INNOVATIVE C2 AND SIMULATION FOR CROWDSOURCING AS FORCE MULTIPLIER

Agostino Bruzzone[a] **Henrique C. Marques**[b] **Giovanni CANTICE**[c] **Michele TURI**[c]

[a] Genova University
[b] George Mason University – VA, (US)
[c] DIME (*Department of Mechanic, Energy, Production, Transports and Mathematic Models*) PhD Program

[a]agostino@itim.unige.it   [b]hmarques@gmu.edu   [c]cantice@liophant.org   [c]turi@liophant.org

ABSTRACT

Crowd source isn't a news in the military: its first official appearance as military concept was supported by US Army Brig. Gen. McMaster in 2009 (ARCIC Director), publishing online the 2009 Army Capstone Concept for public comments.

However in this paper the authors aim is to present their studies regarding a project to develop a different generation of C2 processes, inspired by latest technologies, daily applied on Social networks, mobile devices and social cooperation that are addressing also significant researches in the Military Domain, and potentially able to shape the future generation of Simulation and C2 systems.

This paper represents the basic ideas on how to develop a new C2 organization and training simulation approach linked with NCW/NEC concept and strongly oriented to:
- the crowdsourcing phenomena of outsourcing a problem to a large audience;
- translate crowdsourcing into a military environment;
- apply NATO cross functional team concepts in a Virtual/Immersive and interoperable environment;
- define a Crowdsourcing Cross Functional Team;
- evaluating the dispersing leadership concept, self-synchronization and multidimensionality of command;
- analyze information assurance to enable a correct information sharing, using i.e. Augmented Reality;
- model new military dynamic relationships to connect cells and functional areas with neuralgic headquarters;
- applying C2 maturity level N2C2M2 (Alberts et al 2010, Bruzzone et al.2009) and IA (Bruzzone et al 2011, 2010, 2008, 2007).

As the Crowdsourcing has proven a very useful concept in industrial world, adequately adapted, it could serve as a force multiplier in the military.

Keywords: Command and Control, Social Networks, training Simulation, Immersive, NCW/NEC (Net Centric Warfare, Network Enabled Capability), IA (Intelligent Agents), Crowdsourcing, N2C2M2 (Net-centric Command & Control Maturity Model), Augmented Reality, Interoperability.

1. INTRODUCTION

The crowdsourcing concept was officially ascertained in 2006 by an article of Jeff Howe on Wired newspaper "the rise of crowdsourcing". The idea to probe what general people think about any problem is not news, if we think for example at commercial probing or television voting. Avoiding being much generalist, there are two sides to keep in mind:
- crowdsourcing concept is stick to Internet (Networking in general) and the even more spread capability to navigate in different way in almost every country;
- the big leap forward made by the technologies and mobile devices that have made simple to use a lot of daily life applications for the normal people in the last years.

Crowdsourcing as the words explain, is something based on a open request made normally by a digital support, toward a lot of people, especially who has specific knowledge, regarding the solution for a determined problem, asking to give a possible solution and contribute with new ideas, involving not only professionals but also amateurs. That's what defines crowdsourcing "collective intelligence".

Collective intelligence is a business model on which companies can ask for a project or a service development to a distributed group of people working in a virtual community through web and internet support. In this way a lot of companies have the possibility to exploit users and realize products tailored on them, using more resources than they have but costless.

Initially crowdsourcing was based on "digital volunteers" and enthusiast geeks of Internet,

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stakeholders from computers and technologies that dedicated spare time to solve problems for others (i.e. the experts that try to answer you on blogs and communities); today crowdsourcing in some countries is considered a "open enterprise" where freelance experts and professionals can offer their abilities and capabilities referring to a "mass cooperation and collaboration".

Digitalization is changing the life always more and almost every day we can see new items to make easier the people life and passing over a lot of concepts, systems and ways of work and live making them obsolete.

Crowd source isn't completely a news in the military: Its first official appearance as military application concept was supported by US Army Brig. Gen. McMaster in 2009 (ARCIC Director), publishing online the 2009 Army Capstone Concept for public comments; as before, also Lt. Gen. Petraeus wrote in 2006 on US Army Field Manual FM 3/24 "Counterinsurgency", that *"...insurgents' capabilities also come from their creative exploitation of commercially available technologies and materials as well as their lack of bureaucratic encumbrance"*.

2. CROWDSOURCING IN THE MILITARY

We can initially define Crowdsourcing as a "distributed problem – solving" and also an application to produce ideas, solutions, answers.

