relevance of innovation to the Warsaw Summit agenda?

In the information age, NATO being able to innovate rapidly lies at the core of the challenges that will be discussed in Warsaw. The Alliance will only be truly resilient if – in the IT and C4ISR domain – it embraces the notion of permanent and continuous innovation and has the mechanisms to do so.

By Michal Olejarnik, Communication Manager, Chief Strategy Office



Bite-sized innovation



Innovation: You may not have done it before, it may feel uncomfortable, but it's worth it!

Innovation for Leaders in Training

The Agency's development programme for senior managers recognizes the need for innovation not only to be supported by senior management, but for them to think innovatively. One module of the Agency's most senior internal staff development course focuses on innovation, from how to use innovative technology, to what approaches to take to deliver innovative solutions to problems. Students and leaders from the most recent iteration of that course took time out for an innovative (and self-funded) meal, suspended from a crane 50 metres above Brussels.

Innovation in Service Management and Control

Colleagues in the Service Management and Control (SMC) Service Line used SMC metrics for our business email service to automatically generate performance figures and create incidents. By creating a service model and monitoring infrastructure for the email service, they were able to obtain real-time status updates for the email business service, automatically trigger incidents from email service events, identify key performance indicators for service-level reporting and configure the systems to automatically generate performance figures for service-level agreements. The latter can even be tailored to create specific reports based on calendar inputs ranging from normal workdays to NATO exercises. Now that this has been proven in the development environment, the next step is to move it to our operational networks.

On the grid, on the move

Projects that have helped make staff more efficient wherever they are include putting Wi-Fi into the Agency's shuttles that run between The Hague, Brussels and Mons. With smart use of cellular subscriptions in The Netherlands and Belgium, staff are now connected while travelling and the costs have been minimal. Last year over 450 people used the shuttle service. With the typical journey taking around five hours each day, that's a lot of extra productive time. It's also handy to send that helpful message "I'm stuck in Brussels traffic - I'll be there in 15 minutes, but here's the briefing".

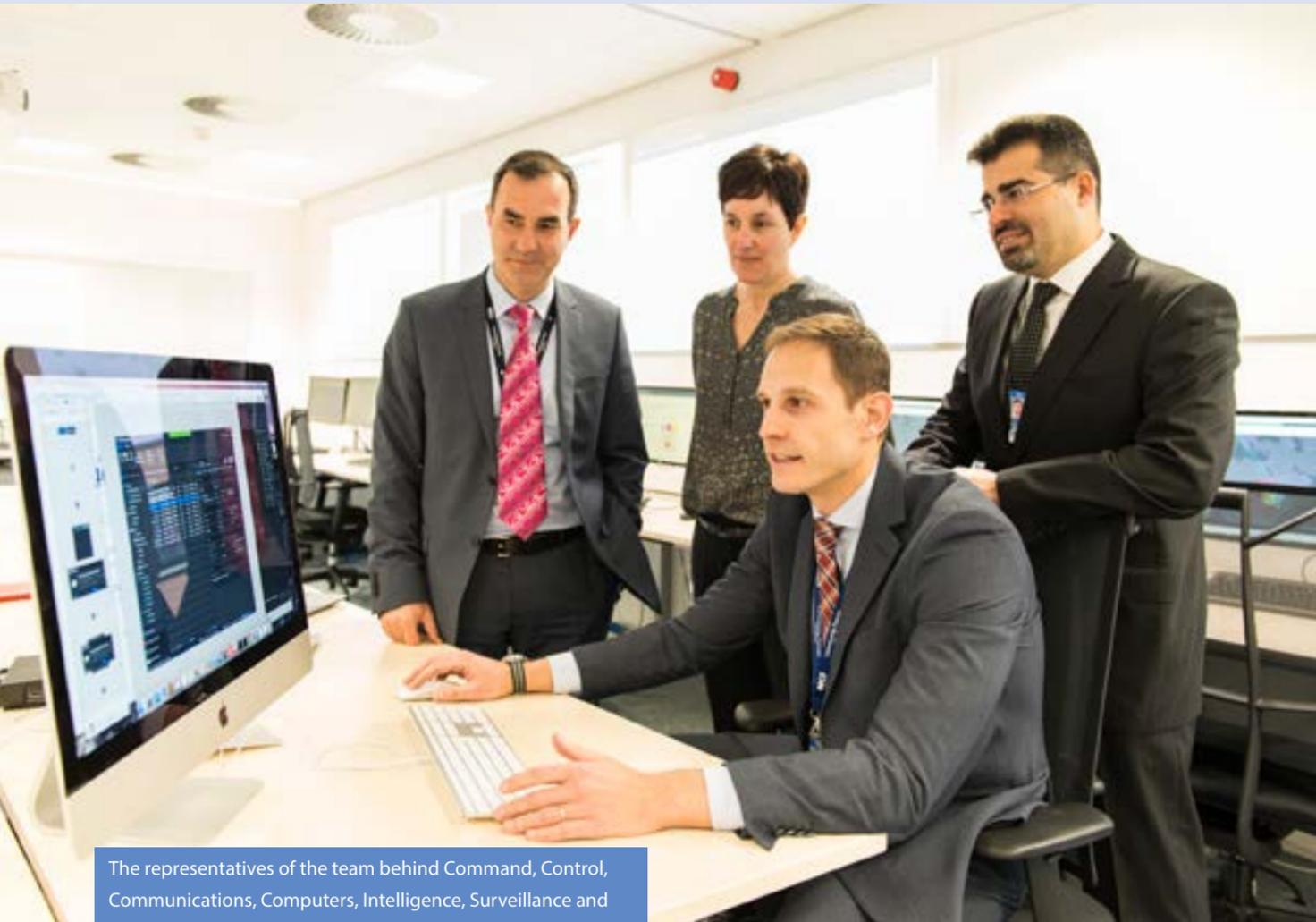
2016 NCI Agency Innovation Challenge



The NCI Agency's Innovation Challenge aims to accelerate transformational, state-of-the-art technology solutions in support of NATO C4ISR and cyber capability requirements. Innovators were invited to apply to the challenge on the occasion of the 2016 NCI Agency Industry Conference and AFCEA TechNet International (NITEC16). The NCI Agency received a high number of proposals representing small businesses and academia from 12 Allies. Top ranked innovators will have the opportunity to

showcase their technology solutions at NITEC16, held in Tallinn, Estonia from 7 to 9 June, and will also be featured in the NCI Agency's Small Business Success Stories. The top ten innovators for the Innovation Challenge are RangeForce (Estonia); Osirium (United Kingdom); QuarksLab (France); AvePoint Public Sector, Inc. (USA); Ntrepid Corporation (USA); Vector Synergy (Poland); NVISO (Belgium); Digital Shadows (UK); Be Informed (Netherlands); Terida Systems (Canada).

Improving C4ISR application User Experience



The representatives of the team behind Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) applications introduce their work towards a better User Experience for the operational community.

- Yavuz Okur:** Principal Scientist, Directorate Application Services
- Sherri Aker:** Bi-Strategic Commands Automated Information System Programme Manager
- Gurkan Ozhan:** Senior Scientist, Service Support and Business Applications
- Oscar Macias:** Programme Management and Integration Capability Contractor

Could you introduce the types of applications that we will be discussing during this interview?
Sherri: We are working on providing tools that make it easier for military personnel to do their jobs. As a specific example, each C4ISR application uses geographical products such as maps. Operations are spread all over the world and involve large geographies, and our users need to zoom into very small areas or zoom out to have a more global view. This is called C4ISR visualization. Overall, the users are working at a very high tempo and with limited resources. They use C4ISR applications to plan, task, execute and monitor joint land, air and maritime missions, and need to see this all on a map. This is a key function for all projects

and having a common user interface is essential for many reasons. What we're trying to tease out of this is a common set of functions that they will all need to use relative to the map, to show, display and manipulate information so that they get a better understanding of a situation and can take decisions. Improving the usability of the C4ISR applications is one of the aims of our Programme Implementation Office and this innovation effort is an important step forward to achieving this goal.

Each project procures a specific application that satisfies a mandate set by NATO operational frameworks. The NATO operational community has been using applications such as TOPFAS for operational planning, NCOP for situational awareness, LC2IS for Land Command & Control, and INTEL-FS for intelligence management. The number of applications will increase in the coming years as other capabilities become available in air, maritime, targeting, electronic warfare, logistics, and various other domains.

Yavuz: C4ISR applications are complex tools by their nature. You cannot make a simple one-click solution. At NATO, there is great software with a lot of perfect functionalities, but we always hear from the operational community that the software is difficult to use. We've even heard things from users like "You need a PhD to use this application." We know that usability concerns for new C4ISR projects can be better addressed if we capitalize the Agency's knowledge in an innovative way. In this innovation project we look at the modern User Experience principles that establish grounds for commonality, efficiency and effectiveness. Every Euro invested in usability saves ten to one hundred times that amount in support and documentation costs. Moreover, the operation becomes safer and simpler. A self-explanatory, simple-to-operate user interface also drastically reduces staff training and familiarization costs. Through the innovation effort, we developed guidance products so that we are now able to look for a common solution to the problems our C4ISR projects have previously been facing alone, trying to develop remedies against difficult to use, complicated applications.

What types of interfaces fit the modern User Experience?
Yavuz: In order to ensure that the best systems are developed, we continuously look for interfaces accepted by the larger audience – mainstream applications. When a user sees an interface similar to what they use on their home computer, it's easier for them to get acquainted with functionalities and therefore easier to complete their mission tasks. Users shouldn't



be spending effort on using the tool, they should be using the application to do their job without any roadblocks. For example, opening many different panels for a simple task, while industry tools are using a panel on the right side with similar functions. As the Implementation Office technical team, we provide guidance material to C4ISR projects to help make clean interfaces so that users can focus on working more efficiently, not on learning different application behaviours and the whereabouts of common functions.

