

# The Implementation of Multi-touch Table to Support the Military Decision Making through Critical Success Factors (CSFs)

Norshahriah Wahab and Halimah Badioze Zaman

Institute of Visual Informatics, Universiti Kebangsaan Malaysia  
shahriah@upnm.edu.my, hali@ivi.ukm.my

**Abstract.** In this paper, we present the implementation of Multi-touch Table (MTT) to support the Military Decision Making. The need of the multi-touch table technology is essential for effective and efficient outcome especially in the Malaysian Environment Army. The decision making process is also integral to successful performance of the battlefield. The military decision making process emphasized on timely decision making, the understanding between commander's intent and staff besides the clear responsibility of the commander and staff. Therefore, the crux of this paper is on how to optimize the military decision making process through the Critical Success Factors (CSFs) that have been identified from preliminary study. By adapting the Critical Success Factors (CSFs), all the concepts, ideas and arguments can be brainstorm clearly and effectively around the Multi-touch Table which further gives advantages in visualizing, organizing and manipulating the data/information amongst military officers. The adaptation of the elements in Critical Success Factors (CSFs) also will promote the communication between commander and staff in the activities that involved visualizing the battle-space, describing the visualization to subordinates/staff, directing action in terms of the battlefield operating system and leading the unit to mission accomplishment. This paper also will present the findings and results obtained from series of questionnaires and interviews amongst Subject Matter Experts (SME) in the domain of Military Decision Making. Based on preliminary study indicated that the Criticality of elements in Critical Success Factors (CSFs) in supporting the process of military decision making. One big issue or dilemma in planning and execution of military decision making is the Commanding Officer (CO) need to rely fully on the subordinate officers' coordination ability and to understand effectively of the consequences each 'Course of Action' (COA) suggested by subordinates officers. The application of Multi-touch Table will be benefited in term of the medium used in supporting the discussion and brainstorming session between the Commanding Officer (CO) and the subordinate staff. Decision makers will refer to the shared display together at the same time with different orientations. Multi-touch Table is interactive table that becoming affordable in commonplaces such as in offices, universities and homes. This technology offers the world possibilities such as task engagement, face-to-face communication, social interaction dynamics and simultaneous input contribution. In the nut shell, the appropriate medium such as Multi-touch Table will put the positive impact

towards the process in military decision making and addition to this point the adaptation of Critical Success Factors (CSFs) may give a lot of advantages specifically in planning and execution of military decision making.

**Keywords:** Multi-Touch Table, Military Decision Making, Critical Success Factors (CSFs), Command and Control (C2).

## 1 Introduction

Decision making has been researched from a number of paradigms, including the classical decision making approach which advocates a logical, rational, analytical approach to decision making suited to military planning and naturalistic decision making which reflects decision making in uncertain and dynamic military operational environments (Daley, 2007). Decisions in a military context, is characterized as “command and control” (C2) decision making and this category features high-level integration of near real-time information for the purpose of deciding how best to utilize force application in a battle environment under varying degrees of uncertainty and time pressures (George, 2008).

Besides, the data and information need to be presented in the collaborative and effective interface. According to Hancock et.al (2006), the surface of Multi-touch Table gives advantages in terms of the vast, horizontal surface and multiple users may use it in the same time. The application of Multi-touch Table offers one type of mechanism that enables the users to change the orientation of the interface by using one touch or multiple fingers. By this way, the users can easily and freely rotate the display orientation that suit and appropriate to them. This can be seen in Figure 1.



**Fig. 1.** The application of Multi-touch Table by multiple users at the same time, different orientations

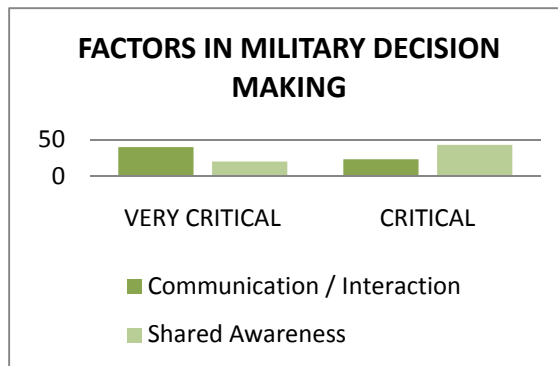
Furthermore, there are others research that have been proved the advantages of Multi-touch Table as a tool or technology which very helpful especially in communication and interaction. Based on research conducted by Cummings et.al (2011), stated

that the Multi-touch Table technology is effective and efficient tool for handling the situation that involved with a huge amount of data/information regardless displayed in one time and this data/information are the main focus of discussion. Moreover, research by Scott (2010), also proved that the application of Multi-touch Table will assist and support the process of military decision making in collaborative setting specifically.