Analyzing this aspect we can immediately view the parallelism with the military problem solving method where an assigned mission from the HQ must be accomplished in cascade by the Unit in all echelons of Command, solving the chained operational problem and proposing to the Commander the possible COAs to apply.

This method, called MDMP (Military Decision Making Process), always has been and it is "the method" used, especially in a conventional and classic scenario, the way to solve operational missions and propose the most probable solutions (COAs – Course of Actions).

In the crowdsourcing the problem is distributed through the network, more o less controlled, to an audience (users) formed normally by specialists or "problem solvers". The solution is normally owned by an individual that asks help to solve the problem. The contributors to the problem are usually compensated just with the intellectual satisfaction to be the 'solver'. Should be more than one good solution and the asker will decide which to use.

Making another parallel, in the military, the Commander can receive a mission that he normally translate in a operational problem to submit to his staff through the MDMP and in a modern command post all cells are linked in a intranet network where all the specialist can operate. Any branches will solve a piece of the operational problem composing few final COAs which will be presented from the chief of staff to the commander. Only he will decide the best COA to use.

In large terms and extrapolating in a well define domain, the MDMP should be considered a sort of primitive Crowdsourcing process where the owner of final solution is the Commander, the audience is represented by the different staffs of units subordinated and the stakeholders that solve the problems are represented by the branches specialist.

But it's not enough. So, how we can apply the distributed and spreading power capability of crowdsourcing in a military operational environment, like a stability mission, to involve huge quantity of different specialists also from distance and solve operational problems?

The new doctrine guidelines to operate in stability missions are normally involving also civilian specialist (engineers, geologists, psychologists, medics, etc.) that any traditional Military Commanding Officer cannot have as "normal capability" from his unit.

2.1. Crowdsourcing possible current example

There are different examples in which this concept was adopted to solve problems related with new technology, medicine, art, research and business through different kind of platform (i.e. Mechanical Turk from Amazon, 2005) but their scope is almost the same: distribute a problem to a audience and get back a solution.

The positive side from using these methods is the large number of solutions and their very low cost. It is not appear just a simple exchange method of ideas; who is using methodically this concept inside a business, company or organization is orienting the power of this concept to create specialized communities, called Community based design or distributed participatory design, able to use software platform to capture, analyze and arrange huge quantity of data.

What is the model to utilize? there are multiple approaches to crowdsourcing concept and application. The principal difference depend from the use of large active cooperation through Internet communities or the searching for specific and controlled interaction from a controlled/interested users.

The primary types of Crowdsourcing (Jeff Howe classification), should be identify as:

- Crowd Wisdom (best practiced form): means using the knowledge of people to find solution for problems, predict future or define strategies;
- Crowd Creation (best known form): concept addressed to encourage and drive people toward creative activities (photos, commercial adv TV, software development – i.e. Linux – etc.), or solve scientific problems as challenge;
- Crowd Voting (best popular form): intended as communities judges for articles, music, movies,
- Crowd Funding (best known form): provide credit and fund to create opportunities or support projects that are not acknowledge.

Other models are build on collective intelligence as Crowd Casting, use put together huge community of experts in various fields of research to face the high cost of researches normally tackled internationally with contribution of multiple researches centers (i.e. Wikipedia).

2.2. Military Crowdsourcing possible current example

Underestimating the raising of new geopolitical and social problems from Intelligence branches, has always been the most reasons why have been developed applications, wargames and algorithms to predict realistic situation developments or possible future events. As in 2011 was founded in U.S. IARPA (Intelligence Advanced Research Projects Activity), working to involve experts by using computer software to make predictions called ACES (Aggregative Contingent Estimation System). The participants are modeled on the ground in real life situation (like soldiers) giving feedback and information about acting situations in real time. This kind of solution is also the concept used in many military projects to digitize information gathered in the battlefield in the last few years, able to speed up and optimize the information's aggregation within C2 and Intelligence systems and digitalize soldiers capabilities on the ground (i.e. Future Soldier program, Future Combat System, etc.), to interact with a complex network, cutting the time to interview on the adversary, etc. Soldier digitization is changing also Doctrine and mission applications as soldiers can have wide access to information, using NCW-NEC concept and application to translate an information advantage in a operational advantage through IT and networking and be able to take more initiative also as dispersed force and

consent to new kind of staff and decisional organization.

