

MOBILE INFORMATION PLATFORMS IN THE MILITARY DOMAIN

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Abstract

This paper presents a preliminary study of attitude, compatibility, effort and performance expectancy for potential use of mobile information platforms, like smartphones and pads, in the military domain. Although mobile information platforms with all its possibilities, sometimes trending towards imposing, the military organizations are rarely to find among the (early) adapters of this new set of technology, services and ways. To the military organizations, security and reliability issues seem to overshadow the possibilities of mobile information platforms. The empirical data is based on questionnaires, unstructured group interviews and observations during four military activities in Norway. Overall, the study provides an outline regarding attitude, compatibility, effort and performance expectancy for use of mobile information platforms in the military domain.

Keywords: Mobile information platforms, attitude, effort expectancy, compatibility, performance expectancy, military domain, disruptive technology, user acceptance, network based defense

1 INTRODUCTION

Explaining user acceptance of information and communication technology (ICT) is a relevant and long-standing research topic. Mobile information platforms are a part of the ICT, and are devices that are designed to provide their users with various types of data, and enable collaboration across distances. Also, with smartphones, consumers no longer have to carry multiple technology devices where each device only offers a handful of limited functions (Chen et al. 2011). However, some people do not engage in this new technology; to others the possibilities are endless. Nevertheless, to most of us, mobile information platforms are becoming a part of our daily life as a logical extension and next step of the Internet.

1.1 Background

In this paper, we investigate mobile information platforms in the military domain. The military domain we understand as the combination of organizations and tasks whose main rationale is to defend a nation, and its interests and values, against external threats and attacks. A nation's armed forces, and hence the units within services like the army, navy or air force, are typical examples of organizations in the military domain. Further, task like defending the nation and its territories, providing strategic intelligence and supporting civil emergency organizations in crisis, are typical tasks of military organizations (e.g. Ministry of Defence UK or Prop.73 S (2001-2012)).

The military domain is in many ways similar to the emergency service functions (police, fire, medical), organizations of critical infrastructure, or others where the risk of losing human lives or high value assets are present and the organization is willing to use substantial resources to minimize this risk. These types of contexts are all dependent on relevant and timely information. Many of the systems and arrangements of the military domain are traditionally characterized by specifications of high-robustness, high-reliability and high-security. Further, these are most often in accordance with relatively strict military standards and constrained to honour classification schemes for sensitive information. Furthermore, the military domain is characterized by less probable but extremely high-risk activities, like war or armed conflict. Still, one should make a distinction between higher-risk activities and lower-risk activities also in the military

domain. High-risk activities may include operations like war or conflict. In peace time, high-risk activities may also be found at exercises involving firing of weapons or manoeuvring military equipment, like planes, fighting vehicles or ships, or treating highly sensitive information. Low-risk activities may be administrative tasks and some learning and training activities.

The Norwegian Defence has strategic goals of moving towards flatter, more decentralised and flexible type of organization (Forsvarsdepartementet 2009). Effective information sharing is seen as a critical factor. Further, information could be increasingly degraded with each level in the hierarchy which it must pass, and the information sharing could be time-consuming (Bjørnstad 2013; Volberda 1998). In a military context, time consuming information sharing could have fatal consequences. In crises, when the hierarchy becomes overloaded with vast information flowing up and down the levels in the hierarchy, the ability to take action within appropriate time decrease (Bjørnstad 2013). At the same time, new technology in ICT, such as smartphones, has created new opportunities for collaboration and information sharing within and between organizations, and could be one initiative to achieve improved information sharing. An article by Parsons (2012) addressed questions regarding smartphones and the reliance on real-time data. In the article he described that the explosion of commercial mobile devices contributed to the fact that the United States Defence Department (DoD) was scrambling to adjust network infrastructure and security policies to handle their sudden ubiquity. The article also addressed the questions of bring-your-own-device (BYOD) regarded unclassified and classified information. According to Parsons (2012) Army Col. Clint Bigger, commander of the White House Communications Agency, wanted to arrive at a single end-user device that could provide voice, video and data communications over both classified and unclassified networks, and that the Defence should utilize commercial-off-the-shelf for devices, security solutions and to protect information.

