The panel recognizes that establishing UN radio is not always the most efficient and cost-effective way to broadcast. Peacekeeping can and does partner with local radios to convey its messages, while also assisting in local media development and capacity-building. There are also widely available, low-cost solutions for the rapid deployment of strategic messaging. The Radio France Internationale (RFI) model—where looped content can be fed into any enabled transmitter via satellite—is an example that the UN should consider at mission start-up. By providing low-cost connection kits to local radio stations to begin broadcasting UN messages before local UN radio is established, such outreach could be particularly valuable at a time when the mandate is least understood by local actors and resistance of a mission's presence by some may be high. The use of pre-packaged loop messaging also has the potential for strategic messaging in times of crisis. For example, in UNMIK, **Radio Ophelia** is an open-source automated digital FM radio channel with very low bandwidth that provides looped content through transmitters via computer. The UN should seek local partnerships in content production wherever possible.

Recommendations:

↗ *Peacekeeping should rethink its strategic communications paradigm, and employ available tools to make it more multifaceted, operational, interactive and data-driven.*

↗ *Upon the promulgation of a comprehensive policy for the use of social media, DPKO and DFS should provide the necessary training to support its implementation.*

↗ *The UN should seek out and employ low-cost solutions for the rapid deployment of strategic messaging whenever required.*

D. Selected Programmatic Priorities

Technology can greatly enhance the substantive work of both field and headquarters. Yet, the panel looked hard during its inquiry for innovative uses of technology in the field. There were some examples, for instance in MINUSMA, where the DDR section was developing a "piggyback" layer to UN SAGE that would allow it to visualize data and move away from simple database formats, and in MONUSCO, where several mission components feed into a customized protection database tool to allow for information sharing across components working on similar issues. More broadly, as noted above, human rights and humanitarian actors are increasingly looking to technology to enable their own work.

To illustrate the potential uses of technology in programmatic areas, the panel focused on key mandate areas, including the protection of civilians, policing and the rule of law, and border/boundary demarcation and monitoring—all of which argue in favour of moving rapidly to acquire and deploy many of the technologies discussed above.

1. Protection of Civilians

Protection of civilians lies at the heart of nearly every multidimensional peacekeeping mission, and success in this domain is central to the legitimacy and credibility of UN peacekeeping and to the cause of sustainable peace more broadly. Technology can enhance situational awareness and understanding, as well as aid in planning and operational decision-making. Technology can also help tailor not only military and police interventions for populations at risk, but also civilian-led humanitarian and protection interventions.

Without a sound information and intelligence foundation, early warning of deteriorating circumstances becomes a matter of chance, and mobilizing a coherent early response to mounting trouble an impossible task. Moreover, without a reliable, high fidelity means to collect, use, process and share information and data, missions will founder from the start. The UN simply must have access to real-time information along with the technical means and enablers described in the foregoing sections, to allow them to have a more forward-leaning posture, to develop accurate appraisals, and to deliver well-honed political and operational recommendations. **Peacekeeping missions should incorporate technology in the design and implementation of protection of civilians strategies, in particular their early warning and early response mechanisms, to enhance their ability to detect, mitigate, deter, or respond to threats of violence against civilians**.

As noted, UN operated radio stations or recorded programming represent an important communications tool to help inform local communities and dispel rumours that can lead to displacement, or worse. For example, in Liberia, UNMIL Radio regularly broadcasts in the country's six main local languages and produces content in some additional eleven languages. With the largest reach of any radio station in the country, UNMIL Radio is heard by over 85 per cent of the population and is regularly re-broadcast by community radio.

Yet, while **technology can also help peacekeepers extend their reach and provide messaging to empower communities to be partners in their own protection**, it must be used with care. For example, MONUSCO's Community Alert Network initially provided mobile phones to communities to gather information about emerging threats and inform response. After some trial-and-error, the network has transitioned to a "hotline" solution, through which communities contact the mission's community liaison assistants to provide early warning information. This approach minimizes the unintended consequences arising from providing technology directly to local communities in high-risk settings. In addition, the need still exists **to protect sensitive information as well as the privacy of individuals, in particular those vulnerable to abuses**.

Recommendations:

↗ *Peacekeeping missions should seek to incorporate technology in the design and implementation of protection of civilians strategies, in particular their early warning and early response mechanisms.*

↗ *Missions must take care to protect sensitive information as well as the privacy of particularly vulnerable individuals in protection scenarios.*

↗ *Peacekeeping should continue to seek ways to use technology as an empowerment tool in protection of civilian contexts, while remaining mindful of possible risks.*

2. Policing and the Rule of Law

A mission's rule of law mandate often involves working with a state emerging from conflict, to rebuild their capacity in policing, judicial proceedings, and penal operations, and their overall governance and accountability capacity. Automated data collection and analytic tools would be of immediate use to boost mandate delivery. Indeed, while some of these tools are already in place (and could be scaled up and replicated across missions), they often intersect with manual systems and lose the advantages of automation.

Throughout UN peacekeeping, police have become increasingly important to work with national counterparts to prevent crime, build capacity, strengthen service delivery and enhance local confidence in law enforcement. UN police routinely work with national counterparts to plan operations, conduct routine patrols, and engage local communities in their work. UN police and formed police units can benefit from many of the technologies that should also be made available to their military counterparts in any mission, and both benefit from common services, such as the mission's ICT infrastructure, JOCs and JMACs. In addition to working alongside military components to keep the peace, UN police place local capacity building and community stability at the centre of their actions.

Making simple mobile applications and devices available to police is a first step toward enhancing their ability **to simplify and streamline routine and incident reporting**, and accelerate the pace at which reports can be received and acted upon. Such applications can also be useful **to track the movement of personnel**. Furthermore, **the increased use of social media tools as part of a concerted strategic information operation** can strengthen community relations, instil confidence and help communities become more engaged in their own protection. Smart policing initiatives can also help to enhance oversight and accountability, in particular in locations where confidence in the police is low.

Simple **tools exist can be used to strengthen the mission's monitoring and advisory capacity**. In UNMIT, for example, and later in MINUSTAH and UNMIL, UN police developed and implemented a system of monitoring and evaluation of national counterparts—SMART—to track the overall situation in the country. Initially seen as a tool for later stages of mandate implementation, these SMART systems are now being used to streamline reporting flows and track key indicators through a single database, and could easily be replicated across other missions. These systems can provide a comparative basis for tracking broader rule of law indicators, and can help the mission to assess impact and track resource utilization. The system is low cost, low tech, is based on existing IT infrastructure, and can be handed over to national counterparts at the end of a mandate.
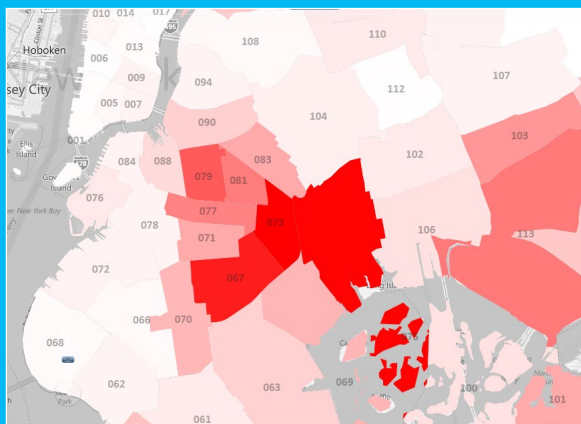
Smart Policing

The Brazilian organization Instituto Igarapé is working to develop technical solutions for "smart policing". In three pilot areas—Rio de Janeiro (2013-2014), Cape Town (2014), as well as in Nairobi (2014)— police officers patrol certain areas with smart phones attached to their vests. An Android app locates the respective police officer via GPS and livestreams audio and video records to police headquarters. In addition, more and more law enforcement agencies are making use of body and vehicle cameras to both document rapidly unfolding events, aid in forensic analysis, and help maintain accountability among police officers.

COMPSTAT

In 1995, the New York Police Department, instituted an automated information system to provide constant analysis from a centralized crime database, from which an analysis of trends and patterns can be visualized and tracked over time. The system – known as COMPSTAT—is designed to assist in operational decision-making, guide deployments and inform resource allocation, as well as enhance accountability.

A "global" COMPSTAT office operates at NYPD headquarters and is connected to desk officers in local precincts, who receive data and verify its accuracy daily. Crime analysis officers at precinct level feed information to commanders on a daily basis, and share information across bureaux. Reports are posted to a citywide portal that all officers can see, and real-time alerts are circulated by a crime information centre. Daily COMPSTAT meetings enhance commanders' ability to make decisions based on accurate data, and a pilot programme has provided individual officers with tablets to access and download information from common databases in real time.

Incident information is recorded on a map, for ease of recall, to visualize trends over time, and to inform response. Single precinct maps help to track month and year-to-date incidents.

Source: New York Police Department

Non-Lethal Technologies

In the past, the UN has been criticized because armed peacekeepers were unable to defuse or control violent and dangerous situations. Many such conditions might call for the use of less-than-lethal force, but typically, peacekeepers are not well equipped with these means. Whether thieves stealing from UN camps, gangs preying upon innocent civilians, villagers stopping convoys—such situations may be effectively managed with trained and ready troops and police equipped with non-lethal capabilities.

A number of modern military and police forces have a range of less-than-lethal weapons suitable for wider application, such as tasers, stun and smoke grenades, rubber bullets, bean-bag rounds, riot control agents (such as tear gas), etc. Some of the newer technologies send messages or painful noise across large distances; anti-materiel weapons can stop vehicles or slow their movement.

The panel stresses that UN missions must take care to consider the legal implications of deploying such weapons and also recognizes that lowering the threshold of force comes with its own complications. Yet, the panel believes that peacekeeping missions must consider the use of these additional tools. The Departments can assist missions in this regard, by working with TechCCs to understand what technology is available.

With growing links between transnational organized crime and conflict, peacekeepers are required to strengthen the capacity of national law enforcement agencies to gather and hold data, and to analyse and disseminate that information. Police have specialized analysis needs that may not fit neatly into a mission's intelligence structure, which prioritizes military operations. **Crime analysis software is vital for determining and generating appropriate resources required for supporting and guiding policing functions in peacekeeping operations**.

These systems are already in widespread use by many police services around the world, and if implemented in peacekeeping missions, could benefit peacekeepers' ability to more effectively manage the deployment of police assets and create a culture of information sharing internally and with national counterparts. In addition to these tools, continuous interaction with national and international bodies (such as Interpol) can also strengthen the peacekeeping's integration with broader efforts to tackle transnational organized crime.

Technologies traditionally thought to be military in nature, such as **UAS, can also be extremely useful to police and should be made more widely available for police (and civilian) work in missions**, as in MONUSCO, where UAS can be tasked in support of police operations and where local police have also requested support to inform their own planning and deployment. Smaller, tactical-level UAVs can help police monitor crowd control situations or cope with more serious emerging threats. On one field visit, the panel met with a police officer who had deployed with a mini-UAV which he was using to inform weapons incidents and other investigations. This officer used the device to capture this video of a severe aviation incident, which enabled investigators to chart a path through the rubble and not disturb crucial evidence.
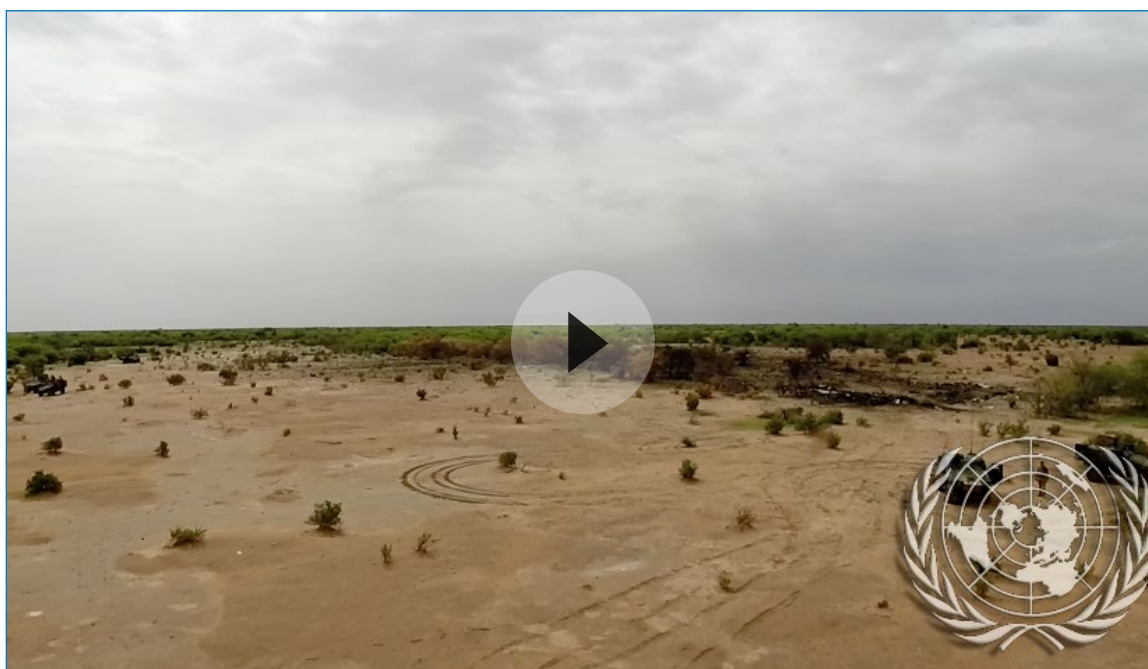
When combined with emerging technologies in urban policing—including widespread use of static, mobile and personal **cameras together with shot spotting technology** (that uses sophisticated acoustics to source the origination of gunshots), aerial visibility measurably strengthens on the ground policing.

Policing is only one piece of the rule of law pillar, which extends to judiciary (including prosecutions) and corrections. These components are often engaged in helping the host government strengthen the capacity of its own agencies and institutions. The police and other mission components **can leverage technology to enhance their training of national counterparts**. In addition, it is the panel's view that **more comprehensive tools should be made available to assist with an end-to-end approach to investigatory support and case-tracking that can help strengthen the links between the police and the wider justice system**. **GoCASE** software, developed by the UN Office on Drugs and Crime (UNODC), is an example of such a tool, designed to initiate and track petitions, informant reports, legal cases, intelligence packages and other processes into a centralized information system, with the aim of streamlining the investigation's case processes and increasing investigations' efficiency. GoCASE contains a data management module that facilitates the capturing, storing and retrieving many types of information, including documents, events and exhibits related to a case, along with an electronic storage facility that allows for the controlled distribution of case files according to defined roles and permissions. **Basic crime scene investigation kits and mobile forensic/crime scene kits should also be made available to missions, as well as biometrics technology and data basing capability, such as fingerprint scanners**.

Formed police units are often called on to establish a clear presence, show force, interpose or even engage with gangs or other local criminal force. For example, as noted above, to better enable crowd management (a common task within the broader mandate of the protection of civilians), monitoring technologies such as miniature UAVs can be a most effective asset, allowing commanders to get a sense of the operating environment in real time. Given the scarcity of some of these resources, however, **missions must establish procedures to prioritize allocation and create policies and procedures for timely sharing of information and data products between military and police. Moreover, better integration between the components will help alleviate the need to acquire duplicate technologies**.
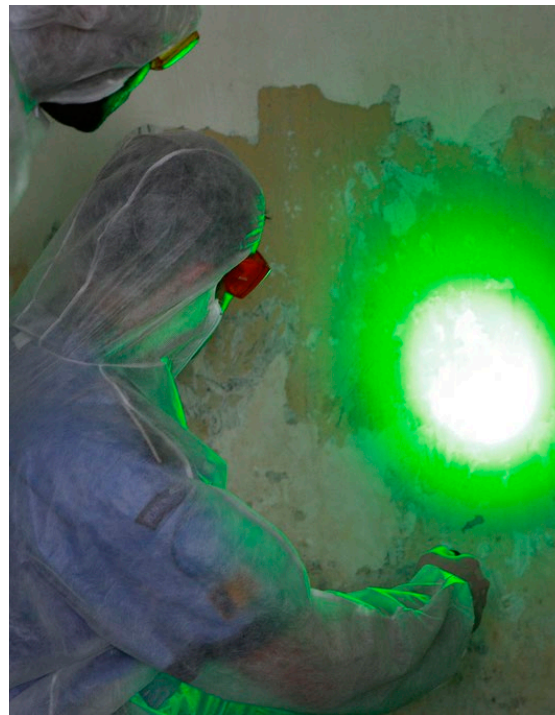
In short, the technologies and innovations discussed above operate at every level of need in peacekeeping by helping skilled personnel do the work, manage the mission, and optimize organizational performance. Continued training is especially important for personnel to stay current with the technology.