Any examples are:

- Military Blogs: it's very easy to find in a lot military headquarters official web pages connections to the principal social networks as Facebook and Twitter; many of these government agencies have official pages and also "discussion corner" for their "friends": at the end, someone have to collect opinions and comments otherwise why spend resources? Looking deeply we can find specific official info-structures like the US AKO (Army Knowledge Online), US ATN (Army Training Network), GTN (Governmental Training Network) and many internal Blogs, etc.; in fact many different training and e-learning Blogs have been created in the last 5 years to involve any ranks and branches soldiers, in pairs with a massive use of e-mails, where they can learn, read, consult, keep them informed, discuss and make opinions about a wide range of issues; strategic and operational too. It is a culture that is changing as they can find some stuff only on the network.

- Crowdsourcing as weapon (Arab spring and social networks): The protests hit Arabic/and Islamic countries in various ways. The riots have in common the use of civil resistance techniques, including strikes, demonstrations, marches and processions, sometimes extreme acts such as suicide and self-injury, but the most innovative elements are the use of technologies like social networks (Facebook and Twitter) and the new era of mobile devices (cell phones, tablet, etc.) to organize, communicate and disseminate events in spite of blaming repressions. The social network drives to a different kind of Command and Control among masses, more light, simple, direct, mutual from commercial HW & SW COTS and without many decisional level; sometimes leveraging people "affiliate" just showing a video and giving direction for the next demonstration, even if they are not interested to the uprising but just to inform people, helping to make re-emerge a new social will, widely supported by technology.

- Civil Defense: during the Japanese tsunami, social network were used giving information and human stories from the flood and dangerous situations.

It's appear that the most important thing in the Decision Making Process of future operational

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missions will be manage and predict events; an adapted version of Crowdsourcing should be the process of taking collective opinions, suggestions or information from a group of experts and combining them to predict events more accurately to increase the forecast accuracy, is an opportunity to go beyond the "internet crowdsourcing phenomena" because it transfers value to the singular opinions and producing reliable forecasts.

If it is possible to best combine selected experts opinions, it will be possible anticipating and intervening during, or better before, that the events occur and change it or change the enemy course of actions.

3. CONCEPTS TO KEEP IN MIND

Just to have the better landscape to identify a good solution, we wanted highlight few concepts:

3.1. Current MDMP (Military Decision Making Process)

The MDMP is a proven analytical process to problem solving. The MDMP is a tool to assists Commanders and staff to develop mission, analysis and order. It is start with the receipt of a mission, and has to product an order to be execute but the analytical aspects of the MDMP continue at all levels during operations. It is a logic process that helps the commander and his staff examines a battlefield situation and reaches logical decisions.

It is configured as a detailed, deliberate and sequential process used, we can say, when the Command post has adequate planning time and sufficient staff support to examine numerous friendly and enemy courses of action (COAs). This situation was typically occurred and occurs when it's necessary to develop operation plans (OPLANs) for entirely new mission, extended operations, and staff training.

The MDMP can be figured out as the foundation of every military mission, classically intended. All documents and conceptual thinking twisted during the process can be used during subsequent planning sessions to re-visiting other changes. Using this process instead of any other methods drive to better analyzes friendly and enemy COAs to identify the best possible friendly COA; it produces great integration, coordination, and synchronization in an operation and minimizes the risk of miss out the critical aspects of mission; it is also detailed as an official document (operation order or operation plan). The MDMP has seven steps and every step begins with input built on the previous steps, driving to the subsequent steps but estimates come on continuously from Commander and staff to give more inputs for the analysis process. Estimates are revised when important new information is received or when the situation changes significantly. They are conducted not only to support the planning process but also during mission execution.

The disadvantage of using this process is that it is a time-consuming process and as a sequential process,

when an errors is committed early in the process will impact also on the later steps.

3.2. NCW/NEC (network Centric Warfare/Network Enable capability)

Is a military Doctrine born in the 1990 and it is coming mature in the current military applications. It's based on the idea to transform the "information advantage" in a "military force advantage" through IT and a massive use of networks to deploy military units in different way than classical doctrine. This kind of wide use of networking and data exchange combined with advanced technology devices and new processes lead through new forms of staff organization.

NCW states the importance of "information" and its power capability based on the relationship that are created with the ignition of tactical information which multiply the ability of a Commander to strike better the enemy.