Mobile information platforms do not only consists of smartphones and pads, but also the networks, the services, the knowledge of the people that are using it, and how they are using it (cf. Reitan et al. 2012). With mobile information platforms, and all the possibilities, the military organizations are still rarely to find among the adapters of this new set of technology, services and ways. The structure of military communication and information sharing is usually tightly coupled to the military organization. A consequence of using mobile information platforms may be more dynamic work processes, not constrained to the hierarchical organization. The information would be shared both vertically in the hierarchy through mobile information platforms, but also horizontally, across boundaries and existing processes. Tadjdeh (2014) argued that in the US DoD, the funding to incorporate smartphones and tablets (as mobile information platforms), both in the offices and battlefield, has stagnated even though the demand for devices is rising. There seem to be great interest towards the possibilities of this technology, but the military adoption is still limited. Therefore, there is a need to study mobile information platforms in the military domain.

Our understanding is that mobile information platforms, although well known to people in the military organizations, are mainly overlooked and ignored as officially supported technology in the military. Exploratory experiments with information sharing using smartphones within the Norwegian Defence have been conducted (Reitan et al. 2015), and results showed enthusiastic users with high scores for usefulness. Nevertheless, few references to this technology are found in official military documents and few initiatives are shown to cater for this technology in the military. To the Norwegian military, security and reliability issues seems to overshadow the possibilities of the mobile information platforms. As far as we know, there is no documented investigation of acceptance of mobile information platforms in the Norwegian Defence.

1.2 Research question

With this background, one critical research question is whether use of mobile information platforms in the Norwegian military has a performance expectancy regarding improved information sharing, and further, whether effort expectancy, attitude and compatibility, affect the potential user's expectation of performance. We wanted to investigate into the expectations of this technology in the military domain and compare this apparent organizational ignorance with the attitude and performance expectancy found with the people in the organization. We collected data from 87 military personnel through a personal questionnaire and interviewed eight groups of people. The purpose of this paper is to enhance the

understanding related to the military's expectations of mobile information platforms. Therefore, this preliminary study focuses on effort expectancy, attitude, compatibility and performance expectancy related to the use of mobile information platforms, like smartphones, in the military domain. The contribution is a more thorough understanding of the determinants of performance expectancy of mobile information platforms among military personnel by emphasizing effort expectancy, attitude and compatibility.

The rest of this paper is organised as follows: In chapter two, the theoretical background is described followed by the methodology in chapter three. In chapter four, our results are presented. In chapter five we discuss our findings and in chapter six, conclusion and suggestions for further research are proposed.

2 THEORETICAL BACKGROUND

Research has studied how and why people start to use and adopt new technology. For example, one stream of literature focuses on implementation of technology at an organizational level, such as the one from Galy and Saucedo (2014) regarding managerial actions to financial performance. However, if the technology should contribute to improved organizational performance, it is necessary that the technology are accepted and used as intended by the organization's employees (see, for example, Bhattacharjee and Premkumar 2004; Uwizeyemungu and Raymond 2010).

Another stream of literature focuses on individual acceptance of technology, and applies intention to use, and use, as the dependent variable (see, for example, Gyampah 2007; Calisir et al. 2009; Sternad and Bobek 2013; Sun and Jeyaraj 2013; Venkatesh et al. 2012). The Technology Acceptance Model (TAM) is widely used as a primary model in this extensive body of research. TAM is used to study internal beliefs, attitudes and intentions to use technology. Perceived ease of use and perceived usefulness are the two main determinants behind the intention to adopt new technology. *Perceived usefulness* is in TAM defined as "the degree to which a person believes that using a particular system would enhance his or her job performance." (Davis, 1989 p. 320), and *ease of use* is defined as "the degree to which a person believes that using a particular system would be free of effort." (Davis, 1989 p. 320).