Recommendations:

↗ *Peacekeeping missions should strengthen cross-component integration to alleviate the need to acquire duplicate technologies, and must establish policies and procedures to prioritize allocation of technology and the timely sharing of information and data products between civilians, military and police.*

↗ *The UN should make simple mobile applications and devices available to police to streamline routine and incident reporting, track the movement of personnel and facilitate "smart" policing.*

↗ *UN police should be provided the tools necessary to increase their use of social media as part of a concerted strategic information operation, to strengthen community relations, instil confidence and help communities become more engaged in their own protection.*

↗ *Simple tools that can be used to strengthen the mission's monitoring and advisory capacity, such as the SMART system, should be replicated, and missions should explore how to leverage technology to enhance their training of national counterparts.*

↗ *Peacekeeping should make wider use of crime analysis software to inform resource needs, deployment patterns and protection activities.*

↗ *UN police should make greater use of vehicle and personnel mounted cameras interlinked with shot spotting technology and should able be able to easily access and task UAS platforms, such as that deployed in MONUSCO. Mini- or tactical UAVs will measurably aid in regular policing work.*

↗ *The UN should seek to make wider use of end-to-end case tracking tools that can help strengthen the links between the police and the wider justice system should be made available. Basic crime scene investigation kits, mobile forensic/crime scene kits and biometrics technology are also important.*

↗ *Missions should review applicability of non-lethal technologies, and work with UNHQ and TechCCs to identify potential solutions as appropriate.*

Mobile Border Demarcation Tools

Internally-developed mobile demarcation platforms can allow peacekeepers to plot border points on the ground in real time, with great accuracy. UNIFIL has developed mobile applications that allow for real-time field measurement to enable Blue Line marking, with accuracy of within 2 cm by drawing from two continuously operating fixed referencing stations.

The mobile platform—System of Incident Reports (SOIR)—is an adapted iOS commercially available web-based platform with multiple data overlays using UNIFIL GIS information. The data captured is stored behind UNIFIL firewalls, via SSL uploads from pre-loaded tablets, to maximize data security. UNIFIL has worked to customize and extend the technology for UNDOF and UNFICYP as well. This technology has allowed UNIFIL to build confidence between the parties—who trust the accuracy of the mission's data for demarcation.
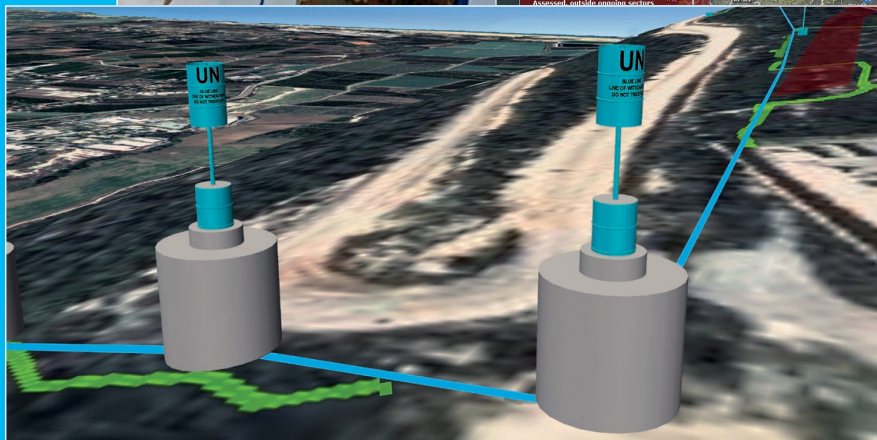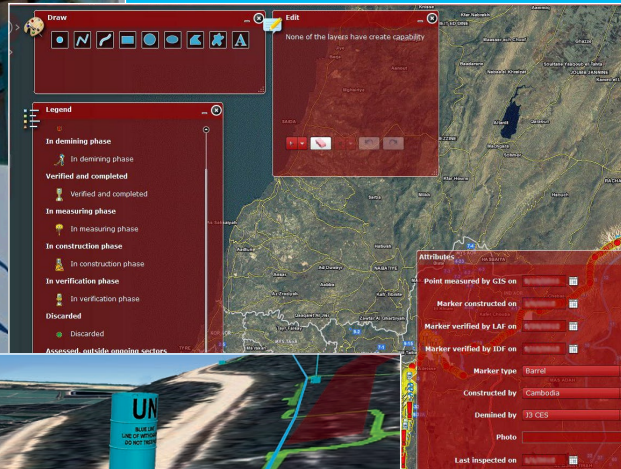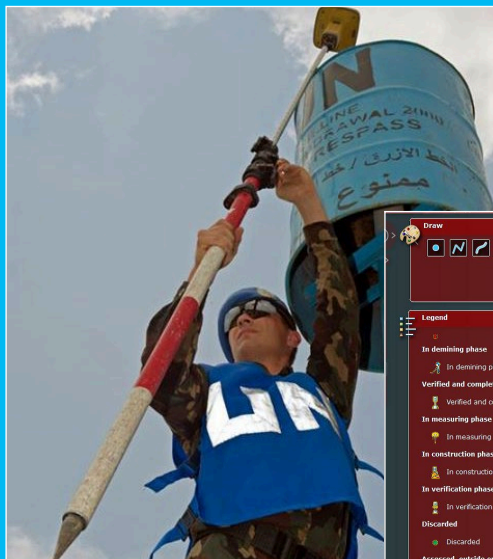
3. Border/Boundary Demarcation and Monitoring

Many peacekeeping missions today have border or boundary demarcation or monitoring as a central component of their mandates. Examples abound. In UNIFIL, liaison officers work with Lebanese and Israeli counterparts to demarcate the Blue Line. Along the Line of Control between India and Pakistan, UNMOGIP observers monitor a ceasefire and in UNFICYP, peacekeepers maintain the buffer zone between the communities. In UNISFA, peacekeepers work with a Joint Border Verification and Monitoring Mechanism and are tasked with maintaining a demilitarized border zone. In MINUSMA, peacekeepers face the daunting challenge of helping Malian security forces fight transnational organized crime over borders that stretch over 2,000 km long. Peacekeepers in UNMIL and UNOCI developed an inter-mission cooperation framework under which military, police, civilian and agencies, funds and programme personnel work together to promote cross-border dialogue and stabilization efforts, strengthening the capacity of local security forces to reduce cross-border flows of weapons and potential armed elements.

Sensor technologies, including UAS, are an essential element in border monitoring, with consent of the stakeholders, and these technologies can enhance peacekeepers' abilities to detect and respond to security threats (see Annex C). Smaller-scale sensors, including cameras and radar can be used to configure "alert zones" in volatile border areas. Wireless networks can allow radars to transmit their information to a central command post and inform immediate response. Commercially available smartphone applications can also alert users to the crossing of terrestrial and maritime borders.

Mobile thermal imaging systems (MTIS) can also assist UN Police to monitor criminal activity and provide real-time monitoring and communications about suspicious movements. They can be used for surveillance with different types of sensors including long-range thermal sensors, high zoom video, radar, LRF, digital compasses, GPS, and digital maps with target positions. They offer high mobility and are easy to upgrade. However, the panel cautions that there are important human rights and privacy issues that must be taken into account when employing any technology in a law enforcement or border setting.

UAS can enable other missions to delineate and map borders with tremendous accuracy. Sensor survey using GPS, satellite imagery, or LiDAR (a remote sensing technology that measures distance by illuminating a target with a laser and analysing the reflected light) are routinely used by the African Union to support demarcation of the numerous African borders that are not yet marked, and could be of tremendous immediate utility to peacekeepers.

Recommendations:

↗ *The UN should seek to make better use of sensor technologies and aerial visualization, including UAS, satellite imagery, cameras and radar in border monitoring activities, with consent of the parties as required.*

↗ *Mobile thermal imaging systems (MTIS) can also assist UN police to monitor criminal activity and provide real-time monitoring and communications about suspicious movements.*

E. Business Intelligence and Risk Management

As peacekeeping operations grow in scale and complexity, there is a need to shore up accountability frameworks against which mandate progress is measured in quantitative data-driven terms. Current methods being used to translate mandates into mission plans, programmes and activities with benchmarks and indicators of progress are being challenged from multiple directions. Member States are requesting increased use of measureable, indicator-driven reporting, and the Secretary-General requires data-driven reporting from senior leadership in their management compacts, against larger Organizational goals. Missions are also requesting more precise data-driven methods for strategically monitoring and evaluating mandate progress. In short, peacekeeping is being called to account, and without the data it needs at its fingertips, it is hard-pressed to answer.

DPKO, DFS and field missions have distinct needs for data-driven monitoring and business intelligence: DPKO needs cross-cutting and integrative data reporting against the totality of mandate progress from a strategic point of view, including harder-to-measure indicators such as conflict dynamics. DFS needs integrated strategic and operational data that is specific to its core business. Missions need not only cross-cutting mandate and business intelligence, but also operational and tactical level data at a more granular level and more rapid pace to allow for more immediate and targeted on-ground response.

A more coherent approach to the use of business intelligence would require the Departments t**o develop and implement a business intelligence policy**, clarify the responsibilities of every office with respect to this policy, and give personnel access to appropriate training and tools. **DPKO and DFS should assess their current ad hoc approaches to data-driven reporting and business intelligence and take steps to bring coherence to this much-needed capability**.

DFS has already begun to build and exploit a strategic level analytics dataset that can be mined based on budget data, but more work is needed to deliver comprehensive real-time information solutions, across the entire mission spectrum from substantive mandate implementation to the plumbing and wiring of a mission. Some support areas have already begun to establish systems for better data management, such as finance, human resources, and aviation, but other key areas, including logistics, Contingent Owned Equipment (COE) and procurement. But DPKO and substantive mission entities have been slower to the task, but the panel notes the development of a strategic management system being used by some in headquarters.

In order to develop business intelligence tools, **priority information requirements must be established with discipline**, and peacekeeping headquarters, as well as mission leadership, must use these requirements to guide information gathering and govern the processes and structures for using, storing and sharing the information over its mission life. In addition, programme and support personnel must work closely together to refine the information management systems throughout a mission's life cycle.

Tracking Progress
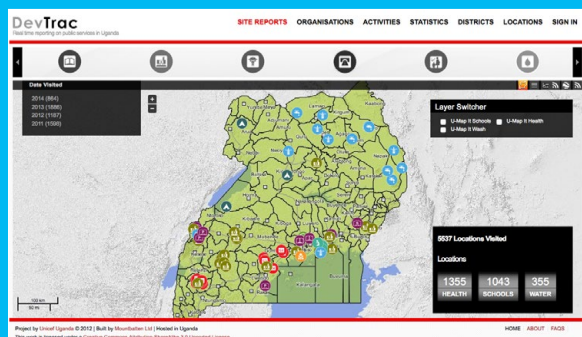
Source: UNICEF

UNICEF's **DevTrac** is a business intelligence dashboard that allows users to track activities of the UN and donor partners in field programming, thereby avoiding duplication, informing of more efficient use of resources, and alerting users to potential fraud. **UNICEF's innovation labs** continue to develop this open source tool, and will soon scale out its next generation, Equitrack. Such a tool could also be adapted to allow integrated peacekeeping missions and their partners to coordinate activities under a common framework, while also managing and mitigating risk.

Managing Risk

Risk management is not a task novel to UN peacekeeping. Every enterprise seeks to manage risk. The UN Somalia Risk Management Unit (RMU), for example, provides risk management advice, carries out risk assessments of partners or vendors on behalf of UN agencies, and conducts monitoring on behalf of UN entities, and, in some instances, donors. It also established and manages a web-based Contract Information Management System (CIMS). It is a user-friendly tool built using free software, to improve information sharing and transparency in a structured and secure manner that can help missions manage risks associated with contracts and vendors.

The tool currently contains information on over 2,000 UN vendors and partners and over 5,000 contracts from 14 UN entities with a contract value of approximately USD 3.6 billion. It captures performance assessments, risk assessments and identifies the number and scale of contracts held by individual entities. It also includes lists of persons and entities designated for sanctions by the Security Council.

The RMU is currently developing bespoke tools within CIMS, for use by donors and other partners with the extension of the RMU programme. These include a mapping tool to view programmes by GPS locations, entity, implementing partner; contractor, value and type of project; a Human Resources Vetting Information Record Tool to improve due diligence and screening and identify people who have been terminated by the UN as a result of gross misconduct (only available to senior-level UN Human Resource managers); a Civil Servant and Ministry Payments Tool to reduce duplication of payments; and a Monitoring Tool for mapping and exchange of information relating to monitoring activities. The RMU has been replicated in Afghanistan and represents a useful approach to risk management that may be replicated or customized for use in Libya, the Middle East, Iraq, the DRC and Mali.

Many tools are available on the market to help the Departments manage, analyse and visualize data. These tools include available software solutions for data management, visualization and analytics—both for more specialized applications (e.g., **SAP Business Objects**, etc.) as well as for greater transparency. Business intelligence represents a powerful accountability tool, and technology can help the Departments lay the data foundation for successful use of this tool. Management processes that systematically focus on the core metrics of peacekeeping operations (e.g., deployment speed, budget delivery, procurement speed, shared service quality, etc.) must be improved from the top down. The panel recognizes that building out this capacity will involve outlays in training or hiring staff with specialized skills.

Recommendations:

↗ *DPKO and DFS should assess their current ad hoc approaches to data-driven reporting and business intelligence and take steps to bring coherence to this much-needed capability.*

↗ *Peacekeeping should prioritize the development of business intelligence tools, and setting, establishing or strengthening priority information and dataset requirements, underpinned by policy, guidance and training.*

↗ *Information management should be prioritized at start-up and refined throughout a mission's life cycle, and priority information requirements of the mission (and of headquarters) translated into processes, structures and governance mechanisms.*

↗ *The way data is collected and managed must be changed, to enable a smarter approach to peacekeeping. The Departments should consider using commercially-available tools to help them manage, analyse and visualize data.*

VI. Mission Support

Since well before its establishment as a separate Department in 2008, Field Support personnel have worked continuously to strengthen the operating position of the men and women on the ground, but additional process innovations, supported by available technology, are still needed to further streamline support operations. Incorporating greater use of technology and smart applications will necessarily entail shifts in the way decisions are made, supply chains are managed, and services are delivered. In the panel's view, data-driven decision-making and mission support tools can enhance the management, operation and accountability of missions.

It is not too much to say that the ability to exploit technology with speed and agility can be a game changer for missions. **The UN must view technology as a strategic enabler in a complex environment, rather than simply a set of tools, and establish the requisite framework to allow it to become an integral part of institutional strategy. Mission C/CITS should have regular access to senior mission leadership to advise on more effective use of ICT** in support of mission mandates and operations and to ensure cyber security is properly prioritized.

As the Global Field Support Strategy (GFSS) approaches the end of its initial fielding stage, mission support operations have already begun the shift to a shared services model, allowing DFS to streamline and consolidate non-location-dependent functions and increase process efficiency. By reducing redundancies, the strategy has aimed to deliver cost savings through economies of scale— reducing support footprints in mission and reducing turnover related to the constraints of non-family duty stations. GFSS also has sought to allow mission leaders to focus on enabling front-end mandate implementation, placing back-end services elsewhere. Thus, the support focus has turned from a regional service centre model to one that identifies the optimal division of labour for shared service delivery, consolidating and leveraging existing providers.

Recommendations:

↗ *The UN must view technology as a strategic enabler for operations in a complex environment, rather than simply a set of tools, and establish the requisite business framework to allow it to become an integral part of institutional strategy.*

↗ *Mission C/CITS should have regular access to senior mission leadership to advise on more effective use of ICT in support of mission mandates and operations and to ensure cyber security is properly prioritized.*

A. Managing the Remote Back Office

Remote back offices are intended to lighten a mission's footprint—particularly in difficult or sensitive missions—and to alleviate some of the administrative burden on managers deployed forward. Where remote back office operations are considered, **solutions that allow multiple users in different locations to track the progress of a particular process should be developed. However, the panel stresses the need to rationalize and streamline business processes, before technology is placed atop them**. As the panel has cautioned earlier, automating poor processes will only serve to perpetuate dysfunction, and imposing that dysfunction on dislocated mission functions will only make operations that much harder to manage.

As the Departments continue to reduce the in-mission footprint and strengthen remote support and service delivery, **tools to support real-time collaboration, information sharing and communications should be prioritized**. Seamless, real-time communication and file-sharing with a remote and forward offices is a powerful enabler which makes flexible, remote service delivery viable. Video-teleconferencing and point-to-point video chatting solutions provide and important personal connection that can sometimes be lost to remote or automated service delivery. In addition, share points can allow for instantaneous information exchange and collaboration in real time.

Technology should assist managers to monitor, plan, anticipate and decide. Back office support should include a business analysis function that reduces the information management and processing burden at all levels. The panel believes that **DFS should explore the concept of a centralized business intelligence "fusion" centre located in remote back offices to help streamline managing and reporting on mission support functions**.