Based on the facts, the implementation of Multi-touch Table will enhance the communication and interaction, the elements in Critical Success Factors (CSFs) in order to support the “command and control” process in military. By putting the communication and interaction as factors that contributing the success in military decision making, supporting with the level of Situational Awareness (SA) and Working experience, will promote the decision making amongst military staffs and Commanding Officer (CO). The elements of Critical Success Factor (CSFs) needed to be emphasized in order to optimize the decision making process. According to (Burns, 2000), situation/shared awareness as the construction of “mental models” to describe, explain and predict a situation. In particular, (Endsley, 2000) proposes that there are three (3) levels of situation/shared awareness as follows :

- i. “description” (of situational elements)
- ii. “explanation” (of the current situation)
- iii. “prediction” (of future states and actions)

Based on preliminary study that have been conducted, thirty (30) respondents from military peoples have answered to the questionnaire sample and the findings depicted that three (3) major factors currently most contributing to optimize the military decision making are Communication and Interaction (40%) followed by Shared Awareness (20%). This is depicted in Figure 2.0 as follows.



**Fig. 2.** Figure 2.0: Critical Success Factor (CSFs) in Military Decision Making

## 2 Preliminary Analysis

The preliminary analysis has been conducted in order to have the feedback and responses on the current problem in the planning and execution of military decision making process. The set of questionnaires have been disseminated amongst thirty (30) respondents involving captains at battalion level. The result can be depicted as follow in Table 1.0.

**Table 1.** Result from questionnaires' respondents from MINDEF, Kuala Lumpur

Item No.	Question and Answer/s	Percentage (%)
9G	Currently, is there any system/tools used to support your department in the process of decision making? If YES, please state.	Non (93.3%)
C 11	The following are the problems or constraints in the process of decision making. Please indicate how critical these problems are in affecting the decision maker, based on the given scale. (I3) : Communication between decision maker to staff (CO) (I6) : Situational Awareness (I7) : Experiences	Very Critical & Critical  (40%) & (20%) (20%) & (44%) (23%) & (4%)
I3	According to list below, please identify the importance of the tools/applications in order to support the process of decision making based on the given scale. (K4) : 'Multi-touch Table/ Touch screen'.	(50%)

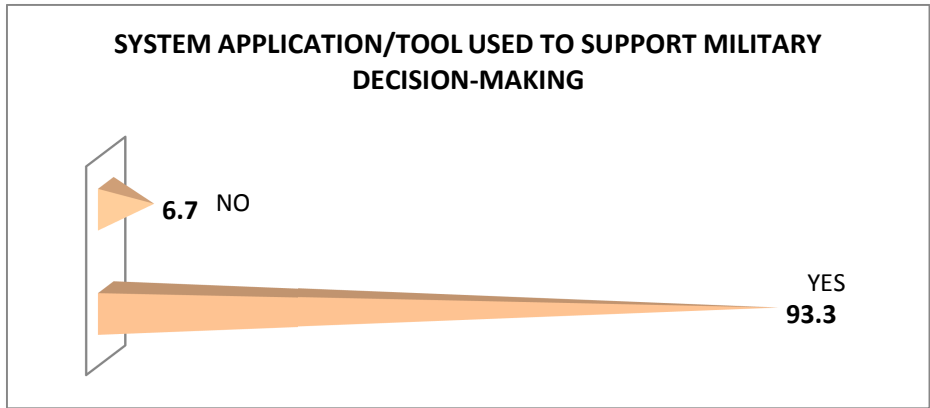
## 3 Findings of Preliminary Study

Based on the research outcomes from Table 1, the conclusions can be made as follows:

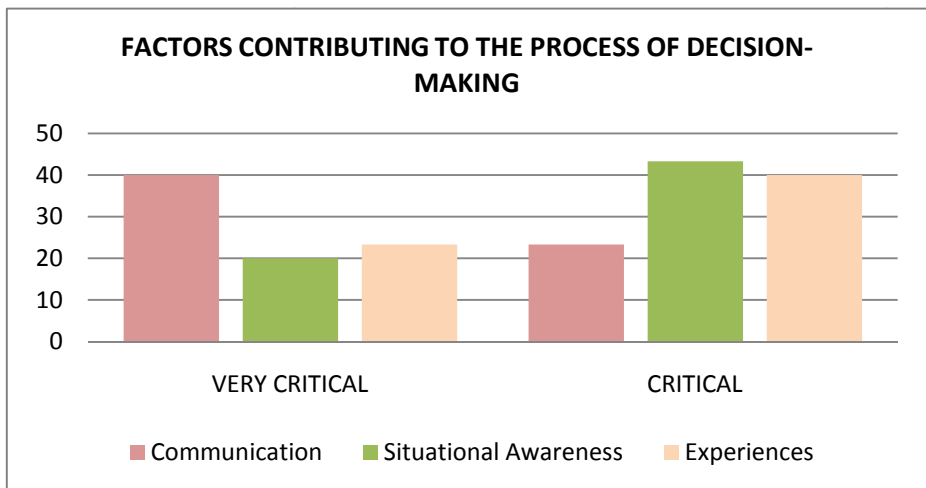
- i. There is (93.3%) responded that non of system/tool that currently used to support the process of military decision making. Otherwise (6.7%) stated that there is a system/tool used in their unit such as simulation to support their decision making process. This statement can clearly be seen in Figure 3.0 below.
- ii. The factors that contributing to Critical Success Factor (CSFs) are communication and interaction amongst military officers besides the importance of Situational Awareness (SA). Situational awareness is needed to achieve the mission goal. Moreover, the

working experiences of the military staff also significant to be considered in order to have an intuitive sense during the decision making. The experts will be able to create and develop their own mental models by exploring and discovering the previous mission. Refer Figure 4.0.

iii. The necessity of system/tool to support the process of decision making. As many (17%) stated that very critical and (33.3%) critical to implement the Multi-touch Table in decision making. Refer Figure 5.0.