The doctrine principals are developed around the information sharing, a shared situational awareness, an improved collaboration and synchronization among organizations, singles, flow and correlation of data that enable a faster command and improve geographically the mission efficiency. In that way NWC doctrine is more about personnel and organizations that IT and network and is setting a new way of processing information in a Command and Control organization that is more centric and focalized on the lack of battle space awareness.

3.3. Other new concepts in experimentation: NATO cross functional team

The development of Cross Functional Team concept is related to build up a new organizational way to lead a specific operational environment like Afghanistan which are more focalized on the efforts on supporting than fighting. This kind of operations are characterized by needs to coordinate, balance and mediate not only military force but also many others activities, often civilian and social, performed for and by different kind of actors. More and more often the operational space where a military force must be introduced is crowded with a lot of different actors (NGO, GO, IO, etc.) that are not always in accordance among them about their reciprocal missions. Any effort is oriented to help building a stable community. The first idea to use cross functional team concept was born with the deploy of Headquarters MNC NE ISAF Joint Command (HQ IJC) in 2010 to combine the Comprehensive Approach, Combined planning and Counterinsurgency because a modern/traditional HQ doesn't allow the best flexibility and agile architecture to face any kind of local needs. The concept was applied to a previous runner scenario to check how the concept could change the general organization and production. The concept doesn't change the basic military planning pillars, execution and also the analyzing principles remain untouched, but there are new and different requirements for information sharing, intensity of social interaction and team work as the cells and branches will continue their

activities in specific small working groups requiring a change of everybody specialists' mindset.

There are other C2 experimentation concepts as AJC2 (Adaptive Joint Command and Control), CROP (Common Relevant Operational Picture), CIE (Collaborative Information Environment), JIP (Joint Interactive Planning) and MNOPS (Multinational Operations) and are all in a research and development phase.

3.4. Cloud Computing

This is set of technologies, content, methods, and communications devices then a process that allocate the activation of a service offered by a provider to a customer to store/archive and process data through the use of resources hardware and software distributed and virtualized on the Network. It can be managed as an evolution of the Internet involvedness or a info-structure of resources. The users can work in a simple Internet browser, using software without any local installation and save data in a mass archive on-line managed by the provider. This technology can have 3 levels of complexity:

-	SaaS (Software as a Service) - use of programs remotely through a web server. - ASP (Application Service Provider).

-	PaaS (Platform as a Service) - similar to SaaS, but instead of programs is performed remotely a software platform that can consist of various services, programs, libraries, etc.

-	IaaS (Infrastructure as a Service) - Use of hardware resources remotely. Similar to grid computing, but resources are not allocated, regardless of their actual use but only on demand.

The remote backup and storage are always guaranteed by the server-farm and the operations are increasingly transferred online. The concept provides 3 levels of user:

-	Cloud providers: virtual servers, storage, applications, usually according to a comprehensive model demand (pay-per-use);

-	administrators: they manages locally the services for a community to integrating software applications which refers to specific audience;

-	Cloud users: Use the services according to the level of permits.

As the Cloud can lower the costs of HW, SW, support, maintenance, data storage and can guarantee access everywhere there are some problems about data security to solve as sensitive data exposure, violations, physical residence of servers and mirrors, cyber security, etc.

A server malfunction can affects a large number of users simultaneously since these are shared services. But the most is that everything is based on the possibility of having a high-speed Internet connection that guarantee the best sharing services.

4. A NEW MODEL: MILITARY CROWD AND SOURCE (SHARING EFFECTIVENESS)

The C2 as we classically know, is part of a decision making practice in a cyclical process. Changes in the way which define decision capabilities affect also doctrine, systems and training. Recent changes in the strategic environment have changed also the point of sight how to have supremacy over the enemy and in an asymmetric theater, information, knowledge and awareness can make difference.

Proposing a new C2 concept we have necessarily remember that it has to be more dynamic, distributed and adequate to different kind of decisions, as the current strategical scenario asking and keeping a large span of manage as the superior situational knowledge remain the pillar of superior capability and awareness.

How to do this? With well prepared personnel, sensors and advanced systems, info-structures, sharing of information and behavior in a coalition environment, information distribution to concept the new operations (SOSO), flatting hierarchies to use experience and background, not only ranks, to defeat enemies that don't know hierarchies and use Facebook and twitter to "hit & run away" conventional and structured forces.

Looking at this detail, dissemination of information is incremented by technologies but the ability to share information and data is the real knot to solve as the most possible way to find solution is decision making decentralization (called edge C2) but supported by adequate resources.