Recommendations:

↗ *As the Departments strengthen remote back-office support models, they should rationalize and streamline business processes, before emplacing technology solutions.*

↗ *Tools to support real-time collaboration, information sharing and communications should be prioritized by the Departments, including a system to allow multiple users in different locations to track the progress of a particular process in the immediate term.*

↗ *DFS should strengthen its approach to the centralized business intelligence "fusion" centre located in remote back offices to streamline management and reporting on mission support functions.*

B. Supply Chain Resilience

The combination of technology and process innovation can help streamline logistics and supply chain management, the goal of which is to deliver the required goods (and services) to the right point at the right time in the right quantity and quality. In peacekeeping, it also entails keeping costs down.

While the UN's approach to supply chain and assets management is expected to change with the full implementation of Umoja in FY 2016/17, **simple technology can already provide a boost, including basic satellite-enabled convoy tracking, RFID-enabled assets and shipment tracking. Modern inventory tracking technology should be in pervasive use throughout peacekeeping**. Over the longer term, a comprehensive approach to business intelligence will bolster interaction between collaborative structures and inform the development of flexible shared supply systems, sourcing, warehousing and strategic planning.

Recommendation:

↗ *DFS should invest in basic satellite-enabled convoy tracking, and RFID enabled assets and shipment tracking, and modern inventory tracking technology, to immediately enhance supply chain resilience.*

C. ICT Backbone and Business Continuity

DFS has introduced Field Technology Operations Centres to manage networks remotely as the centrepiece of the shared services concept for ICT. The ability to control major networks over long distances provides the UN with the ability to monitor network performance and initiate corrective technical measure down to the switch or router level. The shared services concept conserves resources and helps provide more consistent technical solutions to similar problems, while helping to identify systematic errors in the network and appropriately prioritize the distribution of upgrades. **The panel supports these developments. We also recognize that rapid access to competent tech support will be key to making these systems work**.

Recommendation:

↗ *DFS should continue to build the capacity of Field Technology Operations Centres, to enable rapid access to tech support across all missions.*

The Global Service Centre

Field Technology Operations Centres

The Field Technology Operations Centre (FTOC), located within the Global Service Centre (GSC), is comprised of two twin ICT facilities located in Valencia and Brindisi that provide a load-balanced, integrated approach to supporting the provision of ICT infrastructure, systems and services to the field. The FTOC also supports standardized functional and service management processes that allow the Organization to meet an increasing number of enterprise-wide ICT support demands such as Umoja.

As of September 2014, the GSC supported some 45,000 computers and 1,300 servers through 374 satellite earth stations. Some 30 million telephone calls and 220 million e-mails are routed through the GSC annually, and it hosts upwards of 9,000 video conferences a year.

D. Engineering

Capability gaps in engineering—especially horizontal construction (e.g., site preparation and essential infrastructure preparation) make the rapid deployment of staff and materiel a challenge. Major missions typically undertake 60 to 100 priority horizontal engineering projects during the start-up phase, yet missions lack the resources necessary to undertake more than a few of these at the same time. As a result, it is impossible to deploy peacekeepers quickly, in particular to remote areas where they are often most urgently needed. As noted above, camp construction is often prioritized over other operational tasks, and this administrative hurdle often slows down support to mandated programmes.

Multiple approaches to expand engineering capabilities are necessary, and, at heart, have more to do with process and partnership, than technology. For example, civilian architects, design engineers and project managers could be provided by Member States through non-reimbursable loans or gratis personnel, or from other members of the UN family like UNEP or UNOPS (UN Office for Project Services). Horizontal engineering bottlenecks could also be reduced by TCCs contributions of enabling equipment and personnel.

The UN should consider reviving modalities for Member States to provide specialized civilian capacity as Civilian Contributing Countries—CCCs—not unlike other national commitments to provide election or human rights monitors—to undertake specific, short-term engineering projects. The panel recognizes that the Organization has some history with this concept, but believes it is worth revisiting.

One of the key objectives of the Global Field Support Strategy was to reduce mission start-up times by using predeployment resource requirement planning, standardization and modularization. Modularization is intended to enable field missions to ramp up field activities quickly, using preconfigured basic modules that can be adapted to different types of deployments. Modules have included security components, energy, supply, office accommodation, safety and fire protection, ICT, ablutions, light vehicles components and waste water systems. The panel notes that DFS has developed enormous experience with mission start-up over the last decade and can mobilize the necessary skills and systems contracts to make rapid start-up much more fluid than in the past. Such "just-in-time" resourcing should be adapted to other programmatic dimensions of missions, particularly at start-up, to enable mandate implementation to begin at once.

Reducing the environmental footprint of peacekeeping missions. Strengthening just-in-time delivery, as well as remote supply and service provision, permits these functions to be reduced within or removed from a mission's physical area of operations, which, in turn, can help manage a mission's environmental impact on local areas. Shifting from hard wall to more expeditionary accommodation, as noted earlier, will also help reduce a mission's footprint and control waste. In recent years, as peacekeeping missions have been mandated to consider and manage the

FOI's "Camp Authoring Tool" (CAT) allows planners to create a virtual model of a UN peacekeepers camp that shows the effects on energy and water consumption of different design choices, such as adding shading or insulation.

Using Technology to Help Plan Camps

environmental impact of their operations, and DPKO and DFS have taken steps to lighten the environmental footprint through energy efficiency (renewables), greater water conservation, waste management and recycling, fuel efficiency, and increased use of environmentally-friendly construction materials.

Peacekeeping acknowledges the findings of the 2012 **United Nations Environmental Programme study** pointing to its significance for a more eco-friendly environmental impact. The present number of peacekeepers in the field consumes some 10 million litres of water and creates approximately 180 tons of solid waste per day. Moreover, peacekeepers are responsible for 56 per cent of the greenhouse gas emissions produced by the UN as a whole and, in 2012 the UN spent USD 700 million on fuel alone. The potential to reduce consumption and all associated costs is clear.

The panel notes that there are numerous widely available, simple and inexpensive innovations and technologies for immediate application to help reduce the carbon footprint of missions in the field, including **smart thermostats, low-energy lighting, and low-flow showers and toilets. In addition, the use of metres and an accompanying system for the collection, monitoring and reporting of data** on the environmental impact of missions is a critical first step to gathering the baseline information needed to inform camp planning and monitor consumption on an ongoing basis. The panel also notes the **introduction of generator canopies** to muffle sound and reduce noise pollution as well as **modernized air-conditioning units** fitted with CFC-free refrigerants, heat pumps and DC inverters, which reduce energy consumption (air conditioning in the field alone constitutes anywhere from 40 to 60 per cent of a given facility's electrical load). These innovations should be applied throughout peacekeeping as a matter of standard operating procedure.

In addition, **DPKO and DFS should consider several means to incentivize conservation-minded practices among the TCCs and PCCs** by, for example, increasing reimbursement rates for resource-efficient equipment, or adding a new category of "self-sustainable" equipment to the list of reimbursable COE.

The panel notes that currently, cost-benefit calculations for equipment procurement are based on the duration of a mission mandate—typically modelled at 12 months. **UN systems contracts should be reformed to incorporate a life-cycle approach to allow the UN to procure more environmentally friendly technologies that may initially be costly, but over time usually lead to significant savings**. Systems contracts should also directly integrate complete life-cycle solutions so that the vendor providing equipment is also in charge of its removal and environmentally responsible disposal. This innovation is particularly important given many host states' lack of legal and regulatory frameworks as well as capable waste management infrastructure.

The panel notes that MINUSMA was the first UN mission explicitly mandated to consider the environmental impact of its actions. But mandatory language from the Security Council should not be required to provide the impetus for baseline targets of a mission's environmental effects. **DPKO and DFS should begin immediately to issue planning guidance to require regular measurable improvements in the use of renewable energy in every mission as well as measurable reductions in non-recyclable waste**.

Finally, regarding procurement, the panel has drawn the same conclusion as so many other observers: the UN acquisition and procurement system does not well serve the needs of the field. Nowhere is this statement more true than with respect to modern technology. The pace of technological innovation and application happens over weeks and months, not years. **The panel recommends that the UN system create a fast-track system to identify and meet technology requirements of the field and that this system operates within a 6-month window to secure initial operating capability and a 12-month window for full operational deployment. If a technology system or service cannot meet these windows, the UN should not pursue them**.

Recommendations:

↗ **The UN should take a partnership approach to meeting critical engineering capabilities provided by Member States through non-reimbursable loans, gratis personnel, or TCC contributions of enabling equipment and personnel, or provided through arrangements with other members of the UN family.**

↗ **DFS should also revive modalities for Member States to provide specialized civilian capacity as Civilian Contributing Countries (CCCs) to undertake specific, short-term engineering projects.**

↗ **Widely available, simple and inexpensive innovations and technologies, including but not limited to those detailed above, should be applied throughout peacekeeping as a matter of standard operating procedure.**

↗ **Peacekeeping should immediately emplace meters and an accompanying system for the collection, monitoring, analysing and reporting data on the environmental impact of missions to inform camp planning and monitor consumption on an ongoing basis.**

↗ **DPKO and DFS should determine, together with TCCs and PCCs, ways to incentivize conservation-minded practices.**

↗ **UN systems contracts should be reformed to incorporate a life-cycle approach to procurement, and to directly integrate complete life-cycle solutions.**

↗ **DPKO and DFS should begin immediately to issue planning guidance to require a certain percentage of renewable energy in every mission. Similarly, the Departments should institute field-based systems to facilitate and track the measurable reduction in non-recyclable waste.**

↗ **The panel recommends that the UN system create a fast-track system to identify and meet technology requirements of the field and that this system operates within a 6-month window to secure initial operating capability and a 12-month window for full operational deployment. If a technology system or service cannot meet these windows, the UN should not pursue them.**

VII. The Longer View

The foregoing discussion has presented a number of recommendations to immediately incorporate modern technology into peacekeeping operations. As noted, the panel also considered the longer view and examined ways to embed an awareness of and appreciation for how technology and innovation can strengthen peacekeeping over time. In this respect, two areas in particular, stand out: strengthening the individual peacekeeper—whether military, police, or civilian; and strategic investing in peacekeeping.

A. The Digital Peacekeeper

Technology can immediately strengthen operations by linking enhanced physical capabilities at the individual and organizational levels with improved process to meet operational demands. But peacekeeping should not be constrained to thinking in the immediate term. In order to meet the needs of the future, it must be forward thinking—even visionary—in its approach to imagining the realm of possibilities. Rather than add written narrative at this point, several graphics illustrate the potential.

The Panel recommends that **DPKO and DFS establish an 18-month goal of equipping individual peacekeepers with some of the up-to-date technologies discussed in this report, and devise a schedule for ongoing training, technology refresh and periodic review to allow peacekeepers to keep pace with the world around them. Similarly, those who are supporting the digital peacekeepers by providing data, analysis and other real-time assistance must be adequately equipped and trained.**

Recommendation:

⤴ *DPKO and DFS should establish an 18-month goal of equipping individual peacekeepers with up-to-date technologies, and devise a schedule for ongoing training, technology refresh and periodic review to allow digital peacekeepers and those providing them with reach-back support to keep pace with the world around them.*

The Digital Peacekeeper:
Military

Military peacekeepers require an array of integrated communication, information sharing and command and control networks. They require real-time situational awareness and early warning information, to enable them to fulfil their mandates while responding to threats. They must also be able to report incidents and events immediately, with automated location and unit identification.

In future, visors act as a "head-up display monitor" to access real-time situational information, visualized data, and media streams from surveillance systems or body cameras.

Peacekeepers have continuous connectivity to headquarters at every level to enable secure and reliable communications for voice and data.

Specialized mobility enablers, such as mine-protected vehicles and comprehensive sensor-suites, offer added force protection.

Thermal sensors, night-time capable video cameras, and chemical sensors are integrated into the peacekeepers' personal equipment.

Non-lethal capabilities augment their ability to respond to threats.

Vehicles act as core technology hubs that provide mobile communications and data centres and also act as mobile operations and analysis cells for forward-deployed units.

Information fusion and enhanced analytic tools, fed by open source information, aerial, geospatial, and other remotely acquired data, commercial satellite imagery, and comprehensive sensor packages, support decision-making at the tactical, operational and strategic levels.

Physiological sensors provide the peacekeeper, the chain of command and nearby medics with real-time readings and emergency alert capabilities, to enable emergency medical response.

Access to specific layers of map-based visualization of real-time information for enhanced situational awareness through ruggedized tablet or smartphone solutions anywhere, anytime.

Contributes to a common operational picture and collaborates as part of a unified peacekeeping network.

Tracking and geo-location of individuals and vehicles improves safety and security, situational awareness, and command and control during operations.

Advanced technologies, including fuel cells, solar power-packs, individual mini-UAVs, and robotics can enhance mobility, performance, endurance, range, and load-carrying capabilities of military contingents.

Symbol-based visualization of the common operational picture enables fast and well-informed decision-making and aids in coordinating response, while helping to bridge language barriers where they exist.

The Digital Peacekeeper:
Police

To be effective, UN police must have integrated access to a mission's security and information exchange networks and to situational awareness, predictive analysis and early warning information. Such access will allow them to better assist national law enforcement actors to help build their own capacity over time.

Biometric and identity management solutions, including integrated biometric databases, can enhance a broad range of law enforcement tasks, such as border control, civil identification, and the registration of witnesses and criminals in areas where government-issued identification is not common or available.

A variety of mobile forensics and crime scene investigation equipment, such as DNA analysis and crime scene illumination equipment, allow for faster processing of crime scenes.

End-to-end case tracking systems can help a mission work with national partners to strengthen all phases of law enforcement, from arrest, to investigation, prosecution and punishment.

Diagramming systems quickly illustrate crime scenes and accidents and can even help predict locations of future incidents.

Smart software solutions provide accurate and real-time data on crowd numbers, densities, and dispostions and can spot patterns that indicate potential threats.

Mobile thermal imaging devices can help to detect illicit cross-border movements of people, weapons, or goods.

Contributes to a common operational picture and unity of effort operations as part of a unified peacekeeping network.

Specialized mobility enablers, such as riot- or mine-protected vehicles offer added protection.

New technologies in hand-held devices have speech-recognition abilities. Numerous applications are emerging to allow for instant text translation.

Automated response systems relay information in real-time to enable timely reporting.

Cameras in or atop vehicles can document incidents in the field and feed into mission-wide situational awareness.

Tablets and smartphones allow immediate access to databases to provide geo-tagged and layered visualization of tailored information for enhanced situational awareness and access to relevant supporting information and images to help prevent crime or other hostile acts.

GPS and tracking technology allow commanders to know which patrol units are nearest an incident in order to inform and enable rapid response and any needed assistance.

Monitoring and surveillance technology allows police to monitor hot spots and other high-risk areas for early indicators of hostile actions and to help identify suspects and improve security.

Non-lethal weapons offer the formed police units additional capabilities to respond to riots and other volatile situations without having to resort to deadly force.

The Digital Peacekeeper:
Civilian

Civilian peacekeepers have a wide range of duties and responsibilities that span both the programmatic as well as support sides of peacekeeping. Technology can enhance their ability to deliver their mandates, share information securely and easily on mobile devices from anywhere in a mission area, and contribute to data-driven planning and decision-making.

Information is valued, utilized and managed as a strategic asset for all mission elements, and prioritised information requirements established by senior mission leadership enable data-driven mission planning and mandate implementation.
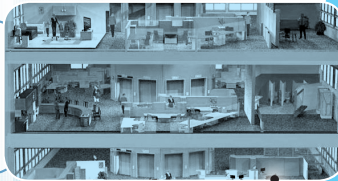
An integrated and multidimensional common operational picture, with real-time visualized and geo-referenced data, provides the mission's core situational awareness capability in support of tactical, operational, and strategic decision-making, thus enabling a coordinated response.

Business intelligence tools, including management dashboards, risk analytics, data-mining applications, and fusion capabilities, help managers and mission leaders track progress and address challenges.
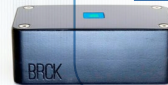
Integrated information management, sharing, analysis and collaboration are facilitated through common solutions designed with data liquidity in mind. Peacekeepers are regularly made aware of and trained on information security and data privacy protocols.

Environmentalally-sensitive technologies help reduce the mission's carbon footprint.

RFID-enabled tracking technology streamlines supply chain management and logistics.

Location tracing, geo-location and incident reporting technology is embedded in all UN vehicles for convoy management, and is included in personal equipment issued to all civilians.

Smartphones, tablets and other mobile devices enable real-time information gathering and reporting, with specialised applications designed to meet substantive and support needs.

Connectivity solutions, such as the BRCK or other mobile connectivity kits, allow peacekeepers to work in even the farthest reaches of a mission area.

Contributes to a common operational picture and collaborates as part of a unified peacekeeping network.

Simulation and scenario-based technology tools are used for training and planning.

All personnel are trained in the use of emergency communications, and individuals are issued with basic trauma packs and trained in the use of emergency medical kits.

State-of-the-art security solutions are integrated into a broader organizational security frameworks, and enhanced physical and IT security controls, such as biometric identification and access control measures and basic cyber hygiene measures, are in place.