Based on an extensive literature review and analysis, Venkatesh et al. (2003) suggests the Unified Theory of Acceptance and Use of Technology (UTAUT) model. The UTAUT model is based on eight different user acceptance models, such as TRA and TAM in addition to Theory of Planned Behaviour (TPB) that added perceived behavioural control as a determinant of use. Perceived behavioural control could be defined as: "reflects perceptions of internal and external constraints on behavior and encompasses self-efficacy, resource facilitation conditions, and technology conditions" (Venkatesh et al. 2003 p. 454). The model suggests that performance expectancy (also called perceived usefulness in the literature) and effort expectancy (also called ease of use in the literature) affect the behavioural intention, and that facilitation conditions affect the use of the new technology.

Some research regarding mobile information platforms and acceptance exists in different contexts (see, for example, Chen et al. 2011; Li 2014; Tan et al. 2014). For example, Tan et al. (2014) found that the intention to adopt mobile learning has significant relationship with perceived usefulness and perceived ease of use in TAM. However, their findings regarding personal innovativeness in information technology, social influence and the control variables of age, gender and academic qualifications on the other hand, showed mixed results. Chen et al. (2011) studied smartphone acceptance in a major delivery service company in Taiwan by testing TAM in its original form and with self-efficacy added. The results showed that only assisted self-efficacy was related to both perceived ease of use and perceived usefulness and individual self-efficacy was only a predictor of perceived ease of use.

With the TAM and UTAUT models, as the framework for our research, we assume that compatibility to existing process, people and structure aspects in the military, are relevant for accepting new technology. We include compatibility as a part of our conceptual model, in addition to attitude, effort expectancy and performance expectancy. The reason is explained in the next sub-sections.

2.1 Performance expectations

Performance expectations is, in the literature, defined as a determinant of acceptance (see, for example, Bhattacharjee 2001; Bhattacharjee and Premkumar 2004; Bhattacharjee and Sanford 2006; Venkatesh and

Davis 2000; Venkatesh et al. 2003; Venkatesh et al. 2012). Indications of high performance expectations of mobile information platforms could be seen in the non-military world, and also to some degree, in the military world. The mobile information platforms have shown us new ways of doing things, for example communicate, coordinate, share and manage information. There seem to be high expectations bound to mobile information platforms as people imagine ways to exploit this technology, the processing power, the networks, and the sensors of the devices for harvesting information, communicating and sharing information.

The apps4army competition(s) (U.S. Army Chief Information Officer/G-6 2010) of the US Army is a good example of this enthusiasm, innovativeness and performance expectations in the military domain. Finding good ways to channel such enthusiasm into constructive arrangements and practices is nevertheless a challenge to the military. It is not only the technology or the terminals that make up the value experienced from the mobile information platforms. It is the "whole package": it is the networks, the services and the communities these services facilitate as a collective. It is ways, of which people become familiar and more and more skilled, to help solve real problems (Reitan et al. 2012). Catering for the mobile information platforms will therefore be much more extensive than just providing resources to buy the terminals. Most likely it will require some official strategy and facilitation in the military domain to address these additional dimensions to function optimal.

Therefore, we address the importance of mapping the performance expectation towards usage of the mobile information platforms. Performance expectation is in this study related to the degree to which the user believes that using a particular system would enhance his or her job performance (Venkatesh et al. 2003). We adopt this variable in our study in order to see what kind of performance expectations the respondents have to use of mobile information platforms.

