



## Use of Information and Communication Technology to Improve Command Control and Communication in Army

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### ABSTRACT

The requirement of our army to be able to fight in the future battlefield is that, a squadron/company commander seating in his tank / armoured personnel carrier should be able to view on a display the deployment and activities of his whole squadron / company. Similarly as we go up, the regimental commander should not only be able to view what is going on within his own regiment, he should be able to view the progress at his neighbouring regiment and of course at brigade and division front. If Army has an access to a satellite imagery, which concerns a troop leader in the forward zone, the troop leader should also have access to it at the fastest.

**KEYWORDS** :Information, communication, technology, Command, Control, Communication, Army, development, computers, Management.

### 1.Introduction

1.1 Information communication technology (ICT) plays a vital role both in peace and in war. Worldwide tremendous development took place in the field of ICT; a silent revolution has also taken place in world. Army is an age old organization which is using and developing information technology for planning, preparation and execution of war. Development of communication technology on the other hand have reduced the time, extended the area and provided versatility in its dissemination. As the organization expands in size and involves in versatile missions, they face new challenges and are forced to adapt to the changing environment. Therefore, need for adopting more effective information communication technology is necessary and a requirement of time. We need maximum output with minimum input. ICT provides that opportunity and in army it acts as a force multiplier.

1.2 The development of ICT has given warfare a new dimension. Whoever controls or dominates the information-sphere will have the power to dominate the future battlefield. Since, world is on the threshold of development in ICT sector, it is now appropriate to comprehend the subject with regard to ascertain the impact of ICT to enhance Command, Control and Communication (C3) system of Army. To do so, we must have fare knowledge on various ICT tools. ICT tools like networking, database management and customized software's have tremendous potential both in peace and in war. In the army its use is very limited and remained unexplored due to numerous reasons. Now it is a need of time to integrate ICT tools to ensure an effective and efficient C3 in the Army.

### 2. Definition of ICT

2.1 A variety of technologies, products and techniques has combined to provide new electronics dimensions to information management. This mosaic is known by the name IT. Now a day IT is also called ICT. It is obvious that ICT concerns the uses of systems and devices that allow transfer, storage, processing and presentation of information. Obviously the computer constitutes one of the major devices in controlling information storage and transfer.

### 3 Tools of ICT

3.1 **Networking:** A group of computers and other devices connected together is called a network and the concept of connected computers sharing resources is called networking . Networks enhance the computer's ability to exchange, share, process, preserve and protect information. There can be three types of networks: Local Area Network (LAN), Wide Area Network (WAN) and Internet.

3.2 **Database Management:** Database services can provide a network with powerful database capabilities that are available for use on relatively weak PCs. All the basic first-hand information for both peace and war can be put in the form of database.

3.3 **Customized Software:** To meet the individual departmental requirement, software developed is referred to as customized software. The customized software could be Budget Management Program for Budget Directorate or Training Management Module for various unit administrations.

3.4 **Information System Development:** To enhance efficiency of the manager by optimum utilization of all IT resources available to him he needs to develop information system. We can also term this as application of IT. Information systems are classified depending upon the scope of utility. The recognized information systems are as following:

- 3.4.1 Transaction Processing System (TPS): TPS is the most fundamental type of computer-based system. It involves routine entries and record keeping of transactions in the computerized databases.
- 3.4.2 Management Information System (MIS): MIS assists managers in decision-making. This type of systems are characterized by pre-designated input, pre-conceived situations and known decision options.
- 3.4.3 Decision Support System (DSS): DSS assists managers who take decisions, which are not structured. Such decisions are taken in absence of rules and guidelines, in a time when fog and friction prevails in the battle field and involve consideration of intangible and unknown or unexpected with previous knowledge and experience.