B. Investing in Peace Operations in the Field

The panel recognizes that adopting and integrating the suggestions contained in this report will require (in some cases significant) investment up front. As noted at the outset, the panel prioritized identifying technology available on the market today at reasonable cost, but the panel also highlighted the importance of considering the overall cost of technological solutions in terms of a system's life cycle to capture the true sense of cost efficiencies.

The practical illustration of UN installation security makes the point. Currently, peacekeeping installations devote considerable manpower to static and perimeter guard duties. Guard duty can be augmented by equipping each camp or installation with a basic suite of sensors placed on portable elevated mounts for flexibility and greatest range. For 360° coverage 24/7, such a suite might include a combination of CCTV, motion sensors, infrared radar and ground radar. The addition of handheld UAVs would enable further investigation of potential threats or blind spots and allow installations to change up its monitoring coverage with minimum impact on personnel. Basic access control measures, such as commercially available remote-controlled barriers, could add to basic perimeter security measures and augment trenches and modern, easy to erect fencing or bastion perimeters. **DFS should develop an essential technology suite for every encampment that incorporates these measures and engage TechCCs to help provide them as needed**.

In addition, **missions simply need more bandwidth**, including via satellite. The wide use of web-based videoconferencing interfaces, such as Skype, greatly enhances operational efficiency and provides missions with important links to the deep field. In some mission areas, poor intra-theatre communications infrastructure delays the transmission of information, impairs the mission's ability to make maximum use of available software platforms, and, in the extreme, compromises mission security. If information-led operations are to become the standard, budgets must reflect this reality. Again, smartly negotiated systems contracts and the engagement of TechCCs can help control costs.

Microwave, fiber link and beyond line-of-sight technologies are steadily improving. The use of small, light, mobile troposcatter equipment, which is on the market as off-the-shelf, and which has a high and long-range data transmission and SATCOM switch capacity, should also be considered to enhance the flexibility of the system.

Again here, the panel wishes to underscore that information management must be prioritized at start-up, and that mission leaders must be accountable to define the priority information requirements of the mission, adjusting them as circumstances demand. At the same time, mission support must deliver real-time information solutions and tools, including, for example, secure mission-dedicated clouds in which a scalable and configurable enterprise operational database system manages routine operational activity and project data to replace section-specific databases and feed into a common operating picture. In fact, the panel believes that

mission data should be managed in a secure, dedicated mission cloud (accessible by authorized staff at Headquarters) with all operational data available via flexible query. Missions that insist on holding important or sensitive data on local servers must be required to justify that decision, especially in volatile environments where the ready compromise of data integrity and personal privacy must be assumed.

Recommendations:

↗ *DFS should develop an essential technology suite for every encampment that incorporates the measures detailed above, and engage TechCCs to help provide them.*

↗ *Budgets must reflect the shift to information-led operations, and allow for the necessary bandwidth to support them.*

↗ *Microwave, fiber link and beyond line-of-sight technologies such as mobile troposcatter should be considered to enhance ICT system flexibility.*

↗ *Mission data should be managed in a secure, dedicated mission cloud with all operational data available to UN leadership via flexible query.*

VIII. Challenges

The panel recognized up front the challenges that must be overcome when discussing the need to upscale the use of technology in peace operations. Chief among these challenges is the need to manage expectations, understand the true costs of increasing the technological profile of missions in the field (including the need to address the human resource requirements of a tech-savvy staff), and building a culture of innovation.

A. Managing Expectations

Employing technology to maximum effect is a priority for peacekeeping, but it raises important issues. In particular, the introduction and expansion of modern technology into a peacekeeping mission might lead some observers to develop unrealistic expectations regarding the ability of a mission to deliver results along unrealistic timelines. The UN must find the balance between actively supporting and sustaining high-tech missions while at the same time avoid alienating traditional or new contributors that lack similar capabilities.

In addition, for unusual situations, including urgent unforeseen deployments, highly sensitive, time-constrained negotiations, or other unique circumstances, intense political pressure will place a premium on quick, correct and discrete action. In these situations, high-quality crisis information management is the global expectation—assistance comes too late when one is unable to communicate.

Much of the technology discussed in this report can help peacekeeping better cope when the whole world is watching. Moreover, as the UN becomes more familiar with using modern technology in field applications, it will become more adept at reconciling the intersecting circles of tactical mission information, mainstream media and the social media of the world's population.

No one needs daily reminding of the challenging nature of peacekeeping missions, but the panel believes that a **regular stakeholder dialogue devoted to discussing how the deployment and use of technology is affecting operations** would enhance transparency and help manage expectations on all sides.

Recommendation:

↗ *Regular and transparent stakeholder dialogue on the deployment and use of technology should be held to manage expectations of all stakeholders and ensure political transparency.*
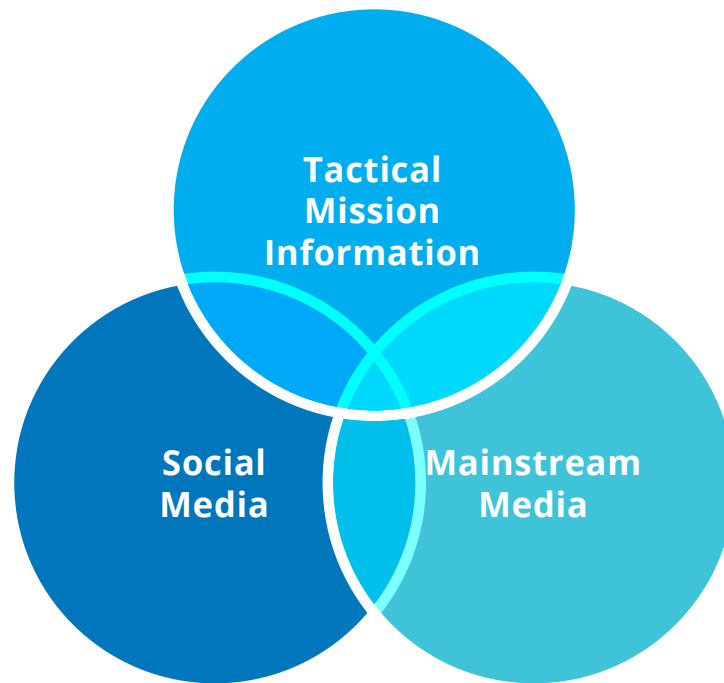
B. Understanding the Real Costs

While the panel has urged the greater use of technology and innovation in field missions, it recognizes that moving in this direction comes at a cost. Two areas are worth highlighting: dealing with legacy systems and managing the human dimension of enhanced technology.

Coping with Legacy Systems

The panel was struck by the field's frustration with in-place automated administrative processes that have long outlived their usefulness. One senior police officer estimated that 10 per cent of his component's daily work is lost to legacy systems, whether through processing requests via outmoded means or working through technical failures of systems that were never designed to carry the loads they do. Nevertheless, legacy systems persist in every complex enterprise, and **DFS should continue its accelerated work through OICT to devise and execute a prioritized plan to terminate legacy systems and consolidate data centres**. As part of this exercise, every mission should be required to consolidate data holdings and, as noted earlier, move its data to a secure, mission-specific cloud.

The panel supports the move, wherever possible, to a shared services model, and in particular to enterprise resource systems to replace legacy systems with integrated solutions. Enterprise platforms such as Umoja are important, but having said this, the panel recognizes the widespread disappointment—indeed, bordering on animosity—of field personnel toward Umoja. Nevertheless, we judge that negativity to be more about a lack of business readiness, poor process, and a lack of adequate training, rather than outcome.

To be sure, Umoja has had its problems. In MINUSMA, for example, the Umoja roll-out coincided with the mission's start-up, and procurement ground to a halt—according to one interlocutor, not one light fixture was purchased for an entire fiscal year, and urgently required personal protective equipment needed for EVD-readiness stalled in the procurement pipeline. **To realize the benefits of Umoja's full potential, DFS and DPKO must institute fundamental changes to existing policies, processes and workflows**. As one individual put it: "I have now learned how the engine of the car works, but nobody has taught me how to drive it". With its implementation over budget and off schedule, Umoja requires the time and space for a reset. The tool is valuable, but it cannot alone compensate for poor process, incomplete policies, extreme operational demands, and a widespread lack of training—especially during its own deployment phase. **DPKO and DFS should incorporate the lessons learned from the Umoja fielding to strengthen its full implementation and to guide deployment of other technology solutions going forward**.

Addressing the Human Dimension

To make strides in greater use of technology and bridge implementation, **the UN must ensure that personnel with specific skills can be recruited and retained for peacekeeping missions and headquarters**. This will require the **integration of requirements for enhanced technological awareness and skillsets, such as information management, in the terms of reference or generic job openings for certain posts**. In some cases, the core competency of technological awareness is no longer sufficient for the task at hand.

At a general level, **all peacekeeping personnel must have access to the necessary courses that will train them in the basic operation and maintenance of the systems deployed throughout a mission and to the rules by which information, especially sensitive information, can be shared with other parties**. In practical effect, this means that staff must **be given time to train, enjoy the support of their management for training, and have reliable access to computers with adequate connectivity**. The panel notes that inadequate funding for training and high staff turnover have contributed to the reluctance to introduce new technologies into field missions, but the need for trained personnel is an undercurrent running throughout this report that must be made explicit. The panel also recommends that **senior mission leaders be provided with the requisite training to understand and employ the tools for decision support at their disposal**.

Perhaps with a touch of irony, human resource training is also an area where technology can be brought to bear, and here the panel notes that **Member States accept the responsibility for providing predeployment training of uniformed personnel. Smart, interactive software provides a mechanism to certify or otherwise attest that they have fulfilled this responsibility, for example, through distance learning or assessed short courses (provided adequate bandwidth is available)**, as a step towards unburdening already stretched training services.

Similarly, a centralized, easily accessible online peacekeeping e-learning and training portal could also strengthen uniformed and civilian peacekeepers' readiness to deploy. **DPKO and DFS should empower the Integrated Training Service to design and conduct predeployment exercises using computers or other modern technology**. In addition, **virtual command post exercises** have proven highly effective at low cost to allow mission leadership to familiarize themselves with each other, with the operating environment, and with the mission mandate prior to deployment. Asynchronous exercises can be employed in low-connectivity areas.

Yet, here as elsewhere, and to repeat: the UN must take care not to automate poor processes, or to impose unnecessary reporting requirements on the very systems technology and innovation seek to help. The daily grind to "feed the beast" is already overwhelming. DPKO and DFS must work with the governing bodies to devise accountability mechanisms that give visibility into system usage without imposing cumbersome and duplicative reporting schemes.

Finally, for highly specialized skill sets, the panel believes that Departments should either outsource training needs, contract for the specialized skills, or call on Member States. The landscape is simply changing too fast, and the operational demands of peacekeeping are too great to expect the UN to develop, sustain and manage the training expertise that is itself required to support the use of sophisticated technology in the field.

Training and Exercises

The increasingly computer-connected and globalized world means that people can communicate in ways unthinkable in the past. Virtual meetings through free applications such as Skype and Google Hangouts are helping overcome the barriers of time and space. This has the potential to revolutionize the training of UN peacekeepers, especially through distance-learning courses and exercises.

Some UN training publications are available online from the Integrated Training Services (e-learning) and the larger set of documents are at the Peacekeeping Resource Hub, DPKO and DFS websites and the Official Documents System (ODS). A few UN pre courses like "Basic Security in the Field" have exams that are completed online to obtain a certificate. This model can be extended for more in-depth and operation-specific training. Distance-learning courses can proliferate to cover many subjects to better prepare peacekeepers for deployment.

Even more significantly, the UN can make greater use of predeployment exercises involving peacekeepers in different countries. Instead of meeting for the first time in the field, the UN personnel—military, police and civilian—can meet online and train together in a virtual exercise, perhaps one customized for the their future deployment. While the UN has experimented with some different types of predeployment trainings, Member States and their peacekeeping training institute can greatly help the UN to create more possibilities.

Even with participants in countries and locations of low Internet bandwidth, exercises are feasible. Real-time conversations are not always necessary; rather the organizers can send instructions by e-mail and receive responses in an asynchronous fashion so exercises take place over days. Communications via e-mail or text could include detailed attachments to provide responses to various scenarios. This way, different peacekeepers can coordinate the plans they have developed and try to arrive at a common course of action for anticipated situations or emergencies in the field. Much more sophisticated simulations are also possible, including with the use or real-time simulators or multi-player games across continents. The global gaming community is already involved in massive coordination for fictional war-fighting. It is time for this new global trend in computer-aided gaming to assist the cause of peacekeeping.

Recommendations:

↗ **DFS should continue its accelerated work through OICT to devise and execute a prioritized plan to terminate legacy systems and consolidate data centres.**

↗ **The UN should move, wherever possible, to a shared services model, and in particular to enterprise resource systems to replace legacy systems with integrated solutions. However, to realize the full potential of these solutions, DFS and DPKO must institute fundamental changes to existing policies, processes and workflows.**

↗ **DPKO and DFS should incorporate the lessons learned from the Umoja fielding to strengthen its full implementation and to guide deployment of other technology solutions going forward.**

↗ **The UN must ensure that personnel with specific skills can be recruited and retained for peacekeeping missions. For highly specialized skill sets, the Departments should outsource training needs, contract for the specialized skills, or call on Member States. The required technological skill levels of personnel should be reviewed and incorporated into job descriptions.**

↗ **All peacekeeping personnel must have access to courses to train them in the basic operation and maintenance of the systems deployed throughout a mission, and the rules by which information, especially sensitive information, can be shared with other parties. Senior mission leaders should also be provided training to understand and employ the tools for decision support at their disposal.**

↗ **The UN should explore the use of smart, interactive software as a mechanism to certify or otherwise attest that uniformed personnel have fulfilled predeployment training requirements, for example, through distance learning or assessed short courses.**

↗ **DPKO and DFS should empower the Integrated Training Service to design and conduct computerized predeployment, virtual command post and asynchronous exercises.**

C. Building a Culture of Innovation

As the UN moves towards intelligence-led and information-driven operations, all personnel will become more dependent on well-functioning applications and high-tech communications. Such widespread dependence effectively lifts the issue of technology into the category of strategic enabler. To make best use of these enablers, peacekeeping at all levels must become an innovative enterprise.

Innovation revolves around connecting good idea to the tools, products, people and procedures to solve a problem in a new, different and intelligent way. In the UN, however, many structural and operational barriers exist to building a culture of innovation. Chief among them is a clear lack of institutional responsibility for innovation. Simply put, innovation has no organizational home, nor defined process for take-up within peacekeeping. No office within the Departments has responsibility to capture innovative ideas, evaluate them, or even promote them when others do the work. Moreover, although innovation is ongoing at field and at UN Headquarters, no systematic way to broadly test or scale innovative ideas and integrate them across peacekeeping exists. With some notable exceptions, such as UN Police's SMART system, good ideas tried and tested at mission level usually never see the light of day.

It is generally true that peacekeeping has not yet become a learning organization. The panel does note a kind of systemic resistance to new thinking, especially when ideas come up the chain. Too often, innovation is seen as a distraction from the task at hand. In addition, and if truth be told, political barriers to innovation often come from Member States that mobilize every manner of argument—too costly, too time consuming, too biased—before they will support novel or innovative behavior in the UN.

Innovation at the institutional level is itself a political and a strategic decision, anchored in the fundamental conviction that human creativity at all levels is a valuable quality to be nurtured. In the panel's strong view, DPKO and DFS leadership should demonstrably value innovation by creating the space for it to occur, absorbing its failures, and rewarding its success.

If peacekeeping is to become the innovative enterprise that it needs to be, institutional weight will need to be brought to bear. The panel recognizes that innovation and bureaucracy are organizational antipodes. Yet, examples of support for innovation surround us. For example, UNICEF's Innovation Unit is world renowned as a centre for excellence in innovation, and UN Global Pulse places innovation at the core of its business model. Other offices and agencies, such as OCHA and UNHCR, have also prioritized innovation. The panel believes that **DPKO and DFS have much to learn from partnering with them**. For their part, the Agencies, Funds and Programmes must get past the biases that exist in their organization against collaboration with peacekeeping missions on the ground. The stakes are simply too high for the people we all serve. Similarly, **peacekeeping should also seize on opportunities to partner with external leaders in technology and innovation**, and who want to aid the cause of peace.

Innovation should be institutionalized in peacekeeping **in the form of a dedicated office for technology and innovation within the Departments**. This office should oversee an ad hoc advisory group composed of internal and external experts whose focus is to evaluate needs, assess new technologies, and prioritize them to leadership for adoption on an ongoing basis. The office would also input information into all budgetary and legislative reporting processes, including the Special Committee on Peacekeeping Operations (C34), the Advisory Committee on Administrative and Budgetary Questions (ACABQ) and General Assembly's Fifth Committee, making full use of the mission and HQ "tech maps" to reinforce priority needs across peacekeeping in the field.