2.2 Effort expectancy

Effort expectancy is in this paper described as *the degree of ease associated with the use of the technology and whether a person believes that using the technology would be free of effort* (Venkatesh et al. 2003). There is extensive empirical evidence that perceived ease of use, together with perceived usefulness, is linked to the intention to use a technology. This suggests that the less effort it is to use mobile information platforms, the more one's performance expectancy is improved. In a military context, the question is whether effort expectancy is a determinant for usage or whether there are other determinants, such as attitude and compatibility, which we assume are more relevant determinants in a military context. Therefore, we adopt this variable in our study and want to investigate whether the effort expectancy for use of mobile information platforms is a determinant for usage or not.

2.3 Attitude

Attitude could be defined as "*an affect, captured as a positive (satisfied), indifferent, or negative (dissatisfied) feeling*" (Bhattacharjee 2001 p. 355). According to Davis (1989), perceived usefulness influences attitude towards use and intention to use. Intention to use will then affect real use of the technology. For example, the research of Sternad and Bobek (2013) supports this point of view, and found that perceived usefulness and ease of use affected attitude towards using a technology in organizations. UTAUT, on the other hand, argued that attitude towards the technology together with self-efficacy and anxiety is not direct determinants of the intention to use the technology. Venkatesh et al. (2003) argued that there is empirical evidence that suggest that affective reaction, as a part of the attitude concept, may operate through the effort expectancy.

In our study, we choose to follow the TAM model, and include attitude towards technology in our research. The reason for doing so is as follows: the part of attitude we want to include in our research is whether the respondents liked or disliked the idea of using mobile information platforms as a part of their daily work in the military, and is not linked to whether the respondents perceive the technology use free of effort. We assume that, in the military domain, the users are more concerned with the greater aspects of mobile information platforms, rather than aspects of the device itself, and therefore is attitude not necessary linked to perceived effort as Venkatesh et al. (2003) argued. Thus, we assume that attitude cannot be included in effort expectancy (cf. Amoako-Gyampah and Salam 2004), and we include attitude as a separate variable in our study.

We wanted to focus on the feelings about using mobile information platforms in the military domain. The terminals, the networks, the services and the digital knowledge are highly available to all of us as private individuals, but to military professionals, the technology has low availability. The technology is, due to security issues, often banned, and such are the ways, the collaboration models and the services not available. Bhattacharjee and Premkumar (2004) argued that attitude towards technology usage change with time as the users gain first-hand experience. Regarding mobile information platforms, we assume that the majority of our respondents have been using smartphones or pads non-professionally, and are familiar with the technology even though they do not use mobile information platforms as a part of their job in the military.

2.4 Compatibility

In the UTAUT model, Venkatesh et al. (2003) suggested that facilitating conditions, as “*the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system*” (Venkatesh et al. 2003 p. 453). We assume that these aspects are highly relevant as determinants for technology acceptance in a military domain. Furthermore, mobile information platforms do obviously provide a different set of parameters than military decision makers traditionally value. The technology and ways of the mobile information platforms scores low on security and robustness in traditional terms, but then it should yield high scores with respect to familiarity, ease of use and general proficiency, costs, capacity in terms of bandwidth, availability to terminals and users, total resources sunk into service development, development momentum etc.

In our understanding, the military domain has strict constraints on its technology and is well settled in the people, process and structure dimensions. The overall robustness, and the ability to safely carry out tasks, are built with well-known structures and processes supported by technological systems and arrangements of high-reliability and high-security. As described in the introduction of this chapter, TPB extends the TRA model by adding a variable regarding facilitating conditions called perceived behavioural control (Venkatesh et al. 2003). Innovation Diffusion Theory (IDT), on the other hand, measures facilitating conditions regarding compatibility and could be defined as “*the degree to which an innovation is perceived as being consistent with existing values, needs, and experiences of potential adopters*” (Moore and Benbasat 1991 p. 195; Venkatesh et al. 2003 p. 454).

In a military domain, we assume that the compatibility variable is more relevant than facilitating conditions and perceived behaviour control. The reason for doing so is that the questions for facilitating conditions in UTAUT concerns whether the respondents perceive that he or she has the resources necessary to use the system or knowledge, and system compatibility. In the military domain, people work with both classified and unclassified documents. Information sharing between these types of systems are highly complex and outside the scope of this article. Instead we wanted the respondents to answer questions related to the work process – and specifically questions about the way people preferred to work and their individual work style.