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#### 4. Satellite Imagery, Remote Sensing and Surveillance

- 4.1 Remote Sensing and Satellite Imagery: Remote Sensing implies, sensing from a distance by a variety of sensors that reveal the presence of entities. Satellite imagery is the image obtained from a sensor placed on a satellite platform. Following functions will be strengthened through different phases of the land battle by suitably employing remote sensing and satellite imagery capability in conjunction with other means:
- 4.2 During Peace Time Border Management:
- 4.2.1 Building up of data bank required for planning of the battle i.e. geographical details, location of structures, topographical changes, and, large scale movements.
- 4.2.2 Continuously updating the database to build up the intelligence throughout the area of interest.
- 4.3 Close to the Imminence of Hostilities:
- 4.3.1 Updating the data bank.
- 4.3.2 Reconnaissance.
- 4.3.3 Surveillance.
- 4.3.4 Latest movements of materials to the battlefield.
- 4.4 During the Conduct of the Battle:
- 4.4.1 Update data base.
- 4.4.2 Reconnaissance.
- 4.4.3 Surveillance.
- 4.4.4 Major movements and application of enemy reserves.
- 4.4.5 Major movements of logistic installations.
- 4.4.6 Movement and locations of major weapon systems.
- 4.4.7 Control and direction of firepower means to enhance their accuracy and reach.
- 4.4.8 Damage assessment of own firepower applications.
- 4.5 Satellite Surveillance: The advent of space age introduced a new dimension to acquisition of photoreconnaissance through sensors from satellites and space stations. Surveillance satellites over-fly enemy territory without the fear of being shot down, as would be the case with aerial platforms.
- 4.6 Geographic Information System (GIS): The GIS provides the tools to create, maintain, and distribute geospatial data. The examples of application with explicit GIS analysis requirements are cross-country movement analysis, inter-visibility and various inputs of Intelligence Preparation of the Battlefield.
- 4.7 Media: Media plays an important role in the modern day warfare. With the proliferation of IT, defence reporting has become more challenging as correspondents find it hard to discern and distinguish between facts, disinformation and misinformation.
- 4.8 Computer Related Weapons: Virus, Worm, Trapdoors, Trojan horse, Nano machines, High Energy Radio Frequency guns, Logic bombs, Electronic jamming and Chipping are few of the computer related weapons which can be effectively employed to destroy adversaries' information systems.

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#### 5. ICT Policy Guidelines

##### 5.1 Present Use of ICT for Enhancement of Peacetime Administration

- 5.1.1 Computerized Office: There is no doubt that ICT in some form or the other is being utilised these days by the army. But the extent of such utilisation is much below any acceptable level.
- 5.1.2 Office Automation: Office automation refers to the use of computer, communication system and office equipment technology to support the activities of an office.
- 5.1.3 Record Automation: At present all the records of different arms and services are having automated service for all the soldiers.
- 5.1.4 Pay Automation: Officers' pay under financial control army pay-1 is made fully computerized. Officers can check their salary, DSOP.
- 5.1.5 Army Web Site: An army web site is developed where latest information on all the activities of army can be experienced by the visitors of the site.
- 5.1.6 Information Security and Communication Security: A comprehensive security arrangement is made by IT Directorate. Access to Information should be on 'need to know' basis.

##### 5.2 Future Use of ICT for Enhancement of Peacetime Administration

- 5.2.1 ICT Battalion: In near future IT Directorate is planning to have an ICT Battalion as army resource with following task:

- 5.2.1.1 Programming.
- 5.2.1.2 Analysis.
- 5.2.1.3 Management
- 5.2.1.4 Implementation.

5.2.2 EW Company: A proposed EW company plan is already approved by ministry of defence with high tech jamming devices comprising of 91 persons.

5.2.3 Pay Automation: Pay automation on FC Army Pay-2 is already in the process of automation. With the completion of the project soldiers will have online facility to check their salary and all other financial matter.

5.2.4 Pension Automation: Soldiers' pension is also under automation. According to the plan of IT Directorate every retired soldier will have a debit card instead of pension card to draw their pension.

5.2.5 Online Examination: The examinations held in the army are also under process of online facility by IT Directorate.

5.2.6 Networking: The networking all the divisions were divided into two phase, Phase one of the project was to connect up to brigade, which is already complete.

5.2.7 E Learning: IT directorate is planning to maintain all existing books, pamphlets, précis and written instructions etcetera in interactive Compact Discs.

5.2.8 Simulation Training: Simulation training is a very efficient method through which certain specialised training can be imparted. Simulation training economises time, reduces expenditure and ensures training in closer to actual situations.

5.2.9 War-Game Simulator: This is especially applicable for training of commanders at various levels in planning and conduct of operations. By utilising IT, interesting software may be developed for this purpose.

### 5.3 ICT in Operations of War

5.3.1 In warfare technology was always a force multiplier and would remain to be so. Development of appropriate ICT suiting specific requirement of operations of war will enhance efficiency of Army to a great extent. This can be applied in different ways to derive benefit both in offensive and defensive operation, battle beyond international boundary, battle in forward zone, in logistics etc.