In fact, recent NATO opinion explain that dissemination remain little if decision making is more centralized; this postulate is has been demonstrated in the current peace keeping operations where a classical military operational order is "shaded and adorned" with a crowded and often confusing, humanitarian, civilian, political, diplomatic and re-construction activities. Working on this environments, change the nature of C2 and increase need of trust in the lower level of units.

The medium education level of a generic soldiers and the massive daily use of technological devices let's think that a Military Crowd Source (as Mix of Wisdom, Creation, Voting & Casting), could be a model that must be able to share knowledge and to give effect to all military users the opportunity to resolve their problems, from education to training and up to operational mission capabilities by

exploiting and involving branches' specialists directly, to solve many different problems.

First of all, before to transport this concept in the military, we have to define the borders for a military crowdsourcing model as a parallel world from the rest of possible uses.

That's why in all possible military uses, we could perform, with a crowdsourcing methodology every time problems, situation, training and more, related and dealt with topics that are not normally spread to common people and tied with a complex scale of classified scheme for information. The solution in this case is simple as we can implement the method on the military intranet networks (considering military LAN, MAN, WAN) banned to ordinary people and even accessed controlled to keep secured the exchange of information.

The tactical networks should be even more secure considering that they are used in the battlefield; this condition is more related with the hardware technology and cyber security, considering the wide use of wireless technologies. In any case even the information security is not our focus in this paper, we cannot avoiding to mention it.

What we say regarding the bordering of military crowdsourcing model, establish also that we can rely our problems only with military and accredited personnel or at least, with "not-military" accredited qualified experts which could be selected from a specific Governmental basin like Civil Defense, University, research Institutes and more.

The guiding principles in this exploration will be: organization, Methods (i.e. augmented reality, virtual world, IA, etc.), representation (conceptual revision of MDMP) and technology.

4.1. Organizations

Re-visiting the organization should be effective; we just define that Crowdsourcing is like a unique box with partitioned spaces but connected, to contain different approaches to tap into a powerful large and open crowd of stakeholders/experts where there is no methodical understanding for the processes used to source and aggregate the different ideas coming from the crowd.

In our case instead, we'll have a lot of military stakeholders and surely experts, with the same educational background and a lot of specialists and different capabilities, all oriented to military situations or a well chosen civilian experts from specific Governmental basin.

So, before to identify a method we have to spot a possible crowdsourcing organization to apply.

Analyzing some crowdsourcing organizations, we can state that those are all motivated to achieve specific goals and normally they use "crowd

mechanisms" that impact on the organization and the method to decide a specific process to apply.

Recent researches, focusing on the organizational perspective and the mechanisms about crowd sourced, there are more o less 19 distinct process types over 46 official examples just because the Structures that want to adopt crowdsourcing methods have to carefully consider the characteristics of the crowdsourcing process that will be used for their particular aims.

As crowdsourcing could be used for different applications (product design, idea generation, problem solving, etc.), there are different mechanisms applicable to all forms of crowdsourcing processes, like for example:

- based on nature (survey, design, tagging);
- participating consumers with producers for creation of value;
- collective intelligence in the "what", "who", "why", and "how" approach, in a "decide process" for individual or group decisions or a "collection & collaboration" to stimulate selection in a production;
- human computation system evaluating the six components as motivation, quality control, aggregation of results, human skills, chronological order and task request in which the stakeholders are involved.

Proposed organization will not reflect any preview institutions know, but will be defined through crowdsourcing rules adapted to the military environment and needs. The rules will be re-write following these principles:

- Classification of a RESOURCE: a person, institution, organization, that can be both user and resource.
- Initial phase of accreditation resources that can be either single (individuals) or packages of integrated resources (whole Command Posts or parts of it, laboratories, etc..). The resources once accredited by a National Authority will be officially available in list/lists to be included and used in the network environment.
- The resources should not be considered hierarchical, but specialized.
- The resources on the network are authenticated through a system of checks and controls based on the official lists of resources.
- Each user (or resource) can see the other resources available and accessible.

Each resource represents a network node, able to give its capabilities, knowledge and experience to the other nodes.

Just to give some examples it is sufficient to think to info-structures like the US JTEN Network (Joint Training Experimentation Network), which is

representing a critical strategic joint asset for training as realization of JNTC (Joint National Training Capability). JTEN is a global network backbone continental and around the world, that make possible to the US Armed Forces to use everywhere their training capabilities. From 2007 it was also establish a tactical JTEN sub network specific for lower units, using fixed and mobile commercial communication devices to extend the band. This extention allow ti bring services and use all technologies like Virtual, Immersive and 3D as taining solution on site.