This office would be empowered to take decisions, in line with the strategic priorities set by senior leadership, but which would also consider other "quick fixes" as needed. It would also have tasking

authority to enable rapid piloting or field testing. To begin, field-focused **innovation incubators could be established in selected missions** to serve as feasibility filters and to pilot projects, where proposals could be tested at small scale or explored as proofs of concept. Smaller missions might be supported by a small travelling team that can visit missions on their own initiative or by request. These incubators could also push ideas directly up to the office. **The office could also sponsor an "idea factory"—a web-based forum to source innovative ideas, crowdsource reactions, and identify volunteers to implement them**.

Streamlining the point of entry for innovation in the form of distributed small-scale innovation incubators can enable a bottom-up approach to innovation, help avoid a parallel track approach and dissuade "turf wars". Such incubators can evaluate the feasibility of any given initiative and help innovators "connect the dots". Permitted to operate on a fast track, innovation incubators can bypass the normal layers of bureaucracy and take promising ideas straight to the advisory group, so that good ideas are assured the space to stand in the sunlight and grow, and innovations are incentivized.

The panel notes plans for the roll-out of ICT-specific innovation laboratories in several missions, beginning in 2015. However, the panel believes that innovation incubators should not be limited to finding tech solutions alone. For the concept to succeed, innovators must have a solid understanding of user needs, in particular in programme support. In other words, innovation, particularly in the introduction and use of technology, will not be supply driven, but rather, client oriented. The goal should be to develop a holistic, collaborative model that combines substance with function, and which reaches beyond DPKO and DFS, to leverage innovators and substantive actors across mission components, including UN agency partners, and which can pull in other local actors, and reach out to industry and academic centres of excellence.

By taking a broader, partnership-oriented approach to innovation, peacekeeping and other field missions can potentially serve as an important incubator to field test the innovations of others. By reaching out to the local community, in particular enterprising young people, peacekeeping can encourage collaborative innovation with those who have the pulse of the local community. This, in turn, could be an important avenue for outreach, capacity-building, and programme support for peacekeeping.

In this systemic top-down, bottom-up approach, all peacekeepers would be empowered to constantly scan the horizon for new and better solutions. To facilitate this cultural shift, DPKO and DFS should commit to a broad programme of continuous learning and training, and the establishment of forums where new technologies or innovations could be presented and discussed. They should also designate **a small cadre of "technology scouts"**, possibly volunteers, and possibly including a person specifically designated as a "tech watch officer", to take the pulse of the global trends, maintain open channels of communication with inter-agency partners, relevant centres of excellence, innovators, market leaders and research institutions, and to inspire and advise the entire peacekeeping enterprise.

In order to reinforce and sustain the technology baseline, and to promote the enhanced use of technology in peacekeeping, **centres of excellence should be established and nurtured throughout peacekeeping and field support**.

Principles for Innovation and Technology in Development

UNICEF's Principles for Innovation and Technology in Development are a set of nine best-practice guidelines intended to inform the design of technology enabled programmes. Although they have been developed specific to development contexts, they have important applications in peacekeeping contexts as well. The principles have been endorsed or adopted by WHO, HRP, USAID, Gates Foundation, UN Global Pulse/EOSG, WFP, OCHA, UNDP, SIDA, IKEA Foundation, UN Foundation and UNHCR.

1. **Design with the User**
2. **Understand the Existing Ecosystem**
3. **Design for Scale**
4. **Build for Sustainability**
5. **Be Data Driven**
6. **Use Open Standards, Open Data, Open Source and Open Innovation**
7. **Reuse and Improve**
8. **Do No Harm**
9. **Be Collaborative**

Source: UNICEF

Recommendations:

↗ *DPKO and DFS should partner with—and learn from—others innovating within the UN system and with external leaders in technology and innovation.*

↗ *DPKO and DFS should establish a dedicated office for technology and innovation, supported by a small advisory group and field-based innovation incubators, together with a small cadre of "technology scouts", designated centres of excellence within the UN, and an "idea factory".*

↗ *DPKO and DFS should commit to a broad programme of continuous learning and training, and the establishment of forums where new technologies or innovations could be presented and discussed.*

IX. Additional Considerations

A. The Politics of Technology and Innovation

Peacekeeping has come a long way in the past decade. Intelligence is no longer a dirty word, and the Departments of Peacekeeping and Field Support now routinely engage in mission planning in accordance with UN rules and regulations well before a mandate is obtained from the Security Council.

But, as the earlier discussion on myths demonstrated, some continue to hold strong views opposed to widening the use of some technology by peacekeeping missions. As the Departments continue to seek out and employ such technology, there is much work to be done to bring the Member States along. DPKO and DFS should establish a standing consultation with TCCs, PCCs, TechCCs, and CCCs to identify early points of convergence, as well as concern, in order to work through deployment and use strategies that permit peacekeeping missions to enjoy the advantages of modern technology. The panel believes that a number of its recommendations will generate a lively political discussion. Panellists are prepared to support the Departments in these discussions in the months ahead, as necessary.

Recommendations:

↗ **DPKO and DFS should establish a standing consultation with Member States to identify early points of concern and work through deployment and use strategies that permit peacekeeping missions to enjoy the advantages of modern technology.**

B. Legal Considerations

UN peacekeeping missions and their members are bound by the provisions of the Charter, UN rules and regulations, as well as by the international law of armed conflict, and international humanitarian and human rights law. They are also bound to respect the laws and regulations of the host country.

This includes the right to privacy and extends to domestic and extraterritorial surveillance, the interception of digital communications and the collection of personal data. The panel believes that as peacekeeping moves more towards information-driven operations and seeks that information from multiple sources, including monitoring and surveillance technologies, it must ensure that strong procedural safeguards and effective oversight mechanisms are in place. In this regard, the **High Commissioner for Human Rights** recognized a "clear and pressing need [to ensure] compliance of any surveillance policy or practice with international human rights law, including the right to privacy, through the development of effective safeguards." The Departments should revise the existing SOP and policy on monitoring and surveillance technology and any other relevant guidance to take account of advances in the technology field.

Under current policy, DPKO must consult with the Security Council and obtain the host Government's consent prior to deploying a UAS, due to the relatively novel, sophisticated, and unique circumstances of its employment by UN peacekeeping in recent years. It is important to note that all data and imagery collected by these systems becomes UN property and is subject to the same rights, exemptions and protections as other UN property, and maintained and protected under the UN confidentiality regimes. The panel anticipates that as UAVs become more ubiquitous, this technology will be incorporated into force generation and SURs very much as with other capabilities.

The panel believes that maximum transparency should remain a principle of the use of peacekeeping technology, in particular, when used to enable information gathering and sharing. The Organization will need to ensure full transparency in the use of technology as well as ensure that technology is deployed for its intended purpose and that personnel are well trained on its appropriate use. The development of strong guidelines, rules and procedures for the collection, use, storage, sharing, protection and security of data, and other information will also help to assuage concerns about access and use of information collected in accordance with a mission's mandate, data privacy, as well as host country sovereignty. At the same time, the panel feels that the deployment of certain technologies should not be unnecessarily delayed by lengthy standard-setting processes. As technology is constantly evolving, so too will the Departments' own experience. A solid initial foundation of guidelines, rules and procedures will need to be iterated over time, as practice evolves.

Recommendations:

↗ *UN peacekeeping must ensure that strong procedural safeguards and effective oversight mechanisms are in place for the increased use of monitoring and surveillance technologies.*

↗ *The Departments should revise the existing SOP and policy on monitoring and surveillance technology and any other relevant guidance to take account of advances in the technology field.*

X. Final Thoughts

As the panel has pointed out in a number of areas, there is a clear need not only for the immediate implementation of certain technologies, but also for the institutionalization of innovation and continuous technological adaptation. The Departments must take deliberate and decisive action to meet these needs. But technology and innovation alone cannot do all that needs doing to strengthen UN peacekeeping, and all that needs doing cannot be done by DPKO and DFS alone. As the panel noted at the outset, the deployment and use of technology brings with it the need to anticipate and manage the effects and consequences of added range, reach, volume and impact. The Member States must be full partners and active in their support for action here.

The Organization must not lose sight of the need for continuous review, lessons capture, adaptation and transparent engagement with all stakeholders as new technologies are integrated into operations. As also noted earlier, the Departments must commit to the policy and process changes necessary to create a technology- and innovation-friendly framework to set a solid foundation for success. The panel also believes strongly that the Organization must pay due attention to, and make commensurate investments in, the implementation bridges that will allow it to flourish through the introduction of technology and to grow into an Organization that embraces, values and empowers innovation.

As noted at the outset, the panel recognizes that technology is not a panacea. No panellist believes that simply throwing technology at a problem will help a peacekeeping mission fulfil its mandate. A field operation might have all the enabling technology in the world, yet still be ineffective or unwilling to use it. But the moment is now for peacekeeping to take greater advantage of the waves of technology and innovation now washing over every dimension of life in societies the world over. It is in this spirit that this report has been prepared and its findings and recommendations presented.

XI. Summary of Recommendations

↗ *Each mission should create a "tech map" of its technology holdings, and DFS should maintain a field-wide mapping to create the foundation for informed decisions regarding capabilities and needs.*

↗ *Missions and headquarters should create an "information map", to establish a clear understanding of how essential information is collected, used, for what purpose, stored, and shared, and by whom.*

GETTING THE BASICS RIGHT

A. Safety and Security

↗ *All encampments, office compounds and staff accommodations should have: backup energy support—including primary or backup alternative energy solutions; perimeter lighting; motion-detection technology; emergency communications; and camera technology using remote access to live feeds.*

↗ *Tamper-resistant tracking technology should be installed on all vehicles and heavy weapons systems.*

↗ *DPKO and DFS, in coordination with the Department of Safety and Security (DSS), should provide individuals with emergency contact capabilities and mobile applications to file travel plans, automatically communicate GPS locations, and alert base stations or headquarters when they are overdue at their destinations.*

↗ *Individual suites of operational and protective equipment should include not only modern and effective body armour and helmets, but also fire blankets, individual field first-aid kits, crisis response instruction cards, backup power packs for mobile phones and other devices, mobile communications and Internet access devices preloaded with critical local information such as medical facilities and transportation hubs as well as translation software, and emergency-activated beaconing technology.*

↗ *Peacekeeping should accelerate the full deployment of personnel and vehicle tracking systems as a minimum requirement for missions to ensure the safety and security of personnel as well as manage and control operations.*

↗ *The panel urges DPKO and DFS to ensure its privacy policy and training are updated to appropriately control the collection, use, storage and sharing of information by UN personnel.*

B. Shelter

↗ *The policy for hard-walled accommodation should be revised, in favour of expeditionary accommodation combined with a strong perimeter security platform and well-practiced emergency reaction capability.*

C. Water

↗ *Strategically resourced ground-penetrating radar and advanced geospatial imaging should be more widely used to find water.*

↗ *DFS should engage global expertise to help ensure environmentally sound waste disposal.*

↗ *Personal water purification "straws" should be issued to individuals for use in emergency situations, along with instructions for their use.*

↗ *DFS should employ rainwater collection, piping and storage systems more widely in missions.*

↗ *The panel strongly recommends that the Departments reassess the current water allocations, with the aim to revise to more sustainable levels.*

D. Communications

↗ *The UN should prioritize solving the interoperability problem, shifting policy where needed to enable federated network or bridging solutions.*

↗ *Every mission should establish and practice the use of emergency SMS as an essential means of intra-mission communication to back up radio networks.*

↗ *Wherever possible, missions should take the steps necessary to incorporate policies and practices to ensure personnel location systems are widely available to and understood by all personnel.*

E.   Energy

↗ *Peacekeeping should adopt as a matter of priority, the systematic integration of alternate energies across all aspects of field operations and incorporate a life-cycle approach.*

↗ *Peacekeeping should work through barriers to the procurement of basic and widely available technologies that will net immediate gains.*

↗ *The panel recommends a standing energy requirements board be established to assess the applications where alternate energy could replace or complement traditional generation.*

↗ *The Departments should continue to look towards additional alternatives to fossil fuels and field test them, with the aim of taking them to scale where possible.*

↗ *Alternative energy technologies should be aggressively applied where possible, especially those that can be sourced locally or regionally. They should also be used for less energy-intensive tasks, and as an important redundancy.*

↗ *DFS should conduct an overview of widely available energy saving technologies and conservation devices and devise a prioritized strategy for introducing these technologies into every mission.*

↗ *When operational circumstances permit, DFS should place limits on fuel consumption to promote the use of alternative energy, and create encampment kits that provide alternate energy backup sources.*

F. Health and Well-being

↗ *Peacekeeping should adopt the 10:1:2 standard by prioritizing the installation of well-functioning emergency alert systems linked to rapid and expert medical response.*

↗ *A system of emergency communications with override features for the most urgent message should form a part of every mission's communications and IT suite.*

↗ *The panel strongly recommends that dedicated channels for this purpose be established in every mission.*

↗ *Medical escorts should accompany high-risk patrols or other operations, and be equipped with redundant communications systems and emergency medical equipment, in particular in high-risk areas.*

↗ *Individuals deployed to extremely remote locations should be trained and equipped to make use of emergency trauma kits, and all individuals should be provided with a basic trauma pack.*

    ↗   *Missions must have the capacity to render advanced life support—either exceptionally within the mission area, or more commonly via Medevac.*

    ↗   *The UN should call upon Member States with advanced technology and capability to provide specialized support to missions in the area of health care.*

    ↗   *Missions should provide outlets for relaxation and connectivity to loved ones outside the mission area, while taking active steps to prevent piracy and other unauthorized use of such resources, and ensure an active posture of cyber hygiene.*

G. Mobility

    ↗   *Where IEDs are an identified threat, all convoys should deploy with the minimum ability to self-recover, together with sapper pioneering teams equipped with heavy vehicle extraction capability and organizational level repair and remediation technologies.*

    ↗   *These teams should, where indicated, travel in mine-protected vehicles.*

    ↗   *Convoys should employ small tactical UAVs as mobile ISR platforms to survey the route and to augment other route reconnaissance and security measures. All operations and convoys should be equipped with fixed or tethered surveillance platforms to offer increased surveillance capability, and mobility enablers.*

    ↗   *Wherever required, missions should be equipped with electronic countermeasures and linked to dedicated intelligence resources while on the move.*

    ↗   *Where required, additional "bolt on" armour, ground-penetrating radar and hand-held explosive composition detection devices could also be made available for immediate use.*

    ↗   *In addition to predeployment IED awareness training, technological tools should be used to enhance awareness and understanding of IEDs among UN personnel, especially in missions with such threats.*

    ↗   *UN peacekeeping should open a direct and extended collaboration with all Member States with C-IED experience to develop a strategy for incorporating this learning into current practice.*

    ↗   *The UN should, together with Member States, take an in-depth look at the foundational elements that comprise the threat of IEDs, with the aim to devising a strategy to address its root causes. Peacekeeping should work with relevant partners to synchronize activities and prioritize resources across the Organization.*

    ↗   *Counter-IED capabilities must be included in initial contingency planning and be a standard line in peacekeeping budgets.*

OPERATIONAL IMPERATIVES

A. Command and Control

↗ *The UN should put in place a customizable GIS-enabled command and control information system to enable more coherent operational interaction from patrol to sector to mission and higher headquarters, supported by continuous and reliable voice, data and video communications.*

B. Monitoring, Reconnaissance and Reporting

↗ *Aerial data, geospatial/geographic information, and other remotely acquired data are of critical importance to any peacekeeping mission and should be available as a matter of course.*

↗ *Clear policies should be emplaced, and leadership accountability be established, to help ensure that information is properly and lawfully obtained, stored, used, processed and shared, and that prevailing privacy laws are respected.*

↗ *As a matter of priority, the UN should make more systematic use of commercial satellite imagery by enabling its near real-time sourcing and dissemination to enhance operational effectiveness and increase peacekeepers' safety.*

↗ *The panel recommends the creation of a new kind of mission—the Special Technical Mission, or STM—to enable the Security Council to call on, organize, and legitimate the use of technical audio, visual, monitoring and surveillance technologies, ground and airborne sensors and other technical means (e.g., ground and airborne sensors), to keep up with events on the ground in rapidly changing circumstances, inform their decision-making, prioritize action and aid in planning.*

↗ *For the UN to make maximum use of UAVs, greater use of smaller, tactical-level assets is required, and miniature UAVs should be incorporated into standard requirements without delay.*

↗ *Comprehensive sensor suites (radars, cameras, infrared and other sensors) with command post fusion centres should be a standard requirement at all UN camps and installations, with static CCTV an absolute requirement.*

↗ *As an immediate measure, the UN should make better use of night-vision goggles, infrared cameras, and lighter, night-time-capable aerial visualization and monitoring platforms with mounted radial-surveillance technology.*

C. Communications, Information Technology and Information Management

↗ *The UN should ensure that fully functioning HF radio networks as the backbone of all communications in missions. Assigned networks should be well controlled and information flow properly regulated, and interfaces between radio and other communications networks must be established.*