## 6 Impediments in Implementing ICT for C3

6.1 Even after having strong drive at various levels for making the Army more computerized there exists some barrier, which is creating bottleneck for effective integration of ICT. Many of the causes could be identified and important ones are discussed as under:

6.1.1 Attitude Towards New Technology: As a whole our society does not want to accept new technology. It takes some time to make them understand about the benefits of technology. Especially the commanders at senior level want to continue with the primitive ideas and technologies of their age. The attitude by officers is showed in chart 1 below:

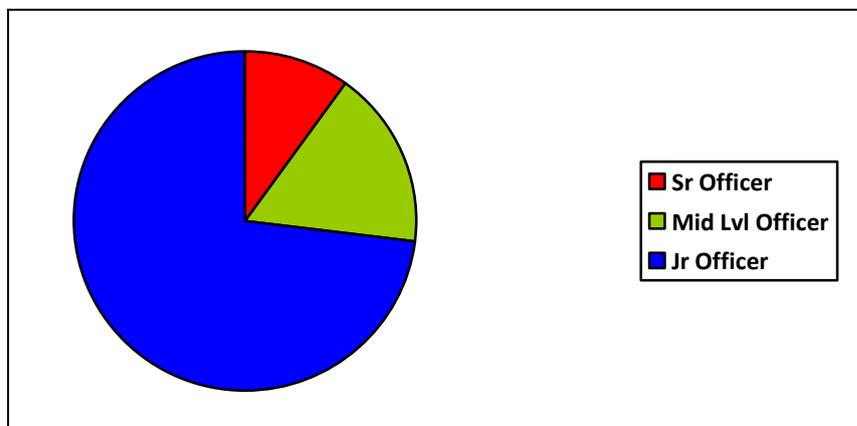


Chart 1. Attitude Towards Technology By Officers

6.1.2. Lack of Computer Experts: Better functioning of computer needs better operator, supervisors and maintenance staff. The educational qualification and intelligence level of the personnel involved in computer needs to be higher. Under the existing table of organisation and equipment of army and intake policy we cannot enrol any professional of this category. Following chart 2 shows computer experts in unit:

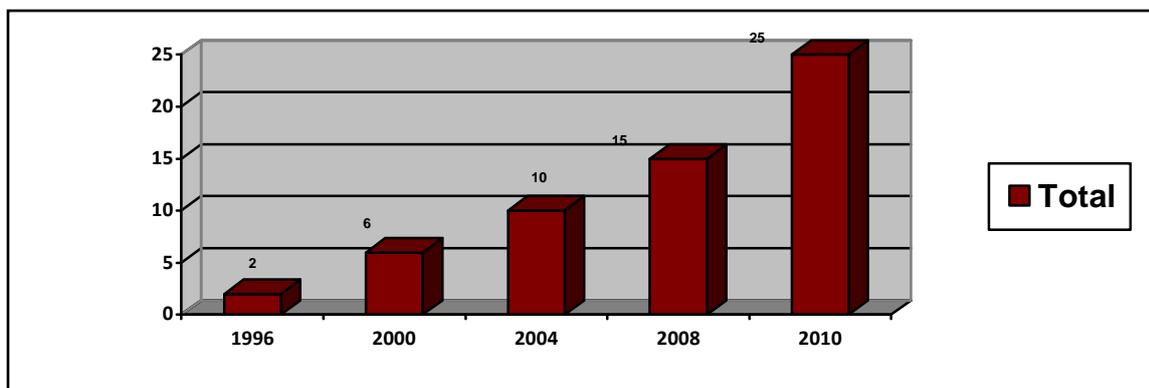


Chart 2 Computer Experts In Unit

- 6.1.3 Lack of Policy and Piecemeal Effort: Army needs to publish ICT policy, which will act as a base of all ICT activities of units.
- 6.1.4 Absence of own Technology: One of the great hurdles towards integration of ICT is lack of own technology.
- 6.1.5 Expenditure: Acquisition and development of software, purchase of simulator, radars, RVPs are costly affair.
- 6.1.6 Absence of Software Development Facility: Developing software for army units, definitely involves expertise, huge effort and time. We are yet to have our own software engineers.
- 6.1.8 Threat from Computer Hackers and Computer Virus Attack: Computers and networks with Internet facility are always under constant threat to hacker groups.