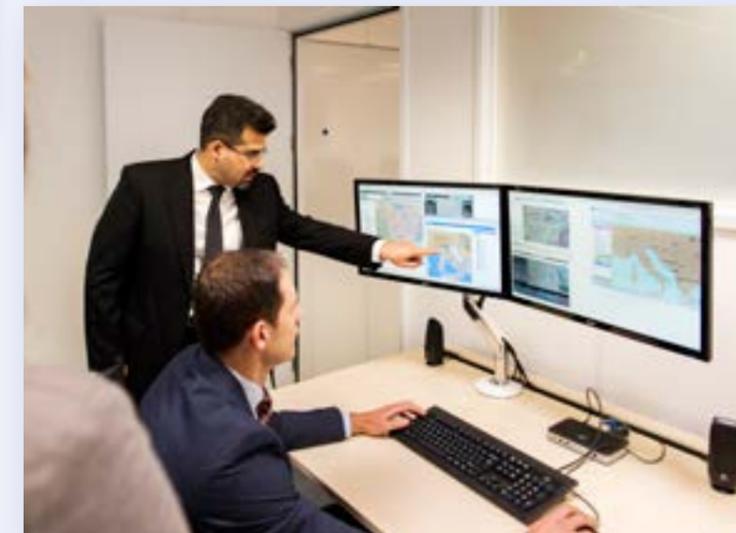
How does a common interface visualization contribute to better applications and a better User Experience?
Sherri: For NATO there are two things that are important and that's effectiveness and efficiency, so we're trying to make the

life of the end user better so that they can be more effective and efficient in their work. The User Experience and common interface visualization is contributing to this. Many of these applications have similar functions, especially in the case of map functionalities, but unfortunately in many applications they look different. One of our goals here is to make similar functionalities look, feel and behave the same way. We look at how to deliver these functionalities in an effective and efficient way, because if they are all going to work together as one family there needs to be some coherency across the suite of software tools. Users are rotating into their positions every three years and for them to learn how to do their job they have to learn how to use the applications. When the User Experience is better it leads to quicker training times and more efficiency in the execution of a user's job. Instead of taking 10 clicks to get to a particular piece of data, it takes two clicks. The fact is that the NATO forces are getting smaller in number and we are now more diverse in the operations that we're covering, plus things are moving at a much faster pace now. So if you don't do anything about how you display information, then users are swamped.

What kind of research is part of developing a new common user interface?
Yavuz: When we were starting with the innovation effort we went back to our roots and asked "What does the user want?" and "How can we make users more effective?" So the development has not been done in isolation, the user has been deeply involved. User input gathered through user workshops and user involvement activities are captured in human-computer interface mockups and click-dummies. Mockups or click-dummies are user interface sketches based on the operational workflow and they mimic major functionalities of final software products.

Agency project teams have a long and successful track record of working with the operational community while developing solutions.

Sherri: We also had User Experience specialists come in and say "Okay, with these things you want to do, this is what you need to consider." They brought in new ways of representing capabilities on the screens with different menus and selections. They told us



how to effectively use the real estate on the screen so that you don't have dead areas and so that actions are more intuitive. They provided a lot of principals that you need to follow when you start to consider building human-machine interfaces. Focusing on User Experience puts forth a more comprehensive approach, also incorporating usefulness, usability and joy of use.

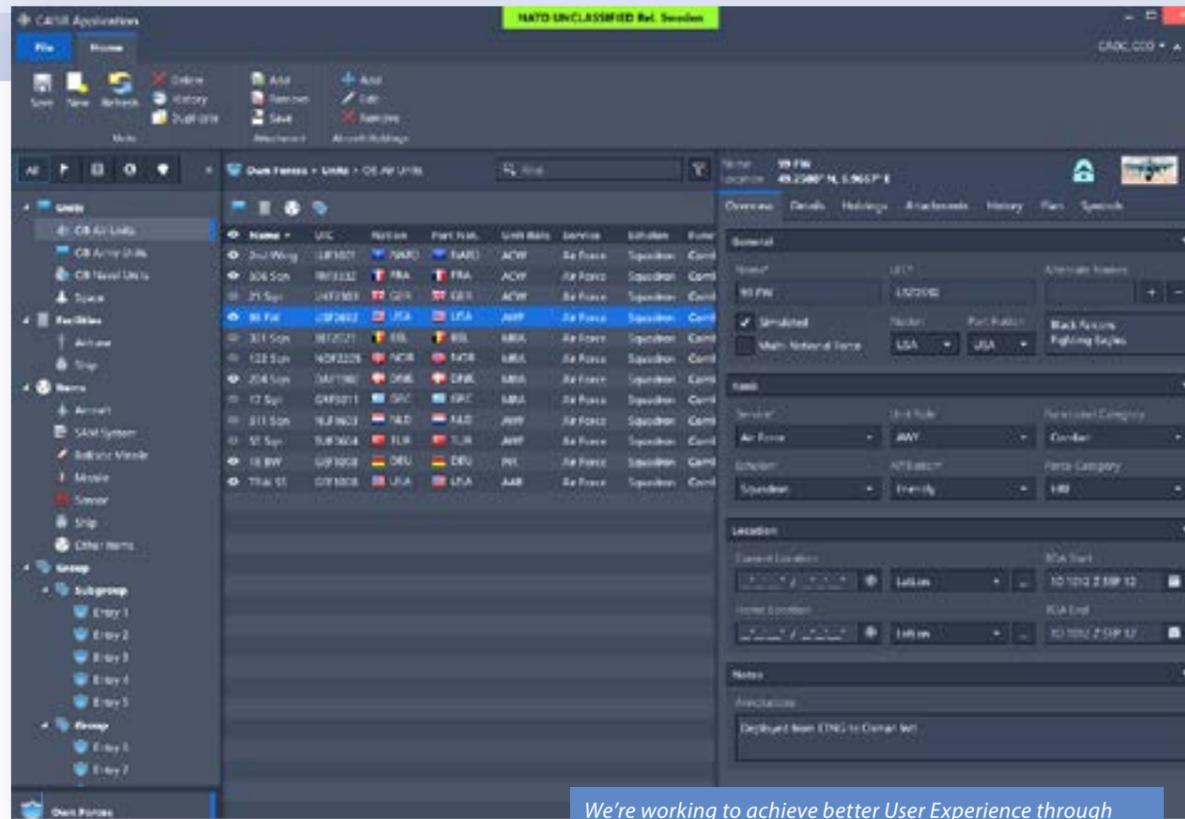
Gurkan: It is important to take cognitive aspects into consideration when designing user interfaces. For example, when a typical user looks at a screen, they usually start from the top left corner and scroll quickly to the bottom right corner, so it is more efficient and ergonomic to place your toolbars, buttons or other elements of the user interface in such a way that fits human interpretation. Another key principle is to strive to eliminate, or at least minimize, the extraneous cognitive load; that is, processing that takes up mental resources, but doesn't actually help users understand the content. For example, using different font styles or colours that don't convey any unique meaning.

Oscar: It is really important that we unify the cognitive thinking in a way that moves the user's attention to a place where we want it. If there is something important, we know that it needs to be placed in a certain area on the screen.

What kind of testing occurs while creating a system?

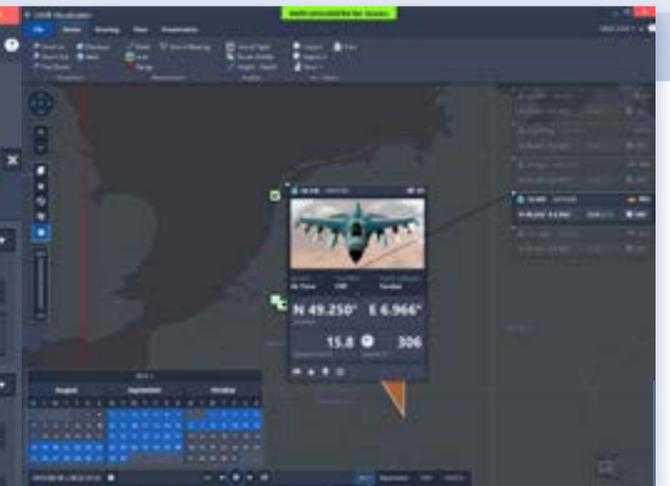
Oscar: Users can be invited to work with an initial design and we can observe how they interact with the new user interface. We call this usability testing. The idea is to record information on what they are doing and what they are expecting the system to do. Usability testing is supposed to be in very interactive, with users explaining what they are doing while they test the system.

Gurkan: Usability testing is a central ingredient in this design process. A typical system user is observed at the workplace and is recorded by means of a camera and microphone while he does his day-to-day business. If the user stops frequently, we know there is a problem. We observe where there seems to be an issue, where an action takes too long or is too complicated – the user needs to move his arm too much or open up too many windows to find something.



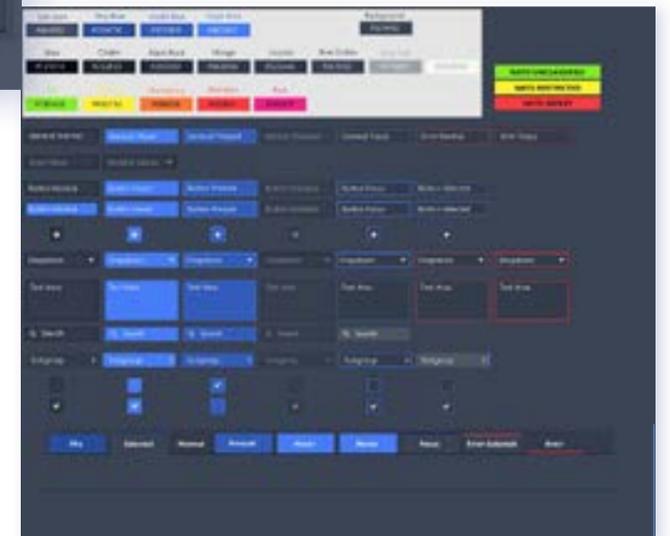
Example for Data-Driven Application

We're working to achieve better User Experience through user-centered design.