Another important example is ATN (Army Training Network) based on a web multichannels portal with a lot of resources for training. The network is focalized on training programs and projects, providing to Commanders and Staffs tools and enabling cooperation, interoperability and resources sharing through trained personnel, materiel to prepare lessons, reharsals and drills and Data Base with training solutions (briefings, SOP, TTP, etc.) ready to be used.

Other training network as reference is GETN (Government Education Training Network) that from 1992 is the training network for many Government Federal Agencies, using satellite channels that allow to the users to share information, training programs and services.

4.2. Methods and Mechanisms to implement

The principal mechanism it's based on the generic potential of crowdsourcing. The resources most suitable are selected by the user and tasked to the problem to be solved. In this way a user can take advantage of the certain resources capacities that it doesn't own, using the intake of experts and stakeholders to solve or help solve and finally share solutions.

The feature of online participation, makes it that once identified the audience of resources involved to solve the problem, the task realization must be done in a modular and variable way as the various resources involved work, make development, use their knowledge and experience, having also crucial contributing to finding a solution that will benefits both parties (applicant and solver) and all the resources that have contributed, in terms of experience and skills gained, in similar problem if it recurs.

Compared to the generic mechanism, in a military case:
- The user that needs to activate the problem solving procedure, he'll performs a task on a number of other specialized resources that may be useful in solving the problem by fixing constrains (time, resources, etc.), and providing the elements that he knows about the mission.
- The solution of the problem or task assigned can be solved in different modes, privileging MDMP expeditious method based on A & A (ask & answer), as the collective intelligence does in a decision process.
- Resources operate in a "flat coordination" environment for constant and dynamic process

elaborating one/more solutions for the decision making/executive level.

Once decision making/executive level have chosen the solution it will puts in place but the tasked resources remain hooked up to the end of mission to check/verify/modify the possible variances.

4.3. Business theories Search theory

The resources group transformation in "collective intelligence", it must meet the requirements related to the ability to solve the problem, able to develop the issue submitted difficulties, standardize procedures for problem development, having a group of resources sufficient making the problem modular and maintaining the various issues independent.

The mechanism requires a strong sense of collaboration and self-synchronization in which there is also a positive competition in advancing the problem development and its potential subjects and participation, and sharing best results (i.e. DARPA 2009).

In a complex environment like a military stabilization operation, the Commander problems are many and are not always related to the typical military sphere. The use of crowdsourcing methodology especially in this sort of work permits in the lack of resources, to assign the development of certain activities of problem-solving to other "geographic" resources or ask for cooperation to solve certain problems if his resources are already committed or to solve complex problems that require the use of valuable and rare resources.

The externalization of problems can be complex, but some specific activities can be given in "external solution" and then assembled in order to ensure the mission achievement.

A conceptual revision of MDMP could be desirable but its needs a specific and dedicated research.

4.4. Representation

The best change we can observe in the current military operations is the strong and advanced use of digital technologies to support the Command and Control networks and in general the Command post activities. The Command Posts today, a part from the kind of missions, are equipped with many different devices and systems that connect to other Centers and nodes to gather information and data.

A possible representation of a crowdsourcing method could use a common operational system and a pre-formatted platform, generically installed in every user's computer or device to connect users and resources in the same network and make easy to use it and collaborate. This software platform could utilize technologies like Augmented Reality, Virtual World, IA-CGF, Avatars and LMSs systems to yield well known technologies and COTS, making simple and open the architecture.

4.5. Technology

As the technologies change every six months, most of the technologies to use to develop a project like this are available just now in the market and also in the Army to realize a prototype. Principal network technologies will

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be the Cloud computing concepts applied to the military network.

In particular, using the most advanced technologies HW (Hardware) related to mobile devices and methods of use of Social Networks and Social Cooperation, through the creation of a specific software application, it want to develop a set of interfaces that allow access to a wide range of individual and collective digital thematic channels from which it can access various types of applications and services, it can federate various types of web server resources in order to foster collaboration and cooperation, you can use simulators situation, compose documents, exchanging and comparing views and resources and find solutions to specific operational problems and, using human and material resources differently and rarely available.