## 7 Measures to Improve C3 of Army by ICT

- 7.1 Awareness: There must be a general awareness about computerization among the members of the Army, particularly at senior officer's level.
- 7.2 Formulation of ICT Policy for Army: A detailed and clear cut policy on the ICT with yearly target is essential.
- 7.3 Listing Computer as a Communication Equipment: Computer being office equipment restricts procurement from Annual Training Grant allotments.
- 7.4 Arrangement of Training and Maintenance: The training of personnel should get highest priority and attention along with after course employment in right place.
- 7.5 Standardization of Hardware: A standard specification of computers should be formulated for the entire Army to ensure interfacing and ease of communication in future.
- 7.6 Budget Allocation: Required amount of budget should be allocated beforehand so that there is no shortage of fund and interruption during the process of computerization.
- 7.7 System Architectural Design for Entire Army: There is a need to appoint system architects who should design and make overall master plan of ICT development for Army.
- 7.8 Employment of Computer Expert: At present Army has very less qualified computer expert. Though some of the officers are trained, on completion of their training they are posted to different organization
- 7.9 Development and Installation of Customized Software: The IT directorate may ask all concern regarding the requirement of customized software and gradually develop those.
- 7.10 Identifying Interested Officers: Computer is a subject that demands only interested officers for its programming, networking or related process.
- 7.11 Email In Lieu Of SDS: To make the office paperless, the e-mail system should start functioning properly at Army Headquarters level.

## 8 Means to Incorporate ICT for Efficient C3 in Army

- 8.1 The requirement of our army to be able to fight in the future battlefield is that, a squadron/company commander seating in his tank / armoured personnel carrier should be able to view on a display the deployment and activities of his whole squadron / company. Similarly as we go up, the regimental commander should not only be able to view what is going on within his own regiment, he should be able to view the progress at his neighbouring regiment and of course at brigade and division front.
- 8.2 ICT Vision: Things may not be as simple as stated in the preceding paragraph. But that is the actual requirement if we are to meet the future challenges squarely. Basing on the vision some specific measures are suggested below for speedy incorporation and effective exploitation of ICT for enhancement of efficiency of Army:
- 8.2.1 Goal Setting: At present ICT in different form is being utilised by our army. But unless we have a specific goal set for our forces, we are unlikely to make considerable progress in this regard. We have to be very sure as to the level up to which our forces should utilise and exploit ICT.
- 8.2.1.1 Short Term Plan: In short-term policy emphasis should be given to policy and ICT infrastructure development including establishment of communication infrastructures and use of customised software.
- 8.2.1.2 Mid Term Plan: In midterm plan I would suggest to make a policy for 5 years basis. Within this 5 years plan the war game simulator

and laying of fibre optics will get the main priority.

8.2.1.3 Long Term Plan: Long-term plan will be mainly 10 years basis where our objective should be to introduce DSS. Within this plan WAN to be established and with that WAN.