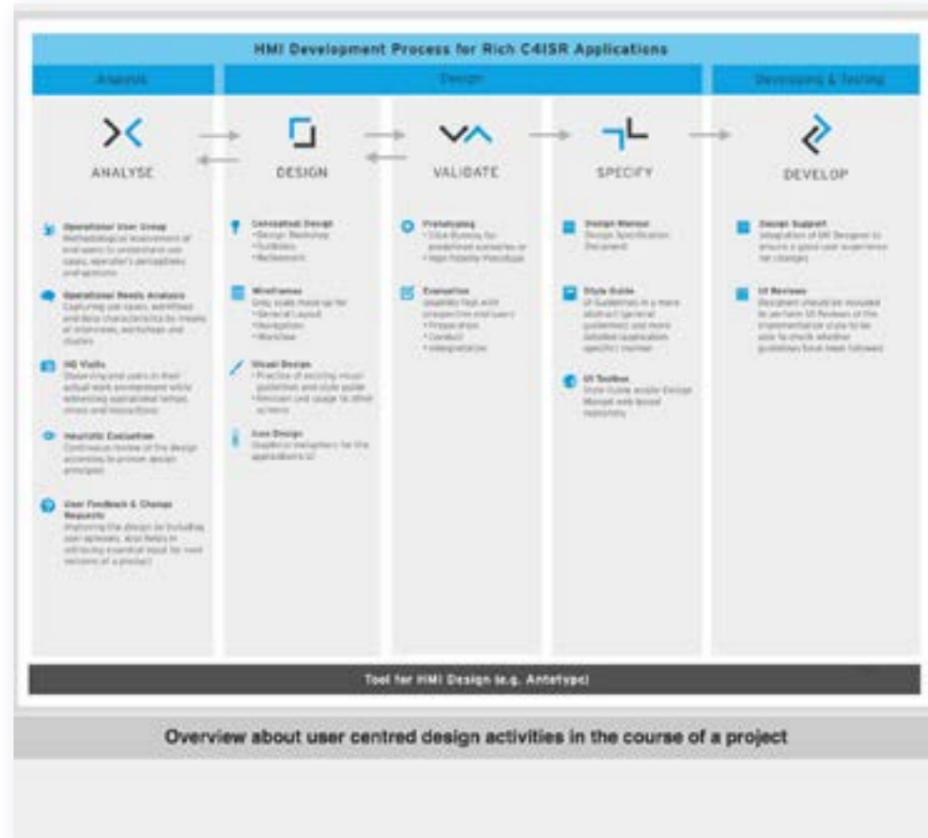


Example for Map Application

industrial partners is very positive, they recognize that a standard user interface design saves them having to develop it for each C4ISR application they build. As we speak, we are including these specifications in the scope of common-funded acquisitions within the Bi-SC AIS programme. We also expect continued focus on User Experience; as a result



Dark Blue Steel Components sample



Oscar: Sometimes we've seen users make work-arounds just to make a task easier. Sometimes they copy text into a notepad or some will even write data they are going to reuse on a piece of paper. When observing this we are asking ourselves, why not provide this functionality inside the system to make it more comprehensive?

Gurkan: Joy of use is also key in the field of User Experience. A user should ideally be satisfied while working. However, it is not uncommon to see that, even if the system is not so user friendly, the person does not complain simply because they got used to it over time. But when you observe, for instance, too much clicking to perform a small task, you know there is an issue.

HMI Style Guide for Rich C4ISR Applications

Are these innovative changes in the design of user interfaces being accepted?

Oscar: Do you remember the old versions of Microsoft Office? Do you remember when they changed it and everybody complained, but in fact this new version is much more usable. Why did this happen? It's because everybody was used to the old version, everybody knew exactly where the options were and were surprised by the change. So that's a little bit what we will have here: a little challenge in the transition, but it will be positive in the end.

Gurkan: When you introduce something new, there is usually some sort of resistance, but with briefings, demonstrations and trainings, we aim to increase awareness and acceptance. As these types of state-of-the-art innovation initiatives are embraced, it is going to become easier and quicker to implement them and improve everyone's working experience.

Where do you see User Experience improvements going in the coming years?

Yavuz: We see that in coming years this small but viable contribution is going to influence more NATO C4ISR applications in a positive way. Material developed in the innovation project is already shared with our current contractor teams and also with interested NATO Nations and their industries. We are aware that a number of companies have looked at our human-computer interface style guide, given us very good feedback and even started using it in different national systems. Feedback from

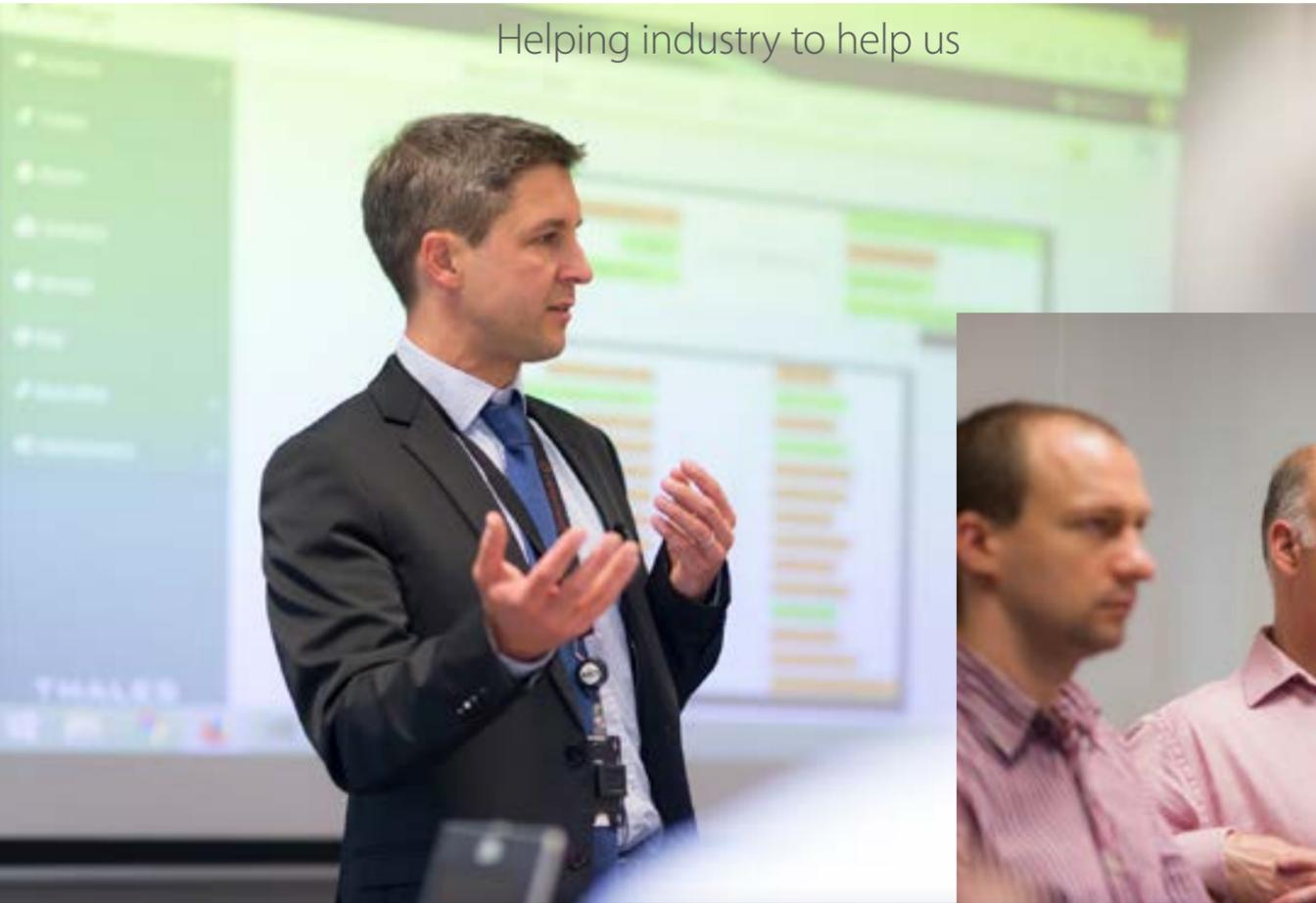
of this work, the NCI Agency has introduced certified professional User Experience training to help Agency staff increase awareness in this area and apply what they learned in their projects. These new principles have already been applied to the HeliOps App and we saw the positive impact with the users instantly.

User Experience is at the tip of the iceberg – the work we have done so far is below the surface. Our biggest return is the end goal of seeing improvements in the User Experience, making NATO's future C4ISR systems easier to develop, more coherent, faster to learn and having our operational users be even more effective.

Interview conducted by Amy Trillard

Technology Incubator: Cyber Security

Helping industry to help us



Last year the NCI Agency took an innovative approach to finding solutions to some of the challenges in the field of cyber security through the Cyber Security Technology Incubator, an activity supported by the Agency's internal Innovation Programme. This initiative was led by the Cyber Security Service Line.

Cyber security is a fast-moving area where the environment and the threats are constantly evolving, and so the countermeasures need to move quickly too. At the incubator kick-off event, the Director of Infrastructure Services, Dr Gregory Edwards explained the need for innovative solutions to cyber security threats, before NCI Agency subject matter experts shared three key challenges from the cyber security world with a broad group of potential collaborators. These event attendees were invited to work in partnership with the Agency to incubate new solutions to current challenges in the areas of mobile security, cyber defence, situational awareness and data fusion.

The Hague Security Delta is the largest security cluster in Europe and is supported by a variety of local and regional governments to help businesses, governments and knowledge institutions address security challenges.

We partnered with The Hague Security Delta (HSD) and the NATO Industry-Cyber Partnership to get a wide range of potential collaborators to help solve these challenges, including

organizations which do not traditionally work with NATO. Collaborating with HSD allowed us to reach out to a wide range of potential partners from many Nations, including small and medium sized enterprises (SMEs), research institutes and academia, as well as some of NATO's more traditional industry partners.

Just two weeks after starting the incubator, organizations from eight Nations had provided over 50 proposals. The Agency – with invaluable assistance from Allied Command Transformation cyber security experts – reviewed all proposals based on pre-determined criteria; operational impact, technical relevance, cost, risk and how well the idea fitted into the incubator framework. This assessment whittled the initial proposals down to a shortlist of seven, which were taken forward.