3 RESEARCH METHODOLOGY

We have followed the Eisenhardt (1989) roadmap for building theory from case studies. The roadmap is used as follows: The first step was the definition of the research question and a suggestion of potential constructs (variables), presented in chapter one and two. We then selected the case based on a theoretical sampling; our selected case was mobile information platforms in the military domain, where we collected data from three military exercises and one military conference in the Norwegian Defence in 2013 and 2014. We included different parts of the organization in our study, such as the home guard represented by a dog unit, military police and medical personnel.

Johnson (1997) and Eisenhardt (1989) recommend multiple data collection methods to strengthen the grounding of theory by triangulation of evidence. Therefore, this research contains a questionnaire (for details, see chapter 3.2), unstructured group interviews and some observations (for details, see chapter 3.3). Furthermore, investigation triangulation was used in this study, in order to improve external validity (cf. Eisenhardt 1989; Johnson 1997).

The next step in the roadmap is to analyse the data. Our analysis is presented in chapter four. After the analysis we started to search for evidence of “why” behind the relationship, and to discuss our findings

from a military setting towards existing theory (Eisenhardt 1989). The discussion is presented in chapter five.

3.1 Sampling and data collection

This study is part of a research project related to mobile information platforms in the military domain. The research project has an exploratory approach, and we collected data from three military exercises and one military conference in the Norwegian Defence in 2013 and 2014. The names of the exercises/conferences are not mentioned, due to the confidential aspect. The data was collected from a questionnaire, unstructured group interviews and some observations of military personnel. The first phase of this project aimed to explore performance expectations, attitude, compatibility and efforts towards the use of mobile information platforms in a military context as a foundation for further design, development and research in the area.

3.2 Variable measurement in the questionnaire

The main data collection method in this study was questionnaires. The questionnaire is mostly built on the Venkatesh et al. (2003) article. The measurement scales has, in previous research, been found reliable and with acceptable validity. We have made a simple conceptual model for our preliminary research, to illustrate the potential relationships among the variables.

All questions were measured using a seven point Likert scale, with anchors of “1” = strongly disagree and “7” strongly agree. In order to fit within a military domain, the questions were in some degree reworded and modified. A total of 87 respondents have answered the questionnaire. Participation in the research was voluntary. We did not exclude any questionnaires due to missing data.

The performance expectancy variable was measured by three questions from Venkatesh et al. (2003). The final question from Venkatesh et al. (2003) measurement scale regarded chances of getting raise is not relevant in the context and therefore not included. Three questions are used to measure effort expectancy. Two questions are from Venkatesh et al. (2003) ... *I would find the mobile information platforms easy to use* and *Learning to operate the mobile information platforms is easy for me*. The question: ... *Using the mobile information platforms will be free of effort*, is based on the definition of effort expectancy and aim to measure whether the respondent perceive the new technology free of effort. Four questions are used to measure attitude. These questions are from Venkatesh et al. (2003). Finally, we wanted to include compatibility. The variable is measured with three questions collected from Venkatesh et al. (2003), originally from Moore and Benbasat (1991).

3.3 Unstructured group interviews

This study is a preliminary study as part of a more comprehensive research project. For the sake of the project, we needed to capture more insight than the questionnaires, alone, could give. For this reason, we also conducted unstructured group interviews and chose an exploratory open-ended approach (Eisenhardt 1989; Eisenhardt and Graebner 2007; Graebner et al. 2012). This should allow us to capture relevant details and mechanism that may not have been covered by the questionnaires, and allowed us to take advantage of emergent themes and context specific knowledge. The project therefore chose to conduct unstructured group interviews as a support to explain the results from the questionnaire. We wanted the respondents to express themselves in their own words. The aim was that the respondents talked freely and the interviewer avoided influencing the direction of the conversation. During the three exercises and one conference, we talked with eight groups of people. We included in our study respondents from different levels of the hierarchy in the organization and functions. For example, personnel from the military police, the dog unit, medical personnel, and staff were included in the study.