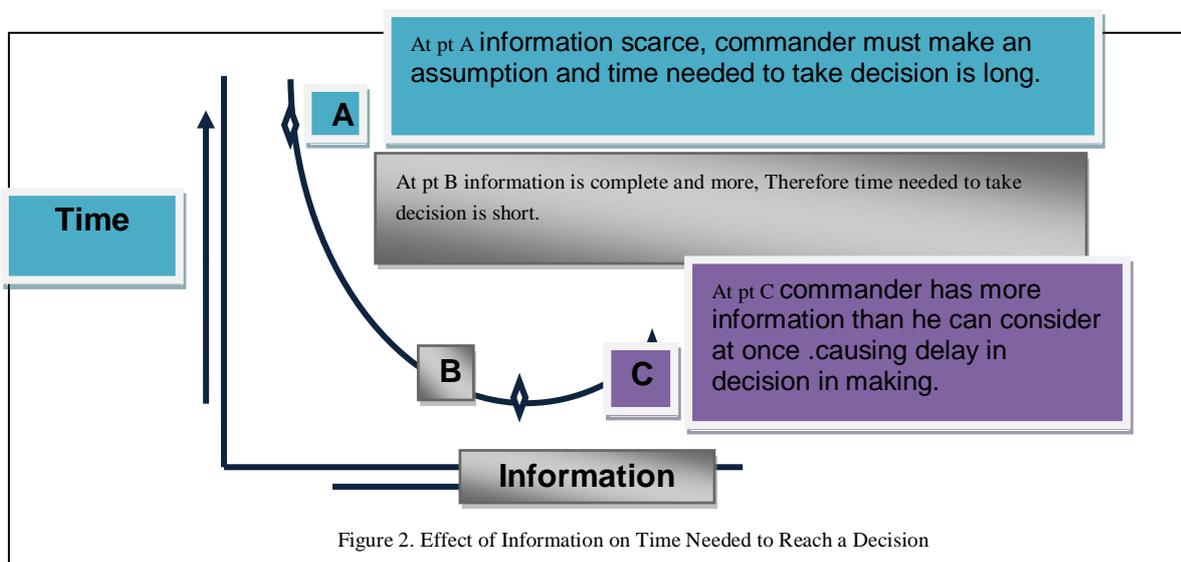
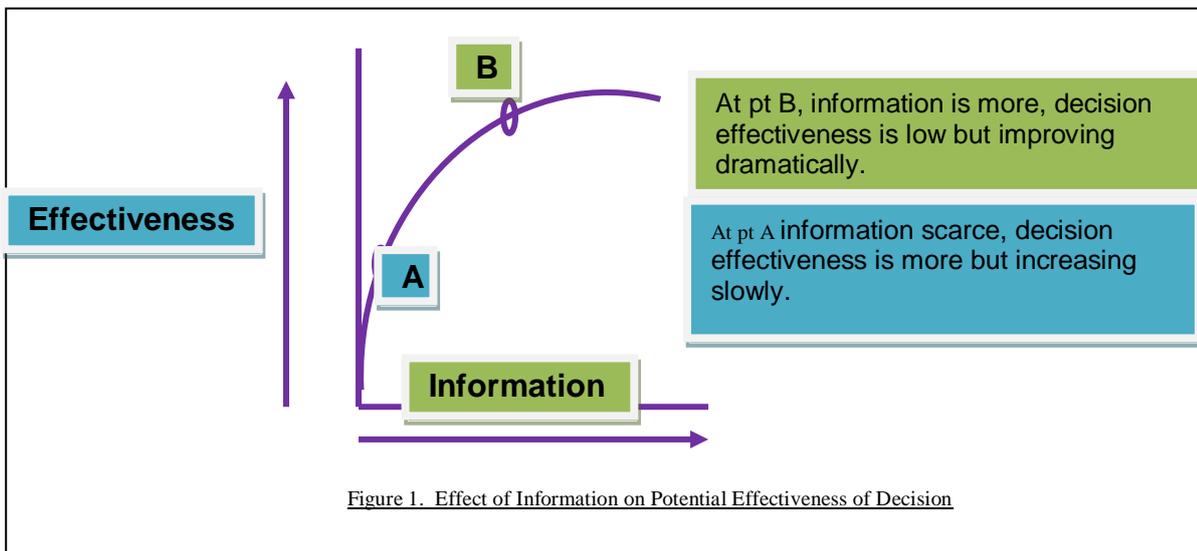
8.3 Training: Army should endeavor to update the communication equipment and impart training for making own customized software. Selected officers and men from Corps of Signals should be trained on specific fields. A certain number of officers, junior commissioned officers and other ranks of all arms and services may be trained at IT School on the advanced ICT fields. Selected army training institutions should be provided with proper laboratory and computer facilities to impart basic computer training to all officers and soldiers required to work on computers. In all army garrisons, training should be arranged on common computer application for officers and soldiers.

8.4 Customized Software Development: A software development plan should be forecast annually and Army Headquarters may reward the successful programmers. Hosting Seminars and workshop related to army affairs should also encourage software development.