↗ *The UN's ICT policies should be revised to enable the provision of, and support for, mobile tools that will enhance peacekeepers' abilities to do their jobs and tools that will allow them to align operational processes to the need for accelerated information flow.*

↗ *Peacekeeping missions should make enhanced use of, and support handheld devices or tablets equipped with specialized mobile applications.*

↗ *Smartphones or tablets should be made immediately available to military and civilian staff members, military observers and police officers regardless of rank.*

↗ *Better use should be made of standardized mobile communications capabilities deployable at short notice and manned by civilians or contributed forces.*

1. Information Use, Processing and Dissemination

↗ *Modern surveillance and reconnaissance suites are powerful force protection and intelligence tools that UN peacekeeping should field immediately, without exception or delay.*

↗ *As it acquires more specialized technology, the UN should also ensure that the specialized personnel and additional tools required are provided.*

↗ *Every mission should undertake a comprehensive review (at least) annually of its information priorities, as well as its information gathering, management, analysis and dissemination practices as measured against those priorities.*

↗ *DPKO and DFS should implement systems, with clear roles and responsibilities and relevant substantive training to field missions, to improve internal information sharing and electronic records management and achieve data liquidity.*

↗ *Peacekeeping should revise its reporting requirements to enable, where appropriate, single reports from the field to serve multiple purposes, and missions should strengthen the capacity of JOCs to maximize their role as the information hub of the mission.*

↗ *JOCs, JMACs (or a mission's other analytic capacity) and GIS components should be immediately provided with the tools required to collect, process, use and disseminate information effectively, to the benefit of decision makers. GIS capacities should be co-located with the JOC wherever possible.*

↗ *To enable missions to make better immediate use of open source information, the UN should reiterate the policy that lifts Internet restrictions for those engaged in open source information collection, and provide training on basic cyber security and ethics protocols. It should also ensure that open source analytic tools are immediately available and accessible to those whose core business requires them.*

↗ *Peacekeeping should pursue partnership opportunities to capitalize on combined capabilities and learning.*

↗ *DPKO and DFS should work with UN Agencies, Funds and Programmes and other humanitarian actors in the field to establish a common information exchange policy and protocols sensitive to humanitarian principles, to enhance common situational awareness and understanding, and explore the use of available inter-agency data-sharing tools.*

↗ *As the UN moves towards intelligence-led peacekeeping, it should engage with Member States to determine an appropriate governance structure for the use of certain technologies used to collect information.*

↗ *The UN must continuously review and update related internal policies and procedures as technology evolves and is taken on board by peacekeeping.*

↗ *The UN must immediately implement basic cyber hygiene—at a minimum, to include hardware asset inventory, software asset inventory, secure configurations of networks and systems, a system of continuous system monitoring and vulnerability mitigation, and means of controlling the distribution and use of administrative permissions.*

2. Strategic Communications

↗ *Peacekeeping should rethink its strategic communications paradigm, and employ available tools to make it more multifaceted, operational, interactive and data-driven.*

↗ *Upon the promulgation of a comprehensive policy for the use of social media, DPKO and DFS should provide the necessary training to support its implementation.*

↗ *The UN should seek out and employ low-cost solutions for the rapid deployment of strategic messaging whenever required.*

D. Progammatic Priorities

1. Protection of Civilians

↗ *Peacekeeping missions should seek to incorporate technology in the design and implementation of protection of civilians strategies, in particular their early warning and early response mechanisms.*

↗ *Missions must take care to protect sensitive information as well as the privacy of particularly vulnerable individuals in protection scenarios.*

↗ *Peacekeeping should continue to seek ways to use technology as an empowerment tool in protection of civilian contexts, while remaining mindful of possible risks.*

2. Policing and the Rule of Law

↗ *Peacekeeping missions should strengthen cross-component integration to alleviate the need to acquire duplicate technologies, and must establish policies and procedures to prioritize allocation of technology, and the timely sharing of information and data products between civilians, military and police.*

↗ *The UN should make simple mobile applications and devices available to police to streamline routine and incident reporting, track the movement of personnel and facilitate "smart" policing.*

↗ *UN police should be provided the tools necessary to increase their use of social media as part of a concerted strategic information operation, to strengthen community relations, instil confidence and help communities become more engaged in their own protection.*

↗ *Simple tools that can be used to strengthen the mission's monitoring and advisory capacity, such as the SMART system, should be replicated, and missions should explore how to leverage technology to enhance their training of national counterparts.*

↗ *Peacekeeping should make wider use of crime analysis software to inform resource needs, deployment patterns and protection activities.*

↗ *UN police should make greater use of vehicle and personnel mounted cameras interlinked with shot spotting technology and should able be able to easily access and task UAS platforms, such as that deployed in MONUSCO. Mini- or tactical UAVs will measurably aid in regular policing work.*

↗ *The UN should seek to make wider use of end-to-end case tracking tools that can help strengthen the links between the police and the wider justice system should be made available. Basic crime scene investigation kits, mobile forensic/crime scene kits and biometrics technology are also important.*

↗ *Missions should review applicability of non-lethal technologies, and work with UNHQ and TechCCs to identify potential solutions as appropriate.*

3. Border/Boundary Demarcation and Monitoring

↗ *The UN should seek to make better use of sensor technologies and aerial visualization, including UAS, satellite imagery, cameras and radar in border monitoring activities, with consent of the parties as required.*

↗ *Mobile thermal imaging systems (MTIS) can also assist UN police to monitor criminal activity and provide real-time monitoring and communications about suspicious movements.*

E. Business Intelligence and Risk Management

↗ *DPKO and DFS should assess their current ad hoc approaches to data-driven reporting and business intelligence and take steps to bring coherence to this much-needed capability.*

↗ *Peacekeeping should prioritize the development of business intelligence tools, and setting, establishing or strengthening priority information and data set requirements, underpinned by policy, guidance and training.*

↗ *Information management should be prioritized at start-up and refined throughout a mission's life cycle, and priority information requirements of the mission (and of headquarters) translated into processes, structures and governance mechanisms.*

↗ *The way data is collected and managed must be changed, to enable a smarter approach to peacekeeping. The Departments should consider using commercially-available tools to help them manage, analyse and visualize data.*

MISSION SUPPORT

↗ *The UN must view technology as a strategic enabler in a complex environment, rather than simply a set of tools, and establish the requisite business technology framework to allow it to become an integral part of institutional strategy.*

↗ *Mission C/CITS should have regular access to senior mission leadership to advise on more effective use of ICT in support of mission mandates and operations and to ensure cyber security is properly prioritized.*

A. Managing the Remote Back Office

↗ *As the Departments strengthen remote back-office support models, they should rationalize and streamline business processes, before emplacing technology solutions.*

↗ *Tools to support real-time collaboration, information sharing and communications should be prioritized by the Departments, including a system to allow multiple users in different locations to track the progress of a particular process in the immediate term.*

↗ *DFS should strengthen its approach to the centralized business intelligence "fusion" centre located in remote back offices to streamline management and reporting on mission support functions.*

B. Supply Chain Resilience

↗ *DFS should invest in basic satellite-enabled convoy tracking, and RFID enabled assets and shipment tracking, and modern inventory tracking technology, to immediately enhance supply chain resilience.*

C. ICT Backbone and Business Continuity

↗ *DFS should continue to build the capacity of Field Technology Operations Centres, to enable rapid access to tech support across all missions.*

D. Engineering

↗ *The UN should take a partnership approach to meeting critical engineering capabilities provided by Member States through non-reimbursable loans, gratis personnel, or TCC contributions of enabling equipment and personnel, or provided through arrangements with other members of the UN family.*

↗ *DFS should also revive modalities for Member States to provide specialized civilian capacity as Civilian Contributing Countries (CCCs) to undertake specific, short-term engineering projects.*

↗ *Widely available, simple and inexpensive technologies to enable a mission to reduce its environmental footprint should be applied throughout peacekeeping as a matter of standard operating procedure.*

↗ *Peacekeeping should immediately emplace meters and an accompanying system for the collection, monitoring, analysing and reporting data on the environmental impact of missions to inform camp planning and monitor consumption on an ongoing basis.*

↗ *DPKO and DFS should determine, together with TCCs and PCCs, ways to incentivize conservation-minded practices.*

↗ *UN systems contracts should be reformed to incorporate a life-cycle approach to procurement, and to directly integrate complete life-cycle solutions.*

↗ *DPKO and DFS should begin immediately to issue planning guidance to require a certain percentage of renewable energy in every mission. Similarly, the Departments should institute field-based systems to facilitate and track the measurable reduction in non-recyclable waste.*

↗ *The panel recommends that the UN system create a fast-track system to identify and meet technology requirements of the field and that this system operate within a 6-month window to secure initial operating capability and a 12-month window for full operational deployment. If a technology system or service cannot meet these windows, the UN should not pursue them.*

THE LONGER VIEW

A. The Digital Peacekeeper

↗ *DPKO and DFS should establish standard approaches to equipping individual peacekeepers with identified technology, and should devise a schedule for periodic review and update to allow peacekeepers to keep pace with the world around them.*

B. Investing in Peace Operations in the Field

↗ *DFS should develop an essential technology suite for every encampment, and engage TechCCs to help provide them as needed.*

↗ *Budgets must reflect the shift to information-led operations, and allow for the necessary bandwidth to support them.*

↗ *Microwave, fibre link and beyond line-of-sight technologies such as mobile troposcatter should be considered to enhance ICT system flexibility.*

↗ *Mission data should be managed in a secure, dedicated mission cloud with all operational data available to UN leadership via flexible query.*

CHALLENGES

A. Managing Expectations

↗ *Regular and transparent stakeholder dialogue on the deployment and use of technology should be held to manage expectations of all stakeholders and ensure political transparency.*

B. Uunderstanding the Real Costs

↗ *DFS should continue its accelerated work through OICT to devise and execute a prioritized plan to terminate legacy systems and consolidate data centres.*

↗ *The UN should move, wherever possible, to a shared services model, and in particular to enterprise resource systems to replace legacy systems with integrated solutions. However, to realize the full potential of these solutions, DFS and DPKO must institute fundamental changes to existing policies, processes and workflows.*

↗ *DPKO and DFS should incorporate the lessons learned from the Umoja fielding to strengthen its full implementation and to guide deployment of other technology solutions going forward.*

↗ *The UN must ensure that personnel with specific skills can be recruited and retained for peacekeeping missions. For highly specialized skill sets, the Departments should outsource training needs, contract for the specialized skills, or call on Member States. The required technological skill levels of personnel should be reviewed and incorporated into job descriptions.*

↗ *All peacekeeping personnel must have access to courses to train them in the basic operation and maintenance of the systems deployed throughout a mission, and the rules by which information, especially sensitive information, can be shared with other parties. Senior mission leaders should also be provided training to understand and employ the tools for decision support at their disposal.*

↗ *The UN should explore the use of smart, interactive software as a mechanism to certify or otherwise attest that uniformed personnel have fulfilled predeployment training requirements, for example, through distance learning or assessed short courses.*

↗ *DPKO and DFS should empower the Integrated Training Service to design and conduct computerized predeployment, virtual command post and asynchronous exercises.*

C. Building a Culture of Innovation

↗ *DPKO and DFS should partner with—and learn from—others innovating within the UN system and with external leaders in technology and innovation.*

↗ *DPKO and DFS should establish a dedicated office for technology and innovation, supported by a small advisory group and field-based innovation incubators, together with a small cadre of "technology scouts", designated centres of excellence within the UN and an "idea factory".*

↗ *DPKO and DFS should commit to a broad programme of continuous learning and training, and the establishment of forums where new technologies or innovations could be presented and discussed.*

ADDITIONAL CONSIDERATIONS

A. The Politics of Technology and Innovation

↗ *DPKO and DFS should establish a standing consultation with Member States to identify early points of concern and work through deployment and use strategies that permit peacekeeping missions to enjoy the advantages provided by modern technology.*

B. Legal Considerations

➲ *UN peacekeeping must ensure that strong procedural safeguards and effective oversight mechanisms are in place for the increased use of monitoring and surveillance technologies.*

➲ *The Departments should revise the existing SOP and policy on monitoring and surveillance technology and any other relevant guidance to take account of advances in the technology field.*

ANNEX A

THE EXPERT PANEL

Jane Holl Lute served as Acting Under-Secretary-General, Field Support, and as Assistant Secretary-General for Peacebuilding Support and Peacekeeping from 2003 to 2009. From 2009-2013, she served as Deputy Secretary for the United States Department of Homeland Security. Concurrent to chairing this panel, Ms. Lute serves as the Special Advisor to the Secretary-General on the relocation of the Residents of Camp Huirrya outside of Iraq. Earlier in her career, Ms. Lute was executive vice president and chief operating officer of the United Nations Foundation and the Better World Fund. She also served on the United States National Security Council staff under Presidents Bush (41) and Clinton and had a distinguished career in the United States Army. She has a PhD in political Science from Stanford University and a J.D. from Georgetown University Law Centre.

Ib Johannes Bager has a long and distinguished career in the Danish Army, retiring with the rank of Major General in 2011 as a senior commander for NATO and a specialist in signals and communications technologies. In his retirement, Major General Bager focuses primarily on preservation of the Danish military historical heritage holding several posts as president and chairman of a number of historical associations.

Walter Dorn teaches military officers from Canada and about 20 countries at the Canadian Forces College and at the Royal Military College of Canada. He is a professor of defence studies and recently served as Chair of the Department of Security and International Affairs. As an operational professor, he has researched, visited and served in several UN missions and at UN Headquarters. He has been a training adviser in DPKO and a UN electoral officer in the field. He has also served as a visiting professional at the International Criminal Court. Dr. Dorn is a scientist by training and has conducted lab work on arms control verification technologies. He has been advocating for technological innovation in UN peacekeeping for several decades. He is author of the book **Keeping Watch: Monitoring, Technology & Innovation in UN Peacekeeping** and several **articles** on the subject.

Micheal Fryer served in Darfur as the Police Commissioner for UNAMID from 2007-2010. Prior to this assignment, he served for 37 years in the South African Police Service where he headed the Specialized Operations Division and served as Commander of the South African Special Task Force, retiring with the rank of Major General. He is active in senior mission leadership training, and serves as a police mentor for the United Nations and the African Union, and under bilateral police capacity-building frameworks. Major General Fryer has also served as a member of the Technical Expert Reference Panel (on the UN troop cost survey).

Abhijit Guha has recently concluded a term as the Director of the Office for Peacekeeping Strategic Partnerships in the Department of Peacekeeping Operations and also served as the Military Advisor ad interim in 2013 and the Deputy Military Adviser 2010 – 2012. Prior to joining the United Nations, Lt. General Guha had a distinguished military career in the Indian Army. Lt. General Guha attended the Indian National Defence Academy and was commissioned in the Regiment of Artillery in June 1974. A graduate of the Defence Services Staff College and the National Defence College, he served as an instructor in both institutions, and as Directing Staff in the Indian Military Academy. In addition to a number of senior staff appointments at the brigade, group army and Army headquarters, Lt. General Guha has commanded at every level, including Division Command. He retired from the Indian Army in 2013.

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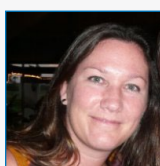
Stacy McDougall is a member of the Departments of Peacekeeping Operations and Field Support, who has provided support to the panel during its work. She joined the UN in 2005 and has been a UN peacekeeper since 2008, proudly serving in various positions in MINUSTAH, UNMIL and UN headquarters. She holds an MSt in International Human Rights Law from the University of Oxford, and an MA in Sustainable Development from the SIT Graduate Institute.

ANNEX B

TERMS OF REFERENCE

Background

Over time, UN peacekeeping has made steady progress in introducing new technologies and other innovations to improve delivery and mandate implementation. As technological advances grow exponentially and peacekeeping mandates continue to evolve in complexity and scope, a concerted effort is needed to ensure that both efficiency gains and cost savings from the use of new and emerging technologies may be realized and leveraged to enable peacekeepers to respond to an increasing number of complex, multidimensional tasks in our field missions. Peacekeeping should benefit from ongoing technological innovations in a systematic and integrated manner.

The Under Secretaries-General for Peacekeeping and Field Support see this as a priority and have suggested the establishment of a high-level expert Panel to review the range of possibilities for the use of new technical tools and technological innovations, while taking stock of those already in use in missions.

For example, the introduction in field missions of information sharing and storage platform called UN SAGE that improves situational awareness by merging incident and other data with GIS; the use of unarmed, unmanned aerial systems in MONUSCO for enhanced data gathering to improve safety and security and situational awareness; a Community Alert Network in the DRC that employs mobile telephone technology to support early warning for local communities; a wide variety of GIS products to improve knowledge and understanding of ground realities in real time; integrated platforms and systems for managing most support operations (procurement, supply, logistics, etc.); improved air-conditioning and power generation systems to rationalize power use and reduce greenhouse gas emissions.