Cyber Security Incubator results

Over the next three months, these selected partners worked closely and intensely with the Agency's Cyber Security staff to refine the proposed solutions, bringing them closer to meeting NATO's needs. The resulting outputs were showcased at a wrap-up meeting in The Hague and were also on display at the NATO Information Assurance Symposium in Mons. Some were

What were the results?

- *Biometric authentication for mobile devices that checks not only passwords, but how you hold the device and how you type, adding a further dimension to user authentication without extra security steps for users*
- *Post-quantum mobile communications smartphone app that employs cryptographic algorithms that cannot be broken using quantum computing*
- *Content marking application that automatically proposes a security classification for emails or documents*
- *Threat vector analysis package to assist cyber threat analysts*
- *Data fusion engine to look at specific and general system threats to build up a more comprehensive cyber threat picture*
- *Tool to scan smartphone apps for security vulnerabilities and automatically fix them*
- *Cyber defence situational awareness tool to show the impact of threats and actions on operational IT services*

also demonstrated at the International Conference on Military CIS (ICMCIS 2016) in Brussels in May. Through the incubator, the Agency learnt valuable lessons on how to reach out to a new range of partners including SMEs and academia in the search for innovative solutions, and how to foster rapid development by external organizations towards meeting NATO requirements. Lessons were also learnt on speeding up the enabling processes when starting to work swiftly with partners.

The incubator has shown that it is possible for NATO and industry to make great progress in a short space of time, on very limited budgets (incubator projects cost a maximum of €19,000, and some were provided as voluntary contributions). The incubator also showed that it is possible to run an open competition that allows external parties to innovate, very rapidly and very cheaply, while guidance from NATO experts improves the products, therefore supporting industry in the creation of end results that are directly useful to NATO and the broader community.

The Agency is now working with stakeholders throughout NATO to address the remaining challenges of how to put such concepts on a stable financial footing, rapidly pull incubator outputs through into mainstream services and how to work proactively with incubator partners without impacting future procurements.

By Dr Peter Lenk, Chief Service Strategy and Innovation, Service Strategy, and Mr Frederic Jordan, Mr Philippe Lagadec, Ms Tamsin Moye, and Dr Konrad Wrona from the Cyber Security Service Line

Are you on social media?

So is the NCI Agency!

Social media inspiration from Trident Juncture



Join us on Twitter, Facebook, LinkedIn and YouTube.

Here's a little of what to expect from us on each platform.

 **Twitter:** Follow us on Twitter to make sure that you get the latest NCI Agency news first, in the quickest way, through bite-sized 140 character snippets.
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[LIKE facebook.com/NATO.NCIAgency](#)

 **LinkedIn:** Connect with us on LinkedIn to keep up with posts from our HR department. A great place to make connections or follow available positions.
[CONNECT bit.ly/NCIAgencyLinkedIn](#)

 **YouTube:** Subscribe to our YouTube channel to watch the latest footage from exercises, events and interviews with NCI Agency leaders.
[SUBSCRIBE youtube.com/user/NCIAgency](#)



Social media was key in reaching the maximum potential audience during the Trident Juncture 2015 Exercise (#TJ15).

Although the numbers continue to rise, as of end of January 2016 the results were as follows:

- Facebook reach – 11,000,000+
- JFCBS Facebook 'likes' increased by 183%
- More than 1.1 million impressions on Twitter
- JFCBS Twitter 'followers' increased by 122%
- 3.3 million+ individual photographs viewed on Flickr
- Broadcast (video marketed to media outlets) content viewed in 30 nations where over 800 broadcast hits were generated to a potential audience of 1 billion+

How was this achieved? For the first time in a NATO exercise, a NATO Media Information Centre (NMIC) integrated a Deployable Digital Production Unit (DDPU). The 45-person team behind this success pushed the communication boundaries by bringing together some of the best communicators working in NATO.

Want to learn more? Read the original story by Barry Mellor, DDPU Chief Editor, Exercise Trident Juncture 2015, in the March 2016 edition of the NATO Allied Joint Force Command Brunssum (NATO JFC Brunssum) Northern Star Magazine on [jfcbs.nato.int](#).

Interviewing the interviewer



Gabriela Rebreaan, Recruiter at the NCI Agency, discusses how the on-demand interview service is allowing the Agency to make innovative changes in recruitment.



Could you tell me about recruitment at the NCI Agency and where the on-demand interview service comes in?

Gabriela: With a team of five recruiters working in the three main locations (Brussels and Mons in Belgium and The Hague in the Netherlands), we run more than 250 recruitment campaigns per year for more than 30 NCI Agency locations around the world. Last year, for example, we received and assessed 21,000 applications from candidates belonging to all NATO member states. Screening these applications down to the best fitting 250 candidates is not the easiest job, and we need to be sure that we are getting the best people and running a fair and transparent recruitment process at the same time. As we are recruiting for an IT organization where change, innovation and development are key words, it is natural for us to look to technology for improvements. Broadly speaking, we were looking for something that was better than an application form, but cheaper than an interview panel. We started to look on the market for competitive products to help us with our preliminary assessments before finalizing candidate shortlists. We decided on HireVue, which is what we call our on-demand interview service.

Why did you decide to use on-demand interviewing?

Gabriela: We decided to use on-demand interviews to make recruitment more convenient, easier and efficient for candidates

and hiring officials. On-demand interviews are an innovative new way to implement the pre-screening stage of the recruitment process and help us get the best people on board. The hiring team simply provides their questions, either as text or a short video, then candidates record their answers to these in a defined timeframe using their computer and webcam, or alternatively a mobile device. Multiple evaluators can then check candidates' responses, individually assess their skills and expertise against specific criteria precisely matched against the essential requirements of a position. Based on this evaluation, more informed decisions can be made on which candidates to invite to a face-to-face interview. On-demand interviews greatly help the recruitment team and hiring officials screen applicants, instead of only their resumes; this way we can get a better understanding of the person behind the application.

How has this made the recruitment process more efficient?

Gabriela: With on-demand interviews, savings are a huge benefit. Not only do we cut travel costs, but also the time cost of panel members. On the side of evaluators, they have different options to perform the assessment and can also share the results. The people involved in the recruitment process (the candidate, recruiters, hiring officials and panel members) are also able to do this work whenever and wherever they are. We know that the

system is being used from 6:00 am to 3:00 am, seven days a week. This technology enables our staff members to be effective more often, in more places. As for candidates, they have the flexibility to complete their interview from any location, at any time.

How does on-demand interviewing benefit candidates?

Gabriela: On-demand interviews are focused on candidates. They can take their interview at their convenience, the questions are tailored to highlight their experience and particular skills in various areas of interest for each position. On-demand interviews also improve the visibility of candidates; seeing their audio-visual answers gives the recruiter and the hiring officials a better understanding of who they are and their experience. We can also now invite more candidates to the pre-screening interview step. This allows us to assess a more diverse pool of candidates before choosing the most suitable to come for formal interviews.

If you had a tip for NCI Agency applicants using on-demand interviewing, what would it be?

Gabriela: On-demand interviewing gives you the opportunity to do some trials before the actual interview, so practice beforehand. Use this chance to prepare yourself. You should also make sure that you have a good Internet connection, that the device you are using is working properly and that you secure a quiet time and space for your interview. You wouldn't want to be disturbed by a phone call mid-question!

What are the next steps to further improving recruitment at the NCI Agency?

Gabriela: In our effort to offer our newly recruited staff members the best possible joining experience, the Talent Management Team is preparing an on-boarding module for new joiners. We are also currently working on the implementation of Assessment Centres, which will help us significantly improve the quality of the recruitment process. As more people are involved in the recruitment process from both hiring managers' and candidates'

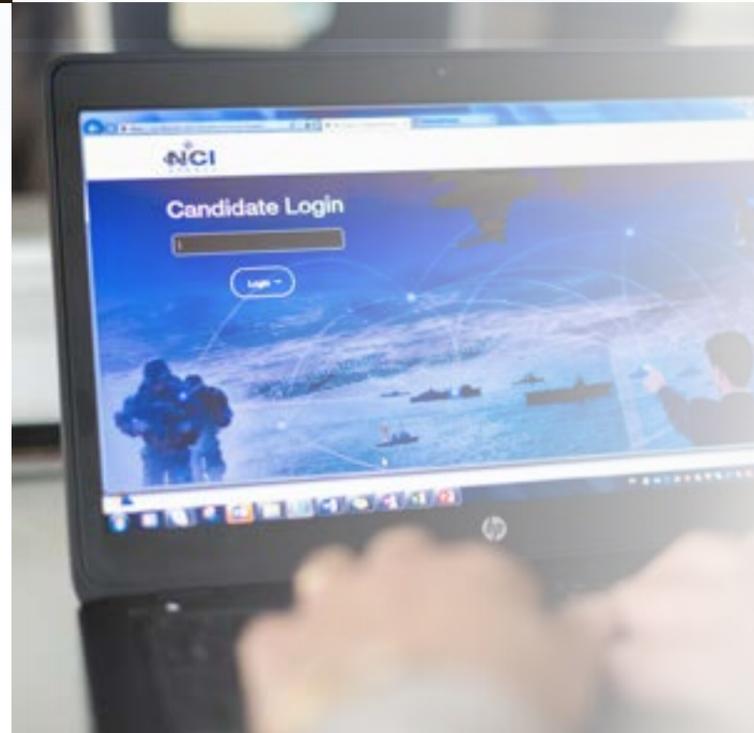
perspectives, we are preparing a training module to respond to their needs. One of our other goals is to improve the timelines and the reporting process, while we revise and adapt the policies in our area of responsibilities. In further improvements, we are looking closely at the new generation and now moving towards applying social recruitment. Currently we use LinkedIn as a way to advertise our available positions – make sure to follow us for the latest updates.