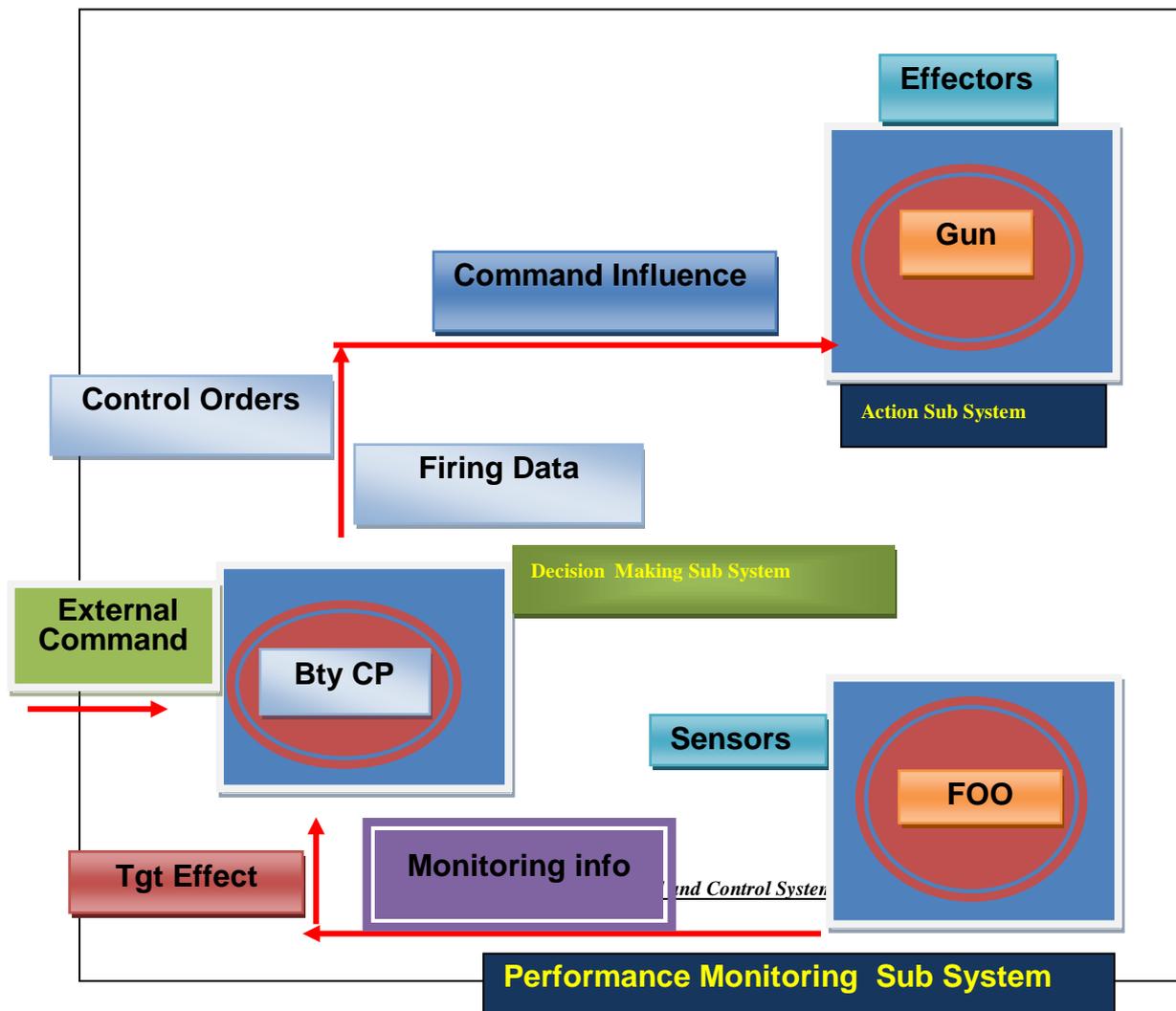
## 9 Impact of ICT on C3 and Decision-Making

9.1 Impact of Information In Command and Control: An 'Information System' is that which handles information. It further amplifies that the system which deals with collection, processing, storing and disseminating information. On the other hand, C2 is the process of directing and co-ordinating military forces in execution of the commander's will and the exercising of his authority over all or part of the activities of subordinate organisations.

9.2 Impact of Information in Decision Making: A decision-making is the fundamental responsibility of command, its central characteristics are the commanders' continuous search for certainty; therefore, it is the function of information. The main disadvantage of the new technology is that it will provide intensive flow of information and data to the decision making body, thereby the chances of becoming stagnant with over and excess information cannot be ignored. Figure 3 and 4 describes the relationship:



9.3 Impact of ICT on Command and Control: Command and Control is the exercise of authority and direction by a properly designated commander over assigned forces in the accomplishment of the mission. ICT only addresses activities directed against the adversary's ability to direct the disposition and employment of forces, or which protects the friendly commander's ability to do so.. Figure 3 explains the system:



9.4.1 Performance Monitoring Sub System: This function primarily revolves round the gathering of all information needed by the decision-making sub system.