The possible applications of technological innovations are numerous and have the potential to improve tremendously the way peacekeeping is done, enhancing operational effectiveness, improving or multiplying impact, and enhancing safety and security of peacekeepers and host communities. However, there is still a long way to go before peacekeeping operations can begin to be aware of and benefit from technological innovations in a systematic manner.

Mandated mission tasks to potentially benefit from improved technology/innovation:

- *Provision of security by military/police components to threats to civilians and the peace*

- *Provision of security to UN personnel, assets and premises*

- *Support to host government and national authorities in programme implementation*

- *Wide range of monitoring and reporting activities*

- *Geographic Information Systems (GIS) and mapping, particularly for elections support*

- *Coordination and integration of UN presence*

- *Advising, planning, and coordination at the local and national levels*

- *Capacity-building and training, and national capacity development*

- *Communication and public information*

- *Provision of basic administrative functions*

Objectives

The overall objective of the project is to identify technologies and innovations that will assist field missions with implementation of mandated tasks in a more efficient and effective way, looking both at technologies already deployed as well as technologies that can be newly introduced. More precise scope of technologies is defined below.

A 5-member Panel of high-level experts will explore areas where technology can be leveraged by conducting a sampling of current challenges and opportunities in different types of missions, from more traditional missions to those with multidimensional complex mandates. The proposed missions are MINUSTAH, UNIFIL, MINUSMA, UNMISS and MONUSCO. The Panel will consist of senior members with military, police and mission support backgrounds, who will be assisted by external technical experts. The expert Panel will be supported by DPKO and DFS staff members who have an in-depth awareness of the subject matter, both from the programmatic and the technical side. The Panel will have staff support of one full-time assigned staff member.

Scope

The focus of the project will be on identifying tools, technologies and innovations in response to stated and identified needs that will improve the ability of field missions to implement their mandates more effectively and efficiently. Broadly categorized, the mandated tasks that could benefit from technological innovations are:

➲ **Monitoring and reporting**. *A wide range of military, police and civilian tasks fall into this category, ranging from "monitoring the cessation of hostilities" (UNIFIL) to "to monitor, help investigate and report to the Council specifically on violations and abuses committed against children…" (MINUSMA).*

➲ **Provision of security (military and police operations), safety and security of staff as well as the security of UN property and premises**. *An example in this category would be"…Requests MINUSTAH to continue to support the Haitian authorities in their efforts to control the flow of small arms, the development of a weapons registry, the revision of current laws on importation and possession of arms, reform of the weapons permit system and the development and implementation of a national community policing doctrine"*

➲ **Supporting the host government and national authorities in programme implementation**. *An example in this category would be "to continue to collaborate with the Government of the DRC in the swift and vigorous implementation of the action plan to prevent and end the recruitment and use of children and sexual violence against children by FARDC…" (MONUSCO).*

➲ **Capacity building and training**. *Activities geared towards national capacity development, such as "supporting the mentoring and training of corrections personnel and strengthening of institutional and operational capacities" (MINUSTAH).*

➲ **Programme implementation**. *Where the mission is responsible for programme implementation in areas such as security sector reform or disarmament, demobilization and reintegration. For example "…Implement the United Nations system-wide protection strategy in the Democratic Republic of the Congo, operationalizing it with MONUSCO's protection strategy built on best practices and extend useful protection measures, such as the Joint Protection Teams, Community Liaison Interpreters, Joint Investigation Teams, Surveillance Centres and Women's Protection Advisers…"*

➲ **Advising, planning**. *An example in this category would be "to continue its collaboration with OCHA and the UNCT in supporting the humanitarian and recovery efforts and further encourages all actors to continue to engage in joint planning and coordination at the national and local level" (MINUSTAH).*

➲ **Coordination**. *"Requests the Secretary-General to appoint expeditiously a Special Representative for Mali and Head of Mission of MINUSMA, who shall, from the date of appointment, assume overall authority on the ground for the coordination of all the activities of the United Nations, and its agencies, funds and programmes, in Mali and shall use good offices and coordinate efforts of the international community…"*

➲ ***Communication and Public information***. *"Welcomes progress made by MINUSTAH in communications and public outreach strategy, and requests it to continue these activities"*

➲ ***Provision of basic administrative functions***.

The expert Panel may explore different aspects of the introduction of technological solutions into field operations, including legal implications, political sensitivities, potential implications for troop- and police-contributing countries, equipment maintenance and upkeep, training on use of new tools, cost-benefit analysis, among others. These factors should be factored into the formulation of recommendations on new technologies and innovation to DPKO/DFS management, but should not impede their exploration.

Outside the scope:

➲ *Tools and technological improvements at UNHQ, unless there are direct relationships or interdependencies with the proposed field solutions.*

Suggested areas for review:

➲ *Areas that have already been identified by DPKO-DFS as primary beneficiaries for the work of the expert Panel are safety and security of personnel; environmental management; GIS and mapping; and reporting and information management. The expert Panel may wish to consider these areas as a starting point for its work.*

Methodology

The expert Panel will be based in New York at UNHQ where in-briefings with senior management, the DPKO/DFS Working Group on Technology and Innovation in Peacekeeping, and other relevant stakeholders will be conducted. It will be up to the expert Panel to determine if field visits are warranted and if field visits are to take place, which missions are to be visited. There is, however, an expectation that some of the discussions and interviews with mission personnel could be conducted through structured telephone and/or video teleconferences.

In addition to potential field visits, the methodology suggested includes a combination of document review, meetings and a series of focus groups. It is anticipated that the expert Panel will also consult and involve any organization and/or individual who they feel could progress the agenda. To support the work of the expert Panel, seminars may be organized with interested partner research institutions or Member States to allow a dialogue between the Panel and key partners in the field, such as other UN system entities with field presences, academic and research institutions, non-governmental organizations, regional organizations and arrangements that also have field operations, industry leaders, entrepreneurs and individuals.

Once formed, the expert Panel may decide on a methodology of work that best suits their strengths.

Output

The expert Panel will present a report with findings, solutions and concrete recommendations for the short, medium and longer term. The report should highlight cost and other considerations. Recommendations should also take account of existing UN systems and infrastructure for the sustainability of suggested solutions. The Panel's recommendations will also address how DPKO-DFS can stay current of new technologies and mainstream innovative solutions to benefit peacekeeping.

The final report is due six months after commencement of the assignment.

Funding and Resources

Funds for staff costs are being provided extra-budgetarily by Member States as well as through cost sharing with partner research institutions. Missions that receive the expert Panel will be expected to coordinate the visit to optimize time on the ground and provide logistics and other assistance, including transport, accommodation, security clearances, local language translation, and other support.

Support

Members of the DPKO/DFS Working Group on Technology and Innovation in Peacekeeping will support the work of the Panel in their areas of expertise. In addition, the Panel will have one dedicated substantive support staff. He/she will be assisted by other expert staff at UNHQ on a part-time basis, as well as designated mission focal points for the project.

A network of external partners consisting of members of the wider UN family, Member States, research institutions, non-governmental organizations and corporate entities will support the effort by providing their own input and informing the Panel about areas of common interest and synergies with the project.

ANNEX C

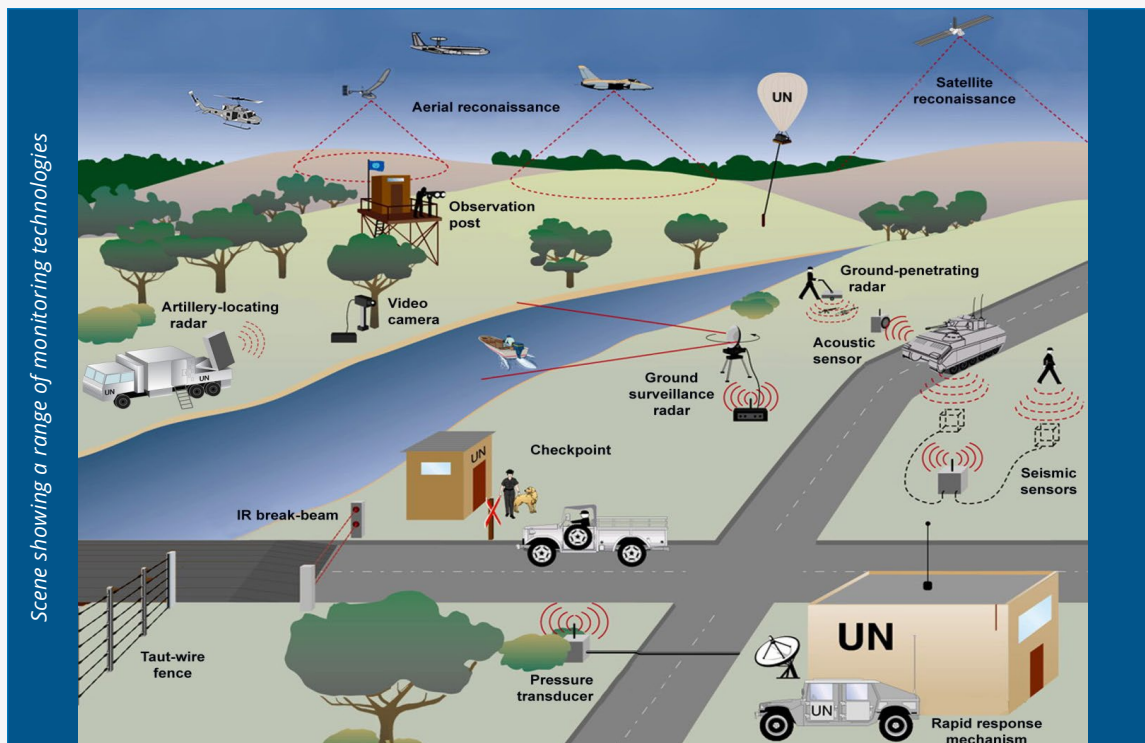## TECHNOLOGY AND INNOVATION SPOTLIGHTS

1. Monitoring and Surveillance Technologies

Monitoring and surveillance are critical functions for the fulfilment of mission mandates. For instance, they are needed to: verify cease-fires and peace agreements; protect civilians and regions; oversee elections; support human rights; uphold sanctions; secure borders; and reduce the illegal trade in exploited resources. When dangerous armed groups and spoilers of peace processes are at large, it is vital to know their movements and nefarious preparations, especially to achieve early warning and preventive action.

Far too often, UN peacekeepers have been unable to stop massacres, prevent atrocities, catch smugglers, identify aggressors and spot human rights violators. In many cases UN missions did not have adequate tools to foresee or to act, even when the political will was present. Many atrocities are committed under the cover of darkness, yet UN missions are poorly equipped for night-time surveillance. Also many violations occur far from UN camps, especially in missions with large geographical areas of responsibility; yet the UN lacks the necessary technological capacity for remote monitoring, including little or no infrastructure for unmanned overhead surveillance and unattended ground sensors.

Without technological aids monitoring is extremely limited at night, over large areas, in remote or difficult terrain and for underground objects. In addition, information and image recording, analysing, sharing and authenticated storage is challenging without proper hardware and software.

Monitoring and surveillance technologies offer the UN a way to increase the range, accuracy and duration of observation. These technologies facilitate continuous monitoring. They can also increase effectiveness, including cost-effectiveness in many cases, while decreasing intrusiveness, especially in places where a human presence is not required 24/7. With technological enablers, peacekeepers can be better positioned and move rapidly over large areas in response to indicators sensed remotely. Furthermore, these technologies enhance the safety and security of staff in the field, allowing them to be based further from constant danger and reducing the likelihood that they will be caught by surprise, ambushed or kidnapped. Finally, technology provides a means for information recording and evidence storage to share more easily, accurately and quickly with UN headquarters. In addition, when deemed appropriate, the information can be shared or shown with the conflicting parties or other bodies, such as national or international tribunals.

Scene showing a range of monitoring technologies

*Source: A. Walter Dorn, **Keeping Watch: Monitoring technology and innovation in UN Peacekeeping**, Tokyo, UN University (2011)*

Many types of monitoring and surveillance technologies are readily available for use in peacekeeping. The figure above illustrates a range of applicable aerial and ground-based technologies.

Most of the technologies shown in the figure are not currently in use in UN operations. Some have never been used in UN history. All can make a major difference in UN effectiveness. The following "gap analysis" shows the possibilities and the deficiencies, beginning with the top of the figure, which focuses on space and aerial imagery.

I. Overhead Imaging: Eye in the Sky

Satellites: For decades, information from satellite reconnaissance has been provided to the UN by certain major powers on a need-to-know basis. However, the organization needs to acquire its own sources of imagery to come to its own judgments. Fortunately, commercial satellite imagery is rapidly becoming more capable, timely, and cost effective. To its credit, the UN makes frequent use of such imagery for map-making, change detection, ground and activity analysis; but, the world organization has yet to move from outdated still images to dynamic near real-time reconnaissance to achieve current situational awareness and immediate operational effect. The UN needs to incorporate imagery into its analytical intelligence products, including dynamic Geographic Information Systems (GIS). In the past, significant obstacles were costs (several thousand dollars

per satellite "scene") and turn-around time (weeks to months after a request). Nonetheless, as more commercial satellites are launched into orbit and image costs decline, the UN will find these obstacles are quite surmountable. The latest generation of commercial satellites, including micro-satellites, boasts a resolution of better than 0.25 metres, allowing UN missions to count people from space. Such technology can help the UN answer questions such as: "How many refugees are moving along a certain road today?" or "how many houses and huts were burned in an attack yesterday?" or "Where are roving gangs poised to strike next?" or "What are the spatial-temporal patterns and trends during rainy and dry season by the rebel groups?" Already, human rights NGOs are using satellite imagery to identify the locations of massacres and graves, thereby influencing the perpetrators, including both governments and rebel groups. Similarly, news organizations routinely include satellite images to illustrate locations and events in their stories. The UN can increase its capacity to analyse imagery by employing full-time analysts, expanding satellite imagery access models and developing practical expertise. Expertise in image analysis can also be gained with airborne imagery, including using the UN's own aircraft such as UAS.

Reconnaissance Aircraft: Helicopters have served as the main aerial reconnaissance platform for UN missions, but in most cases the only cameras aboard were hand-held, brought by the crew and lacking image stabilization or high resolution. In a few missions, pods were attached to the helicopters to provide gyro-stabilization for more advanced cameras, including for visible light and forward looking infrared (FLIR) imaging. But, with a few exceptions, these were older generation equipment, not advanced enough to meet the peacekeepers' needs for actionable information. Aerial imagery should be available in real time to peacekeepers on the ground using remote viewing terminals. Advanced aircraft are available for large-area reconnaissance at higher altitudes, safe from ground fire. For instance, jet and turboprop aircraft provide viewing of conflict zones at high speeds and altitudes and can carry significant imaging payloads. Anachronistically, the UN's only major deployment of jets for surveillance was in the Congo in the 1960s. Swedish J 29C jets successfully observed the activities of mercenaries and secessionist forces possessing aircraft that attacked UN forces. The UN reconnaissance jets were of immense value in disproving false concerns and confirming valid ones, including impending attacks. In modern UN operations, jet imagery was provided to the UN but the jets were from supportive Member States, not the UN mission itself.

Airborne Air-surveillance: Shortly after the 2006 Lebanon war, the United Kingdom offered the services of its Airborne Warning and Control System (AWACS) aircraft to help the UN monitor the airspace above Southern Lebanon and the adjacent waters. But because of the immense cost of flying such aircraft, the UN had to turn down the offer. Instead, the UN developed a system based on ground vehicles and ships. While the UN has not yet employed its own airborne air-surveillance systems, it has benefitted from information provided by AWACS aircraft in previous missions. For example, NATO reported extensively on no-fly zone violations over Bosnia in the period 1992—95. Looking forward, the UN should obtain chartered or contingent-owned aircraft with less expensive air-surveillance systems, albeit with more limited coverage.

Unmanned Aerial Vehicles (UAVs): The UN has benefitted from the generous support of nations flying UAVs in several of its mission areas, including in Bosnia and the Democratic Republic of the Congo (DRC). In 2006, the European Union Force (EUFOR) flew Belgian B-Hunter UAVs during the tense election period in the DRC. UN personnel were invited to view UAV imagery on large screens in EUFOR headquarters near Kinshasa, but the UN did not have its own data feed. In December 2013, after several procurement attempts since 2006, the UN finally began operating its own UN-painted UAVs in the DRC, flying under contract out of Goma airport. These have proved immensely useful in expanding the mission's situational awareness. In short, this was a pioneering and successful step forward in making use of a powerful emerging technology.

Aerostats: Another emerging but simpler overhead technology is the tethered balloon. While the UN has yet to employ aerostats, it is actively exploring ways to use them to monitor sensitive areas, including vulnerable airstrips and the UN's own camps and facilities. The relatively fixed and visible platforms, can also serve as useful waypoints and aerial markers for travellers, especially in wide-open areas or at unmarked borders. With the cost of high-resolution cameras decreasing and their capabilities steadily increasing, aerostats will undoubtedly become common place in future peacekeeping operations. This is also true of a wide range of other imaging systems, including the ground-based systems illustrated in the figure.