**Fig. 3.** The percentage of system/tool used in supporting the decision making



**Fig. 4.** Factors that influence the process of decision-making in the Army

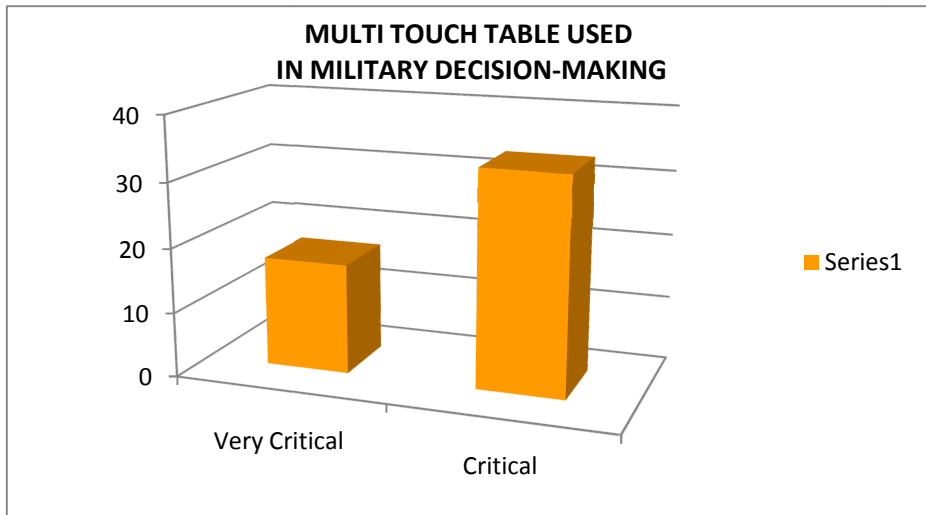


Fig. 5. Practicality of Multi-touch Table in the Military Decision Making

## 4 Conclusion

Decision making in such high stress and timely environments as a military operations center requires the concept of visualization in order to help the Commanding Officers (COs) and staff to visualize the scenarios, solutions and impact of the decision/COA. The decision making process that involved situations such as operating in an environment of volatility, uncertainty, chaos and ambiguity complicates the communication and interaction amongst militaries of higher and lower level. By investigating the effects of communication and interaction may give advantages to structure and develop the content using Multi-touch Table. Moreover, these Multi-touch technologies will allow multiple users to interact simultaneously in the most natural and intuitive method by only using their bare hands. Data and information also may be presented more efficient and effective ways due to this medium that can provide the nature of the touch-based interaction in order to quickly grasp complex controls using features provided such as zoom-in, zoom-out, drag and drop function.

As a conclusion, the adaptation of all the elements in Critical Success Factors (CSFs) that been identified through preliminary study in environment of new display technologies, example Multi-touch Table will allows for more intimate communication and interaction between Commanding Officer (CO) and others military staffs. This may leveraging the knowledge of multiple users in military decision making doctrine. This will also allows them to work together more efficiently and take full advantages of these new technology's abilities in the collaborative setting.

## References

1. Burns, K.: Mental Models And Normal Errors In Naturalistic Decision Making. In: 5th Conference on Naturalistic Decision Making, Tammsvik, Sweden, May 26-28 (2000)
2. Daley, A.C., Harris, D.: Training decision making using serious games. Human Factors Integration Defense Technology Centre (2007)
3. Scott, W., Keith, K., et al.: Enabling Battlefield Visualization: An Agent Based Information Management Approach. 10th International Command and Control Research and Technology Symposium the Future of C2 (2010)
4. George, L., et al.: Synchronizing knowledge in Military Decision Making: A Research Approach for exploring the effects of organizational cultures. Information Systems IX(2) (2008)
5. Hancock, et al.: Informing the Design of Direct-Touch Tabletops. IEEE Computer Graphics and Applications 26(5) (2006)
6. Cummings, et al.: Vispol: An Interactive Tabletop Graph Visualization for the Police. In: Proceedings of ACM CHI 2011 Conference on Human Factors in Computing Systems (2011)
7. Endsley, M.R., Garland, D.J. (eds.): Theoretical Underpinnings of Situation Awareness: A Critical Review. Situational Awareness Analysis & Measurement. Lawrence Erlbaum Associates, Mahwah (2000)