9.4.2 The Decision –Making Sub System: This is the sub system where the major processing functions are found. To carry out its task the decision-making sub system must carry out the following functions:

- (1) Gather information from the performance monitoring subsystem.
- (2) Analyse and assess the information in order to determine what is happening or about to happen.

9.5 Impact of C2 in Battlefield:

9.5.1 A well-trained information management cell may be required in the headquarters to function in such a way so that the command echelon is not overloaded by information. Managing, transforming and disseminating accurate and timely information will be vital for winning a war. The overall C2 system can be seen from two perspectives. They are as follows:

9.5.2 The Total C2 Syste: The total C2 system of a country’s forces has been shown in figure 5 that depicts the overall system of command and control. It also shows information flow and how system is integrated in the hierarchy of command, both laterally and vertically.

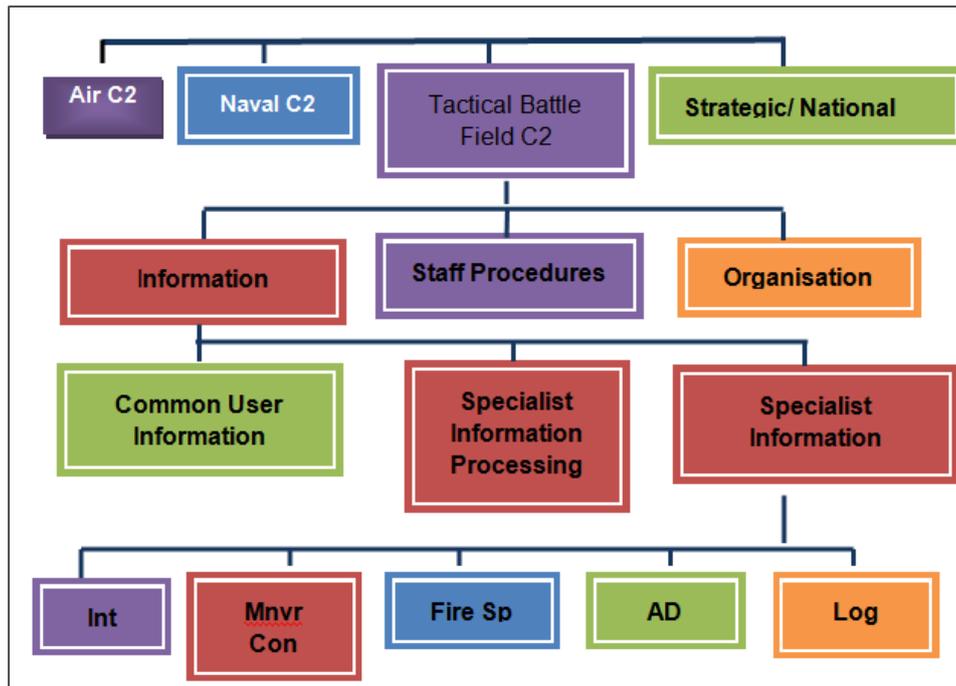


Figure 4. Total Command and Control System.

9.5.3 The Military C2 System: For more complex military C2 system communication is an added sub system, which integrates the earlier mentioned three subsystems into a control cycle or loop. At a corps/ army level this cybernetic model will enhance the speed of information and thus the communication.

9.6 Impact of ICT in Decision Making: ICT makes possible better plans, rich with options for early and effective decision-making. Currently, much valuable time is lost in preparation of plans and dissemination of information. The potential force will disseminate precise information rapidly; digitised map systems, associated terrain analysis and war-gaming tools will produce plans quickly, permitting soldiers to focus their efforts speedily.