II. Ground-based Monitoring and Surveillance

Observation Posts have been used by the UN since its earliest missions to view sites of conflict and UN areas of responsibility. Often these posts were placed in high locations (e.g., on hills) and manned with observers equipped with heavy high-power binoculars. Today, digital and light-weight binoculars offer greater resolution. Unsophisticated personal video cameras are already commonly brought to UN observation posts and on patrols. The imagery acquired could be important as evidence to confront perpetrators or used in depositions in court cases. Often simple video cameras or cell phones are used, but more sophisticated digital binoculars can be purchased to capture high-definition images, magnify the images and send the data directly to a regional headquarters. Some video devices include image stabilization to remove the effects of hand tremors. Video devices can also include GPS and laser-range finders to determine the coordinates of far-away objects, including persons trespassing into demilitarized or protected areas. Modern digital cameras can also time-and-date stamp images and provide special means for data authentication (to prevent editing or falsification). Video cameras can also be left unattended, as was done by the UN along important parts of the Green Line in Cyprus, thus replacing manned observation posts and allowing the peacekeepers to deploy more effectively.

Night Vision Devices, including goggles, can make night observation and patrolling possible. Otherwise, it becomes impossible to navigate roads or forest paths at a time when most atrocities and violations are committed. The UN mission in Haiti used night vision capabilities to launch operations at night in order to gain the upper hand over gang leaders. This meant fewer casualties and quicker arrests. Unfortunately, many missions and contingents have only the most rudimentary devices. In addition, devices that take pictures and videos are seldom found in UN missions.

Artillery-locating Radars (left-centre of the figure) were seldom used in peacekeeping, and today they are found in only one mission (UNIFIL in Lebanon, see Box on radar). In addition to its counter-battery radar (Cobra), France has also supplied truck-mounted air-surveillance radar (Samantha) to track jets and helicopters at a range of 30 kilometres or less. This is enough to cover the airspace over UNIFIL's area of operation on land (i.e., to the Litani river). UNIFIL has also employed powerful ship-borne radars for maritime domain awareness. By contrast, shoreline radars were established in MONUSCO to monitor traffic on Lake Kivu.

The figure also shows, on the other river bank, other important forms of radar.

Ground-Surveillance Radar (GSR) can detect movement on land or in nearby waterways. They can track boats, helping the UN and host states to intercept and stop illegal transits of contraband, minerals or human beings. For instance, the UN bought a radar system to monitor boat traffic in the Shatt al-Arab waterway during the UN's Iraq-Kuwait observation mission. In a few other missions, several developed countries deployed GSR to monitor movements around their camps and in UN areas, such as the Green Line in Cyprus. But these technologies did not stay after the particular units withdrew so they were of limited use to the mission.

Ground-Penetrating Radar (GPR) can help detect underground objects such as landmines, buried weapons or mass graves. This form of radar has not yet been deployed by the UN, probably owing to the sophistication and expertise needed to interpret the radar images. A further drawback is that, with so many objects under the surface, it is usually necessary to first locate suspected areas carefully using additional sources of information.

Acoustic and Seismic Sensors: the UN has yet to purchase such sensors, though as far back as 1976, the US Sinai Field Mission successfully employed such sensors to monitor traffic across strategic passes in the Peninsula to aid the disengagement of Egyptian and Israeli forces. The sensors detected sound and ground vibrations from vehicles and walking persons, providing round-the-clock monitoring. The resulting information was provided to the UN Emergency Force II[2]. Showing initiative, peacekeepers in Bosnia in 1993–95 concocted a make-shift acoustic sensor by placing a radio receiver in a cantonment facility for the heavy fighting equipment of the conflicting parties. The receiver could hear engines starting after a belligerent party broke UN locks to reclaim weapons. The UN would then rush to prevent the movement and use of the heavy equipment for fighting. Effective technologies have evolved and the UN can do much more with remote ground sensors by applying creative thinking.

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[2]*Michael Vannoni, Sensors in the Sinai: A precedent for Regional Cooperative Monitoring, Sandia National Laboratories, SAND96-2574 (1998)*

Checkpoints and Strong Points are key UN methods to maintain some control and to prevent escalations in conflict zones. They constrain access for combatants and check that passing vehicles or persons do not possess weapons or explosives. One traditional method of inspection is to deploy dogs to sniff for explosives; however, other forms of chemical sensing are possible, though costly, for use at entrances to high risk and vital infrastructure, such as airports. Chemical monitors can detect explosives, their ingredients or chemical warfare agents and their precursors. In addition, several older and cheaper technologies can assist at checkpoints, including: motion-detection illuminators to warn of oncoming vehicles or persons (solar-powered versions can be charged during the day); pressure transducers (strain sensors) to warn of vehicles moving on nearby roads or pathways (e.g., trying to skirt around the checkpoint); and video cameras that can be triggered by motion-detectors and can be used to inspect the undercarriages of vehicles should they be hiding bombs or contraband. Infrared break-beams can alert of trespassers or break-ins into UN-guarded facilities.

Taut-Wire Fences can be useful around UN compounds or other high-value sites to spot intruders or trespassers. Attempts to scale or cut the fence can trigger cameras and send signals to a monitoring centre. While not yet deployed, the fences could help stop thieves and armed attackers since they provide not only a warning mechanism, but also a protective barrier.

Rapid Response Mechanism: the utility and effect of the above aerial and ground sensors can be multiplied when they are connected to a rapid response mechanism. Monitoring can trigger a force to send peacekeepers who can view a conflict scene even as they are travelling towards it. They can gauge the situation, determine who to speak with and decide how much force, if any, may need to be applied. The revolution in sensor technology offers a new world of opportunities to make peace operations more effective.

2. Information Management and Command and Control Tools

I. Information Management

While tools such as UN SAGE may be used as an information management and mapping tool for security related incidents, mission components generate large amounts of operational data that cannot fit into SAGE. This data is stored and managed through a variety of simple tools, from spreadsheets to Microsoft Word documents or just in shared drives or emails. Many components/sections have their own, informal "Information Manager". However, these staff members have widely varying information management ability, and tend to keep the data internal to their component/section.

This approach leads to number of challenges:

a. *Only summary data are included and shared in SitReps, with rich operational details hidden in opaque section-owned spreadsheets, documents and emails.*

b. *With only textual data shared via SitReps, it is difficult for the mission to maintain an updated view of the state of key indicators. In other words, it is not possible to have an accurate dashboard showing how the mission is performing against its mandate.*

c. *Because each section's data is hidden within the section, there is no way to intersect or overlay different section's data to detect correlations, patterns or trends. It is also not possible to search for data, by keyword for example, across multiple sections' data.*

d. *Statistical or aggregated reporting of activities, projects and performance indicators are usually manually generated by section information managers without the use of reporting tools that can auto-generate such statistics and reports. This results in duplicate effort across sections and is also prone to human error.*

e. *With heavy staff rotation, in particular of uniformed personnel, data can be easily lost, and incoming staff have to start collecting data from scratch again.*

f. *When data is stored in individual PCs, there is high risk of data loss due to technical problems, such as hard disk crash or virus attacks.*

g. *If mission premises need to be evacuated, this data cannot be accessed until staff members are allowed to return.*

There is no database tool provided by the Mission or UNHQ that would allow this data to be stored, managed and analysed. While UNHQ has invested resources to centralizing and provision of tools for the management of data related to mission finances, staffing and logistics, information management tools are absent.

The panel has identified examples of suitable decision support systems used in the intelligence environment, which provide commercially available solutions to the requirement for exploitation of vast amounts of data. These systems are based on a common standard protocol or other standard format that provides for easy database update and subsequent data mining and analysis. Typically NATO standardization such as MIP, LC2/JC3IEDM, APP6, STANAG and technology standards i.e. IP, J2EE, XML and web services are used. However, because the products used for intelligence functions are designed for that very purpose, substantial customization would be needed to fulfil UN requirements.

An affordable alternative could be an interoperability product such as **IRIS**, which is widely used in more than 40 countries. A market leader, IRIS uses structured data such as USMTF 2000 and NATO ADatP3 formatted messages as its transmission standard. The information mapping tool is designed specifically to develop and execute the data mappings required to automatically pass structured information from one database to another. As databases hosted at the various UN agencies and missions have a tendency to differ, a tool like this would overcome the problem of database interoperability.

Its man-machine-interface is developed in such a way that it simplifies and structures the preparation and validation of information and reports. This software solution is available as stand-alone application or as a server-client solution and integrates in most cases seamlessly into standard products such as Microsoft Office, providing the framework for writing, editing and sending information

The presently used formats and messages in currently available off-the-shelf systems will not cover all UN requirements. However, the IRIS system automatically generates the layout and data entry components required for the user to create and manage structured documents and has a user friendly and intuitive web-based management tools available for defining and managing information in a structured way. This would enable the adding on of commercial tools for automated data management, data mining and analysis as well as data dissemination. Tools produced by Tableau, Blue Yonder and Newprosoft are just a few. The use of these tools, however, should only be seen as an interim short- to mid-term solution.

II. Command and Control Tools

Command, Control, Communications, Computer and Intelligence (C4I) systems providing coherent and seamless application interaction from the individual soldier on the ground to division level are available in numbers on the market as framework commercial off-the-shelf (COTS) products, and which are easy to customize. The following solutions are offered only as representative examples, as there are quite a number of other good products on the market equally well suited for the purpose.

Major features within these systems are functional area subsystems (APPs) for preparation and distribution of plans, orders, directives and reports, which can be prepared simultaneously by many elements of a staff, and then replicated directly to the proper users. Subsequently, they can be dynamically updated by only replicating the delta value of the original information thus reducing

the need for data transmission capacity. All users thus have access to the same and frequently updated information, which supports the synchronization and performance of operations at all organizational levels, it being military, police or civilian.

These application networks of data exchange also foster seamless interlink to information and message handling, VTC, sensor and GPS handling and a numerous number of other services. Even though this type of systems in accordance with the UN paradigm only will cover the levels from UNHQ over Mission HQ to battalion and independent company level, they will not only provide for more efficient and streamlined procedures, but also predeployment preparations and training are seen to gain a lot from this.

One example is the **SitaWare** solution, which provides flexibility in mission planning through collaborative construction of textual and graphical plans and orders, allowing for simultaneous input to the planning cycle from different physical installations. It has a tailored view on available information, which reduces information overload and provides for the situational awareness need during each phase of current operations. Through the use of correlation and aggregation tools combined with formation filtering it is adjusting the information picture to match the actual needs. An intelligent search functionality provides for finding information fast and easily. As the product uses private cloud deployment, no client installation is required, making a typical deployment fast and uncomplicated.

A rather comprehensive interoperability package is available such as MIP, NFFI, NVG, link 16, AIS etc., which actually reaches far beyond UN needs. If so wished, product suite also includes a headquarters application which is seamlessly interlinked with a Battle Management System (BMS), which provides C2 support to company level and below.

Another well proven solution is the **Comm@nder Army system**, which offers an open and scalable solution based on a WEB service oriented architecture over IP networking and federates components of operational environment from strategic to tactical levels. The system is delivered through integrated C4ISR box (hardware, software and communication).

Comm@nder Army is designed for short time deployment and provides on-demand information access via web portal from any web browser and a shared Recognized Ground Picture using a rather intuitive tactical editor leveraging a Geospatial Information System. Mission-oriented applications for planning and execution within the standard functional areas are rather strong (order, planning, logistics. As to interoperability military and civil interoperability services are provided through standards such as NVG/KML, MIP, ADatP3, and XML

Training to use such systems is obviously an issue, and if employed, implementation bridges will need to be provided by the UN. TCC/PCCs not familiar with this kind of technology might find it a challenge to interact with the man-machine interface. However, in some of the products on the market this problem has been handled by introducing a simplified front end, which has proved to be very useful. Further, such systems are well suited for predeployment training, as they in a training set up actually can be accessed via the Internet.

3. Open Source Information and Analysis Tools

Myriad tools exist to help monitor open source information and add to or assist in the analysis of information. Some examples are provided below:

➲ **The GDELT Project** *monitors broadcast, print, and web-based news sources from around the world, in 100 different languages.*

➲ **Storyful** *allows users to monitor social media in real time and alert users to important information, and can be a useful tool for source verification.*

➲ **Recorded Future** *provides users with the ability to analyse over 600,000 open web sources in seven languages, to provide insight into emerging threats.*

➲ **Rapidminer**, *is an open source, advanced analytics platform that can be used for machine learning, and to mine data and run predictive analytics.*

➲ **SAS Text Miner** *is a software suite designed to discover and extract information from text.*

➲ **XMind** , **Mindjet MindManager**, **Coggle**, **MindNode**, *and* **FreeMind** *are mind mapping software that allow users to gather, analyse and use complex information.*

➲ **NodeXL** *is a free, open-source template for Microsoft Excel 2007, 2010 and 2013 that facilitates the exploration of network graphs.*

➲ **ACH** *is a tool that allows users to test their analysis of competing hypotheses.*

➲ **FaultTree+** *is a software that allows users to construct event tree analyses.*

➲ **Swiftriver** *is a tool developed by Ushahidi that allows users to filter and analyse real-time data.*

ANNEX D

SELECTED LIST OF CONSULTATIONS

In addition to extensive consultations within DPKO and DFS, the panel also consulted with the following non-exhaustive list of groups or organizations in the preparation of this report.

Consultations

- *United Nations Special Committee on Peacekeeping Operations*
- *United Nations Military and Police Advisors Community*
- *ZIF Centre for International Peace Operations, Berlin, Germany*
- *Instituto Igarapé*
- *European Union Satellite Centre*
- *Google Ideas*
- *Ushahidi*
- *United Nations Global Pulse*
- *United Nations Children's Fund, Innovation Unit*
- *UAViators*
- *Crisismappers*
- *ICT4Peace Foundation*

- *New York Police Department*
- *United Service Institution of India*
- *International Peace Institute*
- *Norwegian Institute of International Affairs*
- *United States Institute of Peace*
- *Heads of UN Police Components*
- *UN Department of Safety and Security*
- *UN Office of Information and Communications Technology*
- *iRevolution*

Field Visits

- ⮑ *United Nations Organization Stabilization Mission in the Democratic Republic of Congo*

- ⮑ *United Nations Multidimensional Integrated Stabilization Mission in Mali*

- ⮑ *Regional Service Centre, Entebbe, Uganda*

- ⮑ *Global Service Centre, Brindisi, Italy*

- ⮑ *UNICEF Innovation Lab, Kampala, Uganda*

- ⮑ *UN Global Pulse Lab Kampala*

- ⮑ *United Nations Assistance Mission for Iraq*

Written Inputs

- ⮑ *United Nations Multidimensional Integrated Stabilization Mission in Mali*

- ⮑ *United Nations Organization Stabilization Mission in the Democratic Republic of Congo*

- ⮑ *United Nations Truce Supervision Organization*

- ⮑ *United Nations Operation in Côte d'Ivoire*

- ⮑ *United Nations Mission in Liberia*

- ⮑ *United Nations Interim Administration Mission in Kosovo*

- ⮑ *United Nations Mission for the Referendum in Western Sahara*

- ⮑ *United Nations Interim Force in Lebanon*

- ⮑ *African Union/United Nations Hybrid Operation in Darfur*

- ⮑ *United Nations Military Observer Group in India and Pakistan*

- ⮑ *United Nations Stabilization Mission in Haiti*

- ⮑ *United Service Institution of India*

ANNEX E

UNITED NATIONS PEACEKEEPING MISSIONS

- ➲ *MINURSO* *United Nations Mission for the Referendum in Western Sahara*

- ➲ *MINUSCA* *United Nations Multidimensional Integrated Stabilization Mission in the Central African Republic*

- ➲ *MINUSMA* *United Nations Multidimensional Integrated Stabilization Mission in Mali*

- ➲ *MINUSTAH* *United Nations Stabilization Mission in Haiti*

- ➲ *MONUSCO* *United Nations Organization Stabilization Mission in the Democratic Republic of the Congo*

- ➲ *UNAMID* *African Union/United Nations Hybrid Operation in Darfur*

- ➲ *UNDOF* *United Nations Disengagement Observer Force*

- ➲ *UNFICYP* *United Nations Peacekeeping Force in Cyprus*

- ➲ *UNIFIL* *United Nations Interim Force in Lebanon*

- ➲ *UNISFA* *United Nations Interim Security Force for Abyei*

- ➲ *UNMIK* *United Nations Interim Administration Mission in Kosovo*

- ➲ *UNMIL* *United Nations Mission in Liberia*

- ➲ *UNMISS* *United Nations Mission in the Republic of South Sudan*

- ➲ *UNMOGIP* *United Nations Military Observer Group in India and Pakistan*

- ➲ *UNOCI* *United Nations Operation in Côte d'Ivoire*

- ➲ *UNTSO* *United Nations Truce Supervision Organization*

ANNEX F

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