Benefits of on-demand interviews

1. Reduce the screening time
 - On demand interviews provide a talent interaction platform for organizations, including features for:
 - Creating and emailing a digital application to candidates and prospects
 - Collecting and scoring the recorded interviews from candidates and prospects
 - Sharing digital recordings between recruiters and hiring managers
 - Synchronizing scoring, feedback, and comments on applications
2. Get a better perception of the candidate
 - Interviews can combine oral and written answers, which gave us better visibility of candidates' skills
3. Lower recruitment costs
 - Time saved in scheduling and administering interviews
 - Reduced travel costs as only the top candidates are brought to the face-to-face interviews
 - Recruiters and managers can do the assessments at their own pace and the results can be shared
 - Easier to involve people from different locations for screening
4. Introduction to the NATO culture
 - Having the introductory welcome with a NATO branded recruitment platform gives the candidate an introduction to NATO culture
 - Questions are asked by military and civilian staff members, giving the candidates a grasp of the flavor of our unique organization
5. Excellent technical availability
 - 24/7 global support for hiring managers, recruiters and candidates
 - Demo prior to the interview to give the candidates the opportunity to practice

"I participated in the recruitment process and used HireVue. I'm definitely not one of those guys that could earn money making YouTube videos, but the on-demand interview experience was great. My connection speed was excellent, the sound and video quality were very good and it was a smooth process. The system was clean in terms of buttons, with clear instruction and steps. It was also great to have the trial part. I must admit that I did two trial questions and I realized how hard the interview would be. This allowed me to better prepare. Overall, it was an excellent experience, even for a person like me who isn't great in front of a camera."

– David Sampietro, Senior Scientist, Service Support and Business Applications



Big data analysis

Big data analytics are used in the commercial world to target customers, to find market trends, to improve operating procedures and to increase security. Non-commercial uses include tracking patterns of crime or guiding medical diagnoses. But how can data analytics help NATO?

Data analytics are already used to report Agency performance in many areas. But we are also looking at analytic tools – including free, open source tools – to find information on the vast amount of data we collect on NATO's communications networks to help us identify bottlenecks, opportunities to improve performance and to increase cyber security.

The Agency has also looked for areas where big data analysis can help NATO, for example in decision support. Recently, data analytic experts from Service Strategy and analysts from the Operational Analysis Service Line joined forces to assess NATO strategy documents and implementation plans, a task that is part of the Agency's programme of work for Allied Command Operations.

and count terms in the documents. Where big data is typically unstructured, requiring data mining techniques to give structure to unstructured data, in this case the aim was to also look at the rigid document structure and use text analysis to reveal insights into content and meaning.

The extraction and capture of all text was developed in KNIME, a data analysis tool introduced to the Agency by the Innovation Programme. KNIME now forms an important part of the Agency's core business intelligence suite. KNIME processes the more analytically involved areas utilizing text mining, fuzzy matching and expression filtering.

Benefits of (big) data analytics

The big data features of KNIME offer integration with the Spark/Hadoop stack, which was added to the Agency's core business intelligence suite. This allows easy scaling of such involved document analytics to millions of documents, permitting huge quantities of data to be reviewed in a very short period of time.

The combination of qualitative and quantitative techniques makes the assessments more repeatable, allowing trends to be detected. But not everything can be automated. As the



From documentation to data analysis

The purpose of the task was to assess how closely implementation plans are synchronized with high-level policy guidance. When feeding NATO documents into the data analysis tools, subject matter experts were essential to identify terms relevant to the subject. These are then used to automate the information assessment and to create new methods to measure and visualize how the documents align. These experts helped create the dictionary, which was then used by data analysis tools to tag

specific task is liable to change with policy, it is important to have expert input to the process to ensure changes in policies or tasking are accurately reflected in the analysis.

Output of the analysis

The analysis showed that alignment between strategy and implementation was unlikely to be perfect because:

- documents have differing scope: policy guidance isn't written to be an implementation document

- policy concepts may be steeped in jargon and euphemism (lack of common vocabulary)
- it is typically hard to weigh the importance of concepts, and to properly judge the importance of repeated keywords

But policy and implementation texts both share underlying purposes, so there is a good deal of continuity in the structure and language.

Analysis results

The first stage of analysis was to look at the primary documents themselves. Visualizing these results was a challenge as people interpret visual data (such as tag clouds) differently. Co-occurrence analysis was also used to find words that occur together. At this stage there is also the option to analyze specific words of interest. This stage found some words lacked context to be properly understood; for example, "vehicle" or "component". In this case, the program looked for associating terms to improve the quality of the results.

Finally, a list of terms was created to display occurrence and concurrency. Making it easier to assess alignment by visualizing this data, for example via a tag cloud showing the difference in term usage. In the image, red terms represent implementation, and green terms policy, with blue showing the common terms. Some noted obstacles included it being harder to identify the significance of structure in documents and the inability to draw conclusions on the result of text alignment.

Where next?

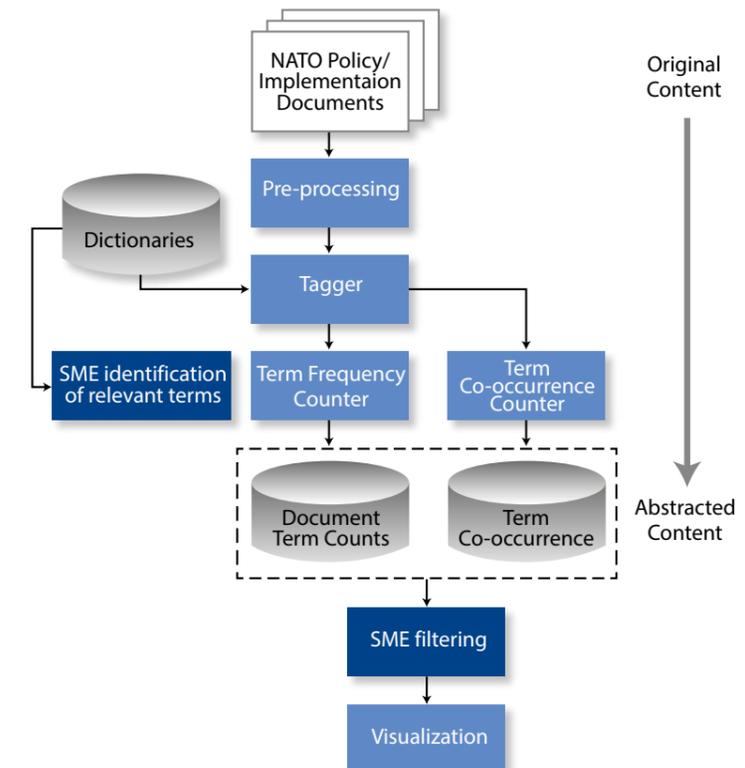
It's still early days – we have seen that these tools can supplement human analysts and help discover new insights. But there is still

a need for experienced analysts in order to exploit these tools. However, we have built up knowledge on using these tools and are looking to apply these innovative data analysis techniques to help the Agency and its customers. The work has shown that our current virtualized, small-scale, data analysis platform (Hortonworks Hadoop/Spark distribution) can analyze this size of data set with ease, but could easily be scaled up and parallelized if there is demand for these services to analyze massive quantities of information. The work done represents an initial step, but in its current state is unlikely to replace manual methods, in no small part due to the delicacy of language in NATO policy. However, extensive research in linguistic analysis should expand the range of operations that can be run, and hence the accuracy of the automation process. The long-term health of automated alignment analysis would depend on increased analytical engineering, and further subject matter expert collaborations.

For wider analysis functions, the Agency, Allied Command Transformation and a number of external experts are working together to see where else state-of-the-art data analysis can help NATO.

The work described here has been presented in greater depth at the International Conference on Military CIS, co-sponsored by the NCI Agency and held at the Royal Military Academy, Brussels, in May 2016.

By Dr Phil Eles and Bruce Pennell, Senior Scientists (Operational Analysis), Marc Richter, Senior Scientist, Service Strategy (Big Data Tools), and Oliver Richard, University of Aberystwyth



An interview with the Chief Education and Training Service Line

Jean-Paul Massart, NCI Agency Chief Education and Training Service Line, explains how the Agency is becoming a key player in the business of NATO learning.



Examples from the eLearning module including video narration

Could you briefly introduce the future NATO CIS School relocation?

Jean-Paul: In 2011 there was a decision made by Heads of State and Government to move the NATO Communications and Information Systems (CIS) School from Latina, Italy to Oeiras, Portugal. In 2015, NATO authorized the construction of a new building and the service line teams have been very busy working with host nation Portugal to help specify, define and design the new building as a modern education establishment ready for the 21st century. Initially moving a fully functioning school in Italy to Portugal was seen as a challenge. Later, we realized that this is a massive opportunity to really change the way we do training at NATO. We can truly transform how the NCI Agency, through its schools and training assets, delivers training in the C4ISR and Cyber arena to NATO and the Nations. The relocation is planned for 2018, but the transformation has already started. Our new facility will be called the NCI Academy.

What had to be considered before moving ahead with developing modern forms of training?

Jean-Paul: We initiated a number of pilot projects so that we could experience these modern technologies first-hand. However, we have to consider the specific nature of the training that we undertake as the NCI Agency. We're talking about adult education, professional education. It is also extremely technical training across the entire spectrum of technical assets that the Agency provides. Even though the younger generation of learners may be brought up with the Internet and social media, that may

not be completely applicable to our target audience, so we have to keep this in mind and implement a gradual transition. The technical nature of the training also meant that a certain amount of practical hands-on instruction is also required. So the dream of going 100% digital wouldn't have been a wise move at all. Nevertheless, we came up with a number of approaches.

What kind of pilot projects have been developed?

Jean-Paul: We developed the pilot eLearning course in partnership with the Legal Office. It is a 30-minute course on the Code of Conduct and is now fully offered in an eLearning fashion. Because all NCI Agency staff members across our 30+ locations have to undertake this course, an online medium is particularly applicable. Through this course we reduce the amount of time our Legal Advisors spend travelling to provide face-to-face training, it is more convenient for staff to complete it, and the training is interactive so we can be sure that the content is being learnt. The course is also available for whenever new staff join and it's consistent every time. In particular, we added video clips by Legal Advisors to make the training more interesting. This will be the first of many courses where the dream is to eventually have a YouTube-like channel for the Agency where there will be, for example, five-minute courses on how to fill in a travel claim, submit an education claim, apply for certain training courses, etc. But before we get there, we have to start small and this Legal Office Code of Conduct course is a very good example of what is possible. The course will go live soon on our new Learning Management System (LMS). A second example is the

experimentation that we are doing related to virtual classrooms. Although this project is in the testing phase at the moment, we see that if we bring in this technology, it will pay for itself by lowering travel and associated travel costs in the future.