Even more, the crowdsourcing method applied to the military environment could give more meaning to the new projects that Italian Defense for example, is implementing into the training simulation, operational C2 activities and experimental sectors (SIAT, Future soldier and ITB projects) (Amico et al. 2000).

For sure, this kind of project requires a mentality change to be understood like a "step forward, not a menace" by the personnel, before it is implemented and obviously a change in the way we train and educate personnel.

4.6. An example

The construction of a drinking water well in an operational area in which a coalition is conducting humanitarian interventions on the population and where there is also a residual resistance, is a typical scenario for the current mission' theaters.

Assumptions: the unit Commander, which has received the mission and has already logistic and maneuvering resources involved in other operations, has received the teams able to work with the tools to dig the well but is not able to manage the project. The only hydraulic engineer available in the operating sector is already engaged in other two similar projects.

The Commander can use the crowdsourcing method and the network to set his operational problem, assigning:

- Among the network resources available and tasked, he can involve an engineer from his national Department of Civil Defense, a military engineer unit which has already made a laying of water pipes and a group of engineers from an allied Country University to set the project management.
- He can assign the safety inherent activities for the surrounding area and recognition of his interest area security to his remaining maneuver forces.
- He can task intelligence resources on the network taking them from superior and

parenthetic HQs, to get the intelligence reports, studies and guidelines for the area.
- Assign the logistic and communications problems to their units' support.

The Commander will put together the tasked resources in a workgroup and gives constrains and sharing information that he has. The tasked resources will operate in "flat coordination" exchanging products and studies results about their activities, reaching a final plan composition to follow. The activities may be following by a super-partes coordinator or by an activities' program management. The final plan solutions will be sending to the Commander who wills choice the best option.

Generally a plan should contain, for example:
- preliminary contacts with the local political authorities;
- definition of working period and the use of any local personnel;
- definition of the area and reconnaissance;
- securing the area sending personnel to safe area near the well location and sector monitoring;
- definition of logistics support area;
- delivery of equipment and operating personnel;
- starting of activities and monitoring;
- completion of the water pipes and well and organization of population hydraulic services;
- well delivery to the local authorities.

During the plan implementation, the network resources that have helped to design and managing the plan, they will monitor any possible deviations.

5. CONCLUSIONS

Crowdsourcing has found resistance to be used in the Military. Reasons could be find in the digital security of networks and data exchange, and into the "social soul" of this kind of methodology, even if the new developments (Crowdsourcing 2.0) are different and more oriented to a goal, using a specific and determined number of specialists to solve any commercial, business and designing problem.

Only demonize or support crowdsourcing is not the best approach to get on it, as this methodology it's now and even more in the next future, the best way to save human and economical resources into the civilian environment and to make progress in a lot of social fields.

Military Crowdsourcing should be based on the current digitized reality and characterized by high level of sharing resources, an extended networking diffusion and by capabilities and networks, reinforced from the exponential evolution of mobile technologies. If developed in a correct way, Collective Intelligence can be mutual from the

model business as "open enterprise" to product ideas, solutions, answers and analyses but also an educational way for personnel and a collaborative method to practice Command & Control upon projects development.

From this point of view the parallelism with certain military requirements is immediate and can give guidelines about the future developments of multinational activities, Command and Control, Training, information sharing and resolution of operational problems.

This methodology could be applied on various options of operational use to devise an integrated e-learning LMS (Learning Management System) and DMP (Decision Making Process) associated with a Cloud Computing network, able to provide a wide range of applications, resources and services for individual users, institutions, structures and operational training missions, and through software that will enable self-synchronization and multidimensionality of command, information assurance and a correct information sharing.

In the field of training, the extension of the concepts of Crowdsourcing, "open enterprise" and "distributed problem-solving", will allow an optimized use of database management, optimization of the CPX-CAX (Command Post Exercise - Computer Assisted exercise), the collaboration during the exercises and situational update to ensure better integration between the function C2 (Command & Control), training simulation, activities developed with Serious Games and procedural training for users.

In fact, with the application of these concepts, there is also addressed to the world of training Simulation, in particular to the sector of Virtual and IA (Integrated Architecture) by exploiting the possibility of integrating with each other at the distributed level, Virtual Simulators and Serious Games for cultural, linguistic, social, economic training and above all procedural users (Tremori et al. 2012), lowering the cost of personnel and resources and applying the new concepts of Cloud Simulation and Virtualization.