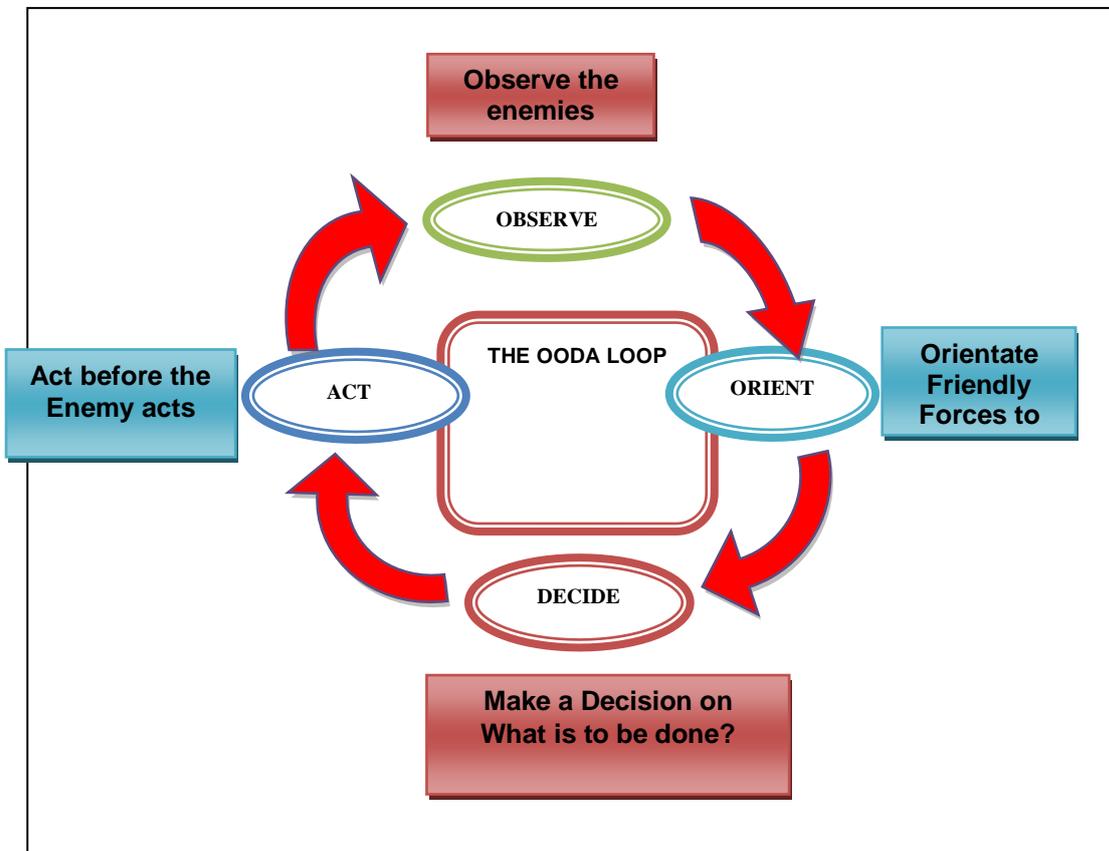


Figure 5. Decision Making Cycle

## 10 Conclusion

10.1 ICT can serve the requirement of military not only in peace time but also during war. During peace time networking, database management, customized software, information system development assists in command, control and communication. Collection, collation, processing and dissemination of information to produce useful intelligence are a complicated process which is required prior and during war. The requirement of intelligence in the Army would remain always high because of the very nature of warfare they are involved in. This can be much better handled by application of appropriate ICT.

10.2 The technological advancement has brought a rapid revolution for the countries that could exploit both IW and ICT in their day-to-day military affairs. ICT will play a major role in the warfare of 21<sup>st</sup> century, and it will decide who will win and who will lose the war. ICT is likely to influence the battlefield at operational and strategic level most but certainly it will have its implication at tactical level also. The use of ICT in our country is mostly for peace time requirement. Our use of ICT in peace time role will definitely facilitate in command, control and communication but to suppress enemies electronic warfare we must focus on ICT use in defensive and offensive operation.

10.3 At present the use of ICT in our army is more in peacetime administrative use. To meet the challenges of future war we should concentrate more on war time preparation. We need to set specific goal based on proper planning by experts. To implement the plan, we must divide the plan into different time frame. First and foremost we need to select interested, talented soldiers' and officers' to train them on software development. We must pay due incentive to those programmers who can develop new software's.

## 11 Recommendations

11.1 After carrying out detailed research on the subject following are the recommendations made for effective C3 using ICT tools:

11.1.1 There should be NOC at Armed Forces level which will have its components up to service headquarters level.

11.1.2 A detailed cost analysis of clearly phased out project for Army by a team of experts is needed before the ICT development plan.

11.1.3 Emphasis should be given on use of ICT in operational purpose, Army Doctrine should expedite introduction of simulators.

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