What are some advantages of eLearning?

Jean-Paul: Overall, the convenience, consistency and cost-effectiveness of these types of courses is a huge benefit. When we talk about these modern technologies it is also really important to take into account the four Rs. The 'right training', for the 'right people', at the 'right time', in the 'right place'. These four Rs have always been the case for individual training, but now we are changing this by adding 'any time' and 'any place'. This shows the flexibility of the new model. Another big advantage is that we will be able to record the classes so that students can review the material and be supported by after-training care.

Can you take me through any challenges that you have faced?

Jean-Paul: Our students and instructors have been brought up with the very traditional classroom-based, instructor-led instruction, so introducing modern technologies can be a challenge. We can't forget that our training is highly technical and in most cases will require a number of practical exercises that require a classroom presence. But if we can reduce the length of a course from a five-day residential to a two-day residential with three days online, we will still have made savings and we will have increased the efficiency of our

instructors and classroom usage. I am confident that with the enthusiasm of the instructors we can manage this challenge.

What is ahead in innovative training?

Jean-Paul: One of the newer advances in training involves using what they call 'immersive training technologies'. This implies the use of virtual/augmented reality headsets that you can put on and see a virtual world. I'm going to give you a practical example of what this technology could mean for us in NATO. We have recently started training on the Deployable CIS (DCIS) equipment. This is a whole range of equipment that provides deployable telecommunications, radio communications and IT computing elements. There are a lot of boxes and cables that have to be interconnected, and this complicated task is what students learn in practical trainings. But what if six months later in theatre the student doesn't remember exactly how the connection is supposed to be made? Wouldn't it be nice if the technician could put on a virtual headset, see a three-dimensional representation of the equipment, and connect with the instructor who is at the school across the globe? Suddenly, the student would be able to see the instructor's arm coming into the picture and pointing to where the cable is supposed to be plugged. Both distant from each other, but connected through the same virtual reality, the instructor teaching the student in an after-care fashion. This could be a tremendous use of this technology, and this year we are working on testing whether this could be implemented.

Interview conducted by Amy Trillard

Transforming training in NATO

The cameras capture movements automatically (wide + zoom)

NCISS, Latina Auditorium

Camera in the back of the classroom



The Agency's Education and Training Service Line is undergoing a significant period of transformation. This transformative need is principally driven by the desire and requirement to adapt NATO's training, covering the entire C4ISR and Cyber spectrum matching with the Agency scopes, to the evolving world. This is not just in defence terms, but also in the environment of learning technology and the ever increasing arrival of 'Millennials'¹ among our ranks.

As part of this, the Service Line is working with the Allied Command Transformation (ACT) Capability Development Branch and Joint Force Trainer to develop an investment package that will enable us to exploit the move of our NATO CIS School (NCISS) from Latina, Italy to Oeiras, Portugal over the coming three years. We see this as an enabler to transform the way we deliver our training to NATO, Nations and Partners.

This transformation in learning delivery is based on innovative and effective ways of distributing training. This will potentially empower us to reach more people in more diverse ways and locations, and in a 'just in time'² mode. It will permit us to streamline both what we train and how we train it, thereby

¹ Generally defined as those born between 1994 and 2004, for whom technology is not a novelty, but a necessity, and this includes in their expectations of the learning domain.

² Delivering training in the format and amount required, at the time required, in the location required, and acting as an aide memoire as appropriate.

³ In due time the NCI Agency will reach out to other providers for the evaluation of other available solutions.

reducing costs and increasing revenue by growing audience reached. This will be delivered through the decentralisation of distribution, and also the utilisation of emerging modes, such as virtual and augmented reality. It is important to note that these technologies are used in a proper combination with traditional classroom-based instruction, the so-called *blended training* approach.

As a quick win though, we have teamed up with Polycom, the current Agency VTC equipment provider³, to equip two areas in our school in Latina with adaptive broadcast facilities. These facilities don't just allow video conferencing technology we use in the Agency, but combine these in a traditional classroom, thereby extending that traditional setting to a virtual broadcast of training. This means that additional students can join the same training from their own locations, assuming they have VTC facilities or software installed. They can watch and hear the instructor and fellow students in the live classroom using 'Eagle Eye' cameras (two in front and one in the back), which automatically lock on to the speaker and

The virtual classroom is a nice trial because it is designed so that the instructor does not need to change teaching styles. The instructor still has a local presence and can pace around the classroom from front to back as always, and the cameras capture movements automatically. This helps us move towards instructors lecturing to larger audiences. Once we achieve this, we can truly move from the typical 10-15 students in a classroom to large online audiences. Eventually Massive Open Online Courses or MOOCs that are getting very popular with universities could be an option.

display their close-up image and broadcast their dialogue, as well as allow the sharing of computer-based resources. An additional feature is that these sessions can be recorded, which among other attributes, could be repackaged for future playback, and/or edited into other asynchronous learning bundles.

And this is just the start, and a means to open our eyes to the practical application of existing and emerging technologies in delivering our learning in a manner fit for the 21st Century. At the end of the six-month Polycom trial, we may elect to continue to use these systems, modify or reject them. And this is the point. We need and we will develop this trial into a much fuller survey of what capabilities do and will exist, and match them to our training needs, with a view to implement the most promising. This, like many commercial providers in the wider world of learning technology, will place the Agency and NATO at the cutting edge of the business of learning, which is where we need to be.

By Jean-Paul Massart, Chief Education and Training Service Line

Diving into Agile Software Development

On 9 March 2016 the NCI Agency General Manager, Director and Deputy Director of Acquisition, Director of AirC2 Programme Office and Services, NATO Headquarters Consultation, Command and Control (C3) Staff representative, and other Agency management personnel, attended a one-day Innovative Software Engineering Executive Class in Brussels.

BGEN Dr Angelo Messina (rtd), Italian Army staff, and Professor Dr Paolo Ciancarini, University of Bologna, held the class, presenting a particular Agile methodology specifically created by the Italian Ministry of Defence to develop their Land C2 Evolution (LC2EVO) system. The system was extremely successful, dramatically reducing the cost of the two million lines of software code produced and delivered, while saying on schedule. Although various elements of the NCI Agency have already been using Agile Scrum methods, it has not been widely used for software acquisitions from industry. The Italian initiative is taking the methodology even further by looking at specific Agile implementations and has proved to be very successful.

"We are working on improving software development, and as one of the activities, based on the Software Intensive Projects study, we are looking into moving from Waterfall Methods to a form of Agile Software Development. We conducted this master class internally. The class was held by the Italian Defense & Security Software Engineers Association (DSSEA) that is exploiting a particular version of Agile (DSSEA iAgile®), which is used by the Italian Army to develop their Land C2 system. The class was very beneficial and we all learned a lot from it. The next step will be to involve Allied Command Transformation and Allied Commander Operations, expose them to this methodology and start rapidly embracing it. It will save us time, money and improves the quality of the delivered products. The challenge will be to develop with the Strategic Commands and the NATO Office of Resources a form of Agile that fits the NATO Capability Development Processes," said Koen Gijsbers, NCI Agency General Manager.

Software Intensive Projects

In light of the Software Intensive Projects (SIP) initiative, the SIP Task Force outcomes and the Agency's lead role on two of the improvement measures, there is a need for the Agency and NATO stakeholders to better understand Innovative Software Engineering methodologies.

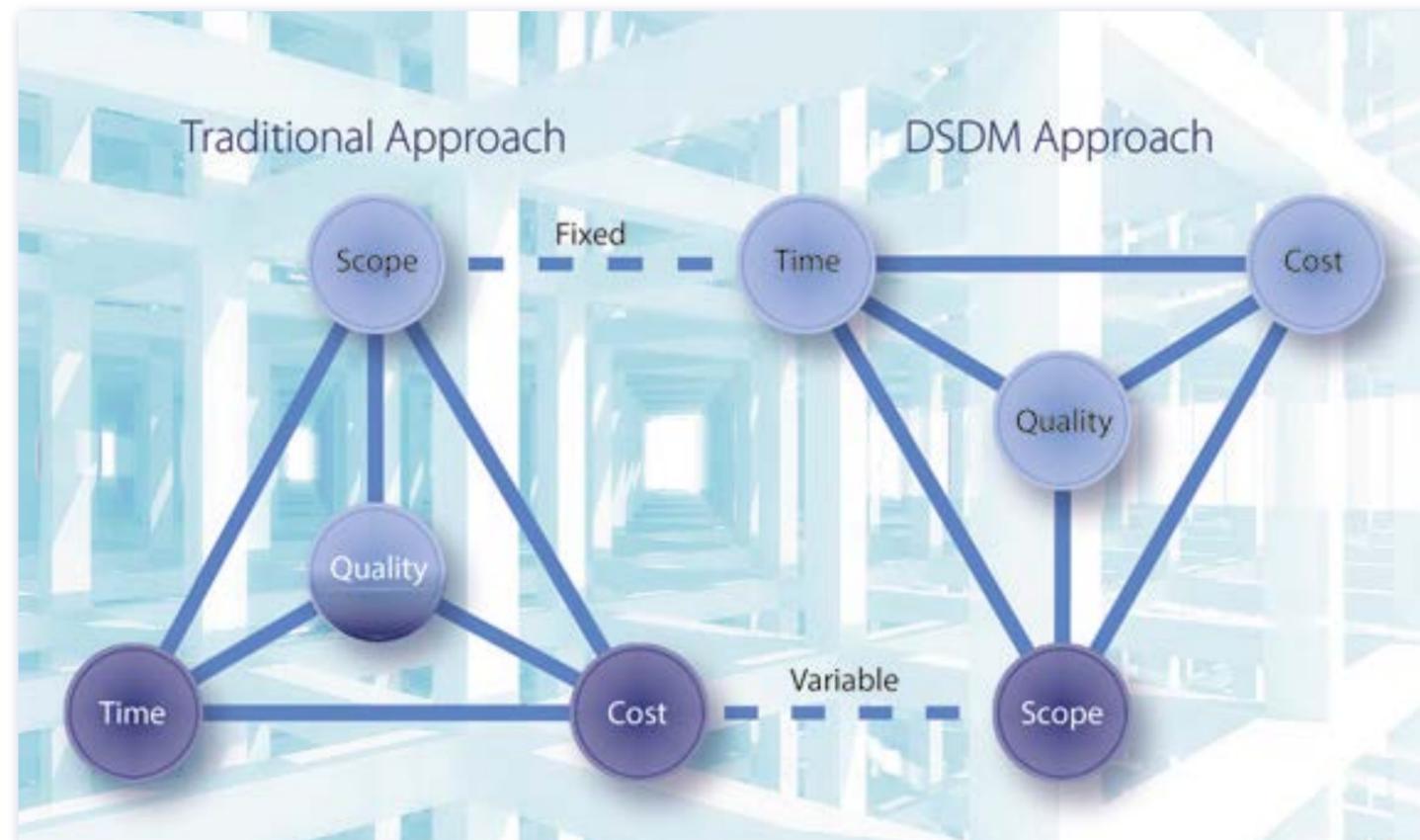
The first of these key principles states the need to deliver earlier and more often. This principle is aimed at changing the culture from one that is focused typically on a single delivery at the end of the development phase to a new model with multiple deliveries during development, leading to an ultimate version that supports the full set of requirements.