The use of such a platform makes it possible to create an immersive and federable environment where different users are involved and where it constitutes a single "interoperable training environment crowdsourcing based", into which all the resources needed for various educational purposes divided for the base training phases and advanced specialization (e-classroom, e-reading, e-lessons, e-learning, e-capabilities, etc.).

Obviously, there are some critical points as:

- the reliability of digital data;
- the non adequacy of traditional method of control;
- ability to control the knowledge of all experts;
- ability to learn the right information;
- Information control is made from different people;
- Right information published force other users (as competitors, companies, institutional and government agencies, etc.) to answer and to respect rules;
- Focus point should be neutral agreed and consensual to build the participants reliability;
- Goodwill and reliability are fundamental.

The concept application in the Military could solve most of this point, and also allow the development of new forms of collaboration trying to keep up with the evolution of military doctrine and TTPs in the current and most future asymmetric operational environment.

Crowdsourcing will principally allow a new military function identifiable as "military cooperation", able not only to support training in the various levels of military personnel but at the same time provide a basis for establishing a new organization C2, planning, Simulation for training and, operational analysis and decision support is already in use in many industrial and civilian sectors, there are several experiences of suche kind of applications (Bruzzone, 2004, Curcio & Longo 2009).

and that is already being tested in military and NATO allies and other countries thus identifying a form of "distributed Command and Control".

In fact, since 2010 in the military, are studying the possible development trends of the requirements of NATO in the sphere of C2 (or BC-Battle Command), such as "Cross Functional Team", where the traditional concept of Command and Control evolves towards the "Command and Feedback", where the feedback is just a mechanism of monitoring and control the digitized training.

The concept is closely connected with the approach of NCW/NEC (Net Centric Warfare, Network Enabled Capability) and is strongly oriented to:

- To promote the solution of complex problems through the use of resources in a context of crowdsourcing;
- Transport in the military environment the concept of Crowdsourcing as an approach to the available resources in a network;
- Make available specialized resources and valuable, difficult to reallocate and optimize their use and reducing operating costs;

- Apply NATO concepts for Cross Functional Team in a Virtual Immersive and interoperable environment with the use of systems already available, making it more flexible deployment of command posts;
- Define the concepts of Crowdsourcing Cross Functional Team in a national operational environment and their skills, considering the concepts of "Dispersing leadership concept", "self-synchronization" and "multidimensionality of command" in a context like operating SOSO (Stability Operations - Support Operation);
- Define new models of military dynamics relations to connect the cell and functional areas within a "command post geographically" based on the ability to share information and their security;
- Apply the levels of C2 maturity model N2C2M2 (Net-centric Command & Control Maturity Model), IACGF (Computer Generated Forces-Intelligent Agents).

The military importance of operational effects (capabilities) resulting from Crowdsourcing concepts as part of the digitized formation, C2 and Simulation as a collector of resources, designed to support:

- Training of military personnel as a collective but also individual, developing a global Constructive platform consists of a collection of Data Base and digital resources accessible to all users, through Avatar, Serious Game and a virtual environment that can provide, as qualifying technology, training and specialized personnel or to make available resources for research and study in a real training network, information and operational from Army, based on knowledge and training as already happening for example in the U.S. Army;
- C4-ISTAR, limited to the operational function C2 "digitized" as the main enabler of reference for capacity development of the Army and the achievement of the objectives of the ongoing process of transformation and other functions on the basis of the capacity to be expressed and exercisable through the concepts of the Crowdsourcing model;
- Training Simulation LVC-IA, as the dominant tool for training and the achievement of operational readiness of the forces, integrated with the world of C2 and training, but also with government resources available to provide commanders and staff training in the maximum much information as possible on the operational scenarios of reference for enhancing the capacities of departments and individual

components to operate in joint and multinational environments with an operating philosophy "net-centric" and "effect-based".

These concepts and applications will contribute significantly to implement education and digitized training, allowing an ever closer integration of personnel training, skills and individual and collective training in a joint and multinational environment, the use of TTP's in favor of specialists branch and lower levels unit commanders (Pl./Cp.) and crews through the conception, organization and conduct of instructional courses or specific operation done anywhere and eventually useful for preparation of traditional CPX-CAX, accelerating the changes and conceptual culture necessary for a proper implementation of concepts for the Army transformation.

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Headquarters Multinational Corps Northeast (HQ MNC NE) is moving ahead in discovering the essence of Cross-Functional Team concept. Thursday, 21 April 2011 08:17 Veiko Palm