The second key principle states the need for Incremental and Iterative Development and Testing. This principle embraces the concept of incremental and iterative delivery, aiming to provide better outcomes than trying to deploy large complex IT network systems in one 'big bang'.

The Agile methodology clearly supports the previously mentioned principles. It does this by allowing the scope of the project to be adjusted if risks materialise while sticking to time and budget. This contrasts with classical project management techniques, which endeavour to deliver 100% of the scope, but then typically go over budget and deliver late in the process. This approach does require strong management and prioritisation of requirements, but it allows the requirements to adapt as the project progresses, in particular removing requirements that become obsolete as users innovate in how they use the early versions of the system.

improved. Regular incremental deliveries of capability allow the IC/NOR to monitor progress through partial (e.g. annual) JFAI inspections. Agency performance is monitored through the scope delivered (an outcome) rather than money spent (an input). Type B Cost Estimates and invitation for bid documentation are simplified and made fit for purpose, shortening approval timelines.

- Industry: Risk to industry is reduced as it has greater flexibility in proposing solutions to user requirements, and through the prioritisation of requirements it now has an explicit mechanism for handling project risks.



Business benefits

The Agile approach offers tangible benefits to the different stakeholders of software intensive NATO projects:

- Operational users: Frequent, incremental deliveries are defined up-front. Capabilities are never delivered late, although not all functionality is provided at once. Operational users play an active and continuous role in both the governance and the development and testing of the capability. Changes in scope are embraced rather than rejected.
- Allied Command Transformation (ACT): Transformational capabilities get delivered sooner. Requirements from ACT remain focused on user needs and are provided at a higher level of abstraction, increasing the speed at which ACT can initiate capability delivery projects.
- Investment Committee (IC) and NATO Office of Resources (NOR): By definition, projects are delivered on time and on budget. Financial expenditure estimates are greatly

(The current fixed-scope, fixed-cost, fixed-time and fixed-quality approach to NATO Security Investment Programme projects is unrealistic and simply leads to cost overruns and contractual disputes). Requirements are clearer due to continual user engagement.

- NCI Agency: Project delays and cost overruns are significantly reduced or eliminated. Capabilities are delivered earlier. Financial forecasting is improved. User engagement is improved. Risks are reduced and identified earlier. Software deployment timelines are known in advance and ease scheduling issues for the CSUs. Overall the approach meets the NCI Agency General Manager's vision to "...earn customer confidence through agility, innovation and by delivering coherent and cost-effective solutions".

By Dr Franco Fiore, Chief SSBA Service Line (acting), Directorate of Application Services

Sharing innovative thinking at the Chief Innovation Officer Summit



Michael Street, the NCI Agency's Innovation Manager was recently invited to speak at the Innovation Enterprise Chief Innovation Officer Summit in London.

Image credit: Innovation Enterprise is a business media company specializing in enterprise innovation across nine channels including innovation, strategy, digital and big data.

Opportunities Challenges Hidden Assets Formation of Ideas Timescale Push Boundaries Stamina Sustainable Change Cutting edge Technology Structuring Execution

From governments to charities and from multinationals to start-ups, innovation is seen as essential if organizations are to grow, stay relevant or even to survive.

- > How to ensure that innovation delivers tangible results?
- > How to balance a shift towards innovation and an organization's cultural DNA?
- > How to innovate in a non-profit environment?

These were some of the questions addressed at the Chief Innovation Officer Summit, which creates an open forum for discussion between leaders in innovative thinking from a wide range of companies and organizations, allowing for sharing approaches to the challenges and opportunities that come from working in innovative environments.

The NCI Agency's participation in the event allowed for idea sharing with governmental organizations, not-for-profits, and businesses alike. A diverse range of case studies covered innovation from consumer goods, to insurance, to government

services; we saw that while the end result of every innovation can be wildly different, the main challenges are universal.

Succeeding in innovation within government organizations

Innovation within government organizations was a key topic at the summit. All speakers made it no secret that innovation is difficult within big organizations, especially in government. Government approaches to investment and risk were described by one speaker as "putting the 'no' in innovation", as he noted that while every innovative investment has its cost, there is also a cost in delay.

Established, traditional organizations like the UK Royal Mail described how they are adapting to a world where letters and the post is becoming a thing of the past, while conforming to government regulations on investment. But through innovation, they turned a cash flow from -£373M to +£398M in five years. The UK Royal Mail had a positive experience from their ideation activities – much like the NCI Agency's ideation campaign – but recognized that it took time to build up the momentum to a point where they have now received a thousand proposals.

In local government, Neill Crump, Head of the Worcestershire County Council's Digital Centre of Innovation, outlined how digital innovation led to savings of almost 20% in his local government budget of 500 million GBP.

Fostering ideation for structured execution

But how exactly does a large organization succeed in innovation? Especially in the heavily regulated public sector?

Recurring factors focused on two areas: identifying opportunities for innovation and structuring execution.

To foster ideation, the formation of ideas, and the cultural change needed to stimulate and harvest ideas included:

- > Aim to solve the right problem at the right time
- > Get timescales and objectives clear
- > Expect some failures, but reward productive failure for those that are willing to push boundaries
- > Learn from history, what has succeeded in the past and where there are hidden assets
- > Look for ideas internally and externally

To get governance right, recommendations included:

- > Understand the appetite for risk, and if the risk appetite is low, appreciate that there is often a cost in delay
- > Accept the risks associated with change
- > 'Business as usual' processes probably won't work

Overall, stakeholders should expect fast and slow changes, up and down:

- > Not everything will succeed, so be willing to fail, but to fail fast
- > Maintain the stamina to see success through to the end

The benefits of innovation

All those who had seen the impact of successful innovation in government organizations were passionate about the real benefits that innovation can deliver for both the organizations and the communities they serve.

A recurring theme throughout the summit was that while innovative ideas are critical, it takes hard work to turn good ideas into viable products or sustainable changes.

Sharing ideas with organizations completely different from the NCI Agency proved to be beneficial. Typical figures from industry are that only 5% of innovative ideas mature into revenue-generating products, and it can take four years to see their

impact. CoffeeFlour, a company turning discarded coffee cherries into premium flour, provides an inspirational example of how it can take years of development before a product becomes available in stores. This case offers a valuable lesson to the NCI Agency – that patience is as important to innovation as the initial idea.

Staying on the theme of great ideas backed by hard work, it was instructive to hear Frank Stevenson, Design Director at McLaren Automotive describe how McLaren finds and develops new ideas. Describing his workplace as "95% NASA, 5% Disney" he highlighted that inspiration to do things better is all around us if we're looking. His vehicle designs include biomimicry such as creating lighter wheels inspired by cell structures. He also "learnt from history", most notably bringing the Mini and Fiat 500 into the 21st century.

But while we looked with awe at McLaren Automotive's work, the company was looking straight back at the innovation within the other organizations at the summit, including the defence world. Looking to the military as source of cutting edge technology, for example using ultrasound rather than wipers to keep future car windshields clear, because "when it's cheaper, lighter, lasts longer and looks better, why wouldn't you do it?"

Innovation at the Agency

There was interest and praise for the way the Agency is approaching innovation with activities such as the Cyber Security Technology Incubator – looking internally and externally for ideas; internally for the challenges, externally for solutions to push cyber security forward.

Applying digital signatures to make paperwork faster and cheaper in an Agency with many locations solved the right problem at the right time. The open innovation approach to the HeliOps Mobile App brought together Agency security experts, users' operational challenges and industry expertise. Software toolkits allowed easy access to data from NATO's Core Geo Information Systems, while user experience experts improved the user interface and functionality.

Innovation at the NCI Agency makes things faster, cheaper and looks better... So why wouldn't we do it?

By Dr Michael Street, NCI Agency Innovation Manager

Forming future cyber security leaders

INTERNATIONAL
CYBER SECURITY SUMMER SCHOOL

In 2015, The Hague hosted the first edition of the International Cyber Security Summer School. The innovative course was established and delivered by the NCI Agency in cooperation with Europol and The Hague Security Delta. Taking place at The Hague Security Delta campus, the course aimed to help prepare future young professionals for the challenges of cyber security within international organizations.

Students were taught by specialists in the field of cyber security, including experts from the NCI Agency Cyber Security Service Line and Service Strategy, Europol's European Cybercrime Centre and the Dutch National Cyber Security Centre. A carefully selected group of 40 postgraduate students and recent graduates from around the world partook in the exclusive three-day course. Young professionals from NATO, national defence forces and defence industries were among participants.

Preparing for the future of cyber security

One of the reasons why the NCI Agency, Europol, The Hague Security Delta and The Hague City Council teamed up to organize the International Cyber Security Summer School is because young people are central to the future of cyber defence.

According to some research, almost everybody convicted of cybercrime in the last few years has been between the ages of 18 and 32. The average age of cyber criminals is often much less. It's the young who have the technical skills to cause problems in cyberspace, and it's the young who are going to have the skills and the imagination to help us solve them.

Learning from real-world projects

Technology issues topped the course programme, and the legal and policy components that are relevant to cyber security in international environments were also highlighted.

Students gained practical knowledge by working on projects routing from the NCI Agency's scientific programme of work. Project topics included threats posed by insecure USB keys and technical and policy issues linked to biometric identification methods and active defence. Students also tested two innovative technologies for biometric authentication and secure mobile

messaging, both developed under the Cyber Security Incubator initiative, a part of the Agency's Innovation Programme.

Building a community of cyber defence professionals

The 2015 summer school saw great success, with positive feedback from students and mentors alike. Students benefitted from the opportunity to learn directly from experts at NATO and Europol about what international organizations are doing to ensure that the cyber world is secure. Mentors enjoyed working with motivated young professionals and were inspired by their skills, imagination and potential.

The course also contributed to establishing a community of future cyber defence professionals, allowing for collaborative opportunities between international organizations such as NATO, industry and academia in the years to come.

In addition, the summer school helped participants understand the role that NATO and Europol play in the world of cyber security, therefore potentially increasing the quantity and quality of applications to future recruitment campaigns.

2016 edition coming this summer

The International Cyber Security Summer School was an output of the NCI Agency's Service Strategy Innovation Programme. Given the success of the course, a 2016 edition is planned to take place from 21 to 26 August and is also being supported by the NATO Cooperative Cyber Defence Centre of Excellence. #ICSSS2016

For more information please visit:
www.summerschoolcybersecurity.org

By Amy Trillard, Communication Intern, Chief Strategy Office

Summer reading list

If you're inspired to learn more about innovation, or would like some general reading while at the airport or on the beach (or in the office while your boss is on the beach), here are some suggestions.

inGenius: A crash course on creativity, Tina Seelig

A great introduction to how to promote innovation in an organization. Tina Seelig's innovation engine is a great explanation of how our internal abilities – knowledge, imagination and attitude – work with our external constraints of resources, habitat and culture to create an innovative environment.

Ten types of innovation, Larry Keely et al

The result of a study of 1500 dramatically successful innovations, from the US highway network to kitchen appliances, looking for the common traits across all innovations that made a major impact.

This book is great at broadening the scope of innovation beyond the offering (two of the 10 types). The authors group the ten types of innovation into three broad categories: configuration, offering and experience; which has synergy with the mantra of NATO Network Enabled Capability of People (experience), Process (configuration) and Technology (offering).

The Mars pathfinder approach to “faster-better-cheaper”, Price Pritchett and Brian Muirhead

This book captures the key lessons learned when NASA sent Pathfinder to Mars in half the time and for a tenth of the budget of previous Mars missions, and it did much more when it got there. This is a short read on how to do cut-price space travel, but the lessons learned and put into practice with this mission could be just as applicable for NATO as they were for NASA. Brief chapters explain the rationale for each of their key recommendations, from “invite different perspectives”, “deliberately chose to do things differently”, “plan ... and

improvise” and “develop robust solutions”. This book is an easy – but thought provoking – read. The programme leader is convinced that they only achieved their mission, on time and on budget, through embracing innovation, saying “unless it's unusual it's not an innovation, and if you're not innovating you cripple your chances of achieving faster, better, cheaper”.

Mastering the Hype Cycle: How to choose the right innovation at the right time, Jackie Fenn and Mark Raskino

When users or customers are impatient and skeptical, this book gives guidance to separate the hyped and impractical from the successful. *Scope* out what's important to you and how much risk you'll take; *Track* what relevant innovations are out there and where they are on the hype cycle; *Rank* potential innovations to find those that fit your timescale and objectives; *Evaluate* whether there is the ability to move forward with the best candidate innovations; *Evangelise* about the innovations you decide to pursue to get cooperation and support; and finally *Transfer* ownership into the core business. The STREET process. Cool!

Engineers of Victory: The Problem Solvers who Turned the Tide in the Second World War, Paul Kennedy

Transatlantic academic Paul Kennedy analyses a number of military breakthroughs to show that behind great technological ideas there is always a huge amount of refinement and changes to doctrine, organization, training, materiel, etc. before those ideas had an operational impact. The book is an entertaining look behind some major pieces of military history, digging into details to show that for every piece of ground-breaking technology there was a significant period to develop and operationalize it, manufacture and deploy it, and adaptation of the operational forces to make maximum benefit. This entertaining book on military and engineering history is a reminder that the principles behind DOTMLPF-I have always been needed.

By Dr Michael Street, NCI Agency Innovation Manager



Can airport security be increased?

NATO is developing cutting-edge concepts, technologies and capabilities to protect troops and civilian staff on mission against terrorist attacks. The NCI Agency's scientific, technical, operational, and procurement expertise enables the Alliance to match military safety requirements to technologies developed by industry. The initiatives presented in this article were conducted through various NATO programmes such as the NATO Defence Against Terrorism Programme of Work (DAT POW) and NATO Security Investment Programme (NSIP).

Enhancing security scanning at airports

A trial was conducted by the NCI Agency and industry to test new solutions aimed at combining sensor information in order to improve the efficiency and effectiveness of detecting Improvised Explosive Devices (IEDs) in the context of Air Transportation Security. The trial highlights NATO's efforts to provide Counter Improvised Explosive Devices (C-IED) equipment for the protection of military and civilians.

In an airport configuration supported by the NATO E3A Component at the Geilenkirchen airbase, various scenarios were tested that emphasised information enhancement by combining inputs from multiple sensors. A total of four sensors consisting of an explosive detector, a metal detector, an X-ray scanner (that



combines both dual-energy transmission with Z Backscatter® technology), and a passive millimetre-wave walk-by security scanner were tested within an integrated system. In addition, localized biometric information was used to manage the flow of passengers through the screening systems.

The architecture analysed during the trial concentrated the information from all sensors into one decision point where a combined threat level was estimated for the passengers being screened. This solution eliminates manual processes currently applied in normal airport conditions and has the potential to increase the passenger throughput while maintaining or improving the security level. During the trial, a final assessment was made by an operator based on the system recommendation, and in the case of a suspected threat a manual search was employed.

The four industry partners that provided the sensors were Morpho (Safran group, FRA), Alfa Imaging (ESP), American Science and Engineering, Inc. - AS&E (USA) and Costruzioni Elettroniche Industriali Automatismi S.p.A. - CEIA (ITA).

Combining information from multiple sensors enables the coverage of a broader spectrum of threats compared to a single sensor assessment, and also has the potential to reduce the number of false alarms during such a procedure. Furthermore, the configuration promises faster processing of passengers and luggage, a more reliable assessment of the threats and elimination of health and privacy issues due to passive scanning technologies that provide automatic object detection.

Vehicle screening for the detection of explosives

In other advancing C-IED work, a mobile explosive screening capability was delivered by the NCI Agency to the NATO Response Force (NRF) through a NSIP capability package. Vehicle screening systems, as well as personnel and luggage screening systems are delivered to NATO by Rapiscan Systems.

The vehicle screening system, an Eagle® M60 portal, allows for vehicle inspection using a mobile platform in both drive-by and drive-through scanning modes. The drive-by mode allows for driverless scanning, which for example can be used to assess a suspicious unoccupied vehicle. The drive-through portal scanning mode can be used for inspections at seaports, border crossings, and initial location entries, including airport entrances.

The portal unit permits the inspection of cars or trucks entering a protected zone by using X-ray imaging. A material separation technique based on physical properties of the materials (Z number) is employed to find materials such as explosives and narcotics without manual inspection.

Moving forward

Security surrounding air transportation has been a global concern for decades and has recently resurged in the headlines. These types of projects intend to examine how current operations can be improved upon and deliver suitable capabilities that will enhance the security level of NATO troops. However, while considering the implementation of new technologies, their cost, impact on wait times, operating procedures that must be put into place, as well as concerns such as the displacement of potential attack areas need to be taken into account.

Technology alone cannot solve the issue of airport security and a combination of measures including personnel, detection dogs and technology is the best way forward. The security threats that we are exposed to constantly evolve. It is a collective duty of the society to get involved, analyse these threats and identify innovative solutions to maintain safety standards. NATO will continue to engage in discovering, experimenting and delivering new solutions to protect troops and civilians as decided through political guidance.

By Amy Trillard, Communication Intern, Chief Strategy Office

NIAS^{CS}'16

CYBER SECURITY SYMPOSIUM

NATO CYBERSECURITY ALLIANCE

Next generation starts now

07-08 September 2016, Mons Belgium

About the Conference

NIAS, NATO's annual cyber security symposium, is a must and free to attend event for today's security professional. This 2-day event brings together leading security specialists, directors, and mid-managers to product developers and front-line IT staff—to exchange ideas, gain valuable knowledge to implement their security initiatives and share real-world experiences. NIAS2016 addresses the latest innovations in cyber security and provides you with business critical insight, best practice, and practical case studies through sessions, exhibits, workshops and much more!

As an Alliance, NATO's core mission is to safeguard the freedom and security of its members. To do this, NATO has to be strong, stable and secure. Defending against a growing cyber threat or containing intrusions begins with an internal perspective of good computer hygiene, threat vector analysis, and looking to the future.

NIAS 2016 will discuss what NATO can do to increase its resilience in the context of ever more sophisticated attacks, while ensuring NATO forces are secure and defended in a static or deployed readiness posture.

NATO is looking inside its walls to see what it can do now to guarantee mission assurance, we will also analyse emerging threats, and look to the 2020 horizon in exploration of innovative solutions for the next generation of NATO's IT Services.



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Technology