3.4 Data analysis

We used the SPSS software package during our preliminary analysis of the questionnaire. We first examined the demographic data, then descriptive aspects followed by a correlation analysis. During the unstructured group interviews we took notes and the notes were later used as a support to the statistical analysis. To make sense of the unstructured group interview data, we organized the data into categories often based on the theoretical framework. The data analysis was not straight forward, but instead an

iterative process. The results from the unstructured group interviews and the observations were, therefore, used as in-depth knowledge of the context, and as a supplement when explaining the results.

3.5 Demographic data

The demographic data are gender, educational background, military rank and education. The majority of the respondents were male, and the respondents represent a diverse sample regarding educational background, both civilian and military education. Furthermore, the respondents represent a diverse sample with respect to military rank and position. The respondents ranged in age from under 25 to over 60. There was a variation in the number of years that the respondents had been in the military; however, most of the respondents did have more than five years of experience from the military.

4 RESULTS

This section contains an initial descriptive analysis. We emphasize the answers from the questionnaire, but support with evidence from the unstructured group interviews and the observations. For each of the variables, we present a table. The tables show the results including the mean, standard deviation (SD), skewness (skew), kurtosis (kurt), α if item deleted (α_{iD}) and the results from the factor analysis (F). The reliabilities of the scales used, were assessed through the Cronbach α coefficient. Overall, the analysis showed that the multi-items reliability was, for all of the variables, between .697 and .885, suggesting that the scales were reliable (Venkatesh et al. 2012). Furthermore, all of the scales had satisfactory standard deviations, skewness and kurtosis (Bollen 1989; Malhotra 1999; Mason 1986). All of the variables had satisfactorily factor loading and loaded on one single factor.

4.1 Performance expectancy

To investigate to what extent the respondents had expectations regarding the outcome of using mobile information platforms, we asked them whether they would find mobile information platforms useful in their job, time saving and potentially increase their productivity. Table 1 below, presents the initial results:

Table 1 Performance expectancy

Performance expectancy (Alpha = .885)	Mean	SD	Skew	Kurt	α_{iD}	F
I would find mobile information platforms useful in my job	5.75	1.455	-.863	-.342	.881	.872
Using mobile information platforms enables me to accomplish tasks more quickly	5.59	1.408	-.695	-.500	.793	.928
Using mobile information platforms increases my productivity	5.30	1.574	-.718	-.119	.833	.907

Table 1 shows the means of the question scores. Overall, we can say that the respondents have high expectations regarding the performance outcomes when using mobile information platforms. This indicates that the respondents see the need for this type of technology in the military, and that use of the technology is useful, time saving and could potentially increase their productivity.

The unstructured group interviews also showed high performance expectancy, and the respondents provided numerous examples of current actual usage and hypothetical usage. Overall, the respondents said that mobile information platforms could contribute to better information sharing, both to collect, retrieve and distribute information. For example, one respondent talked about the advantage related to less paper and more digital information. Some of the potential use-cases also introduced new types of shareable information and proposed new communication patterns: for example, information sharing and coordination between military police and medical personnel before arriving at a scene.

Our data also indicates actual use of services from mobile information platforms in the military today. These also include usage in situations where this technology is not officially supported and the use of this technology is not regarded as proper. Most subjects did provide several hypothetical use cases as they saw

relevant in their work. Often they would make the connection between how they used their smartphone in their daily life and how they found it useful when not working.

4.2 Effort expectancy

The questions regarding effort expectancy were related to whether the respondents considered the use of mobile information platforms free of effort, easy to use, and easy to learn. The table (table 2) below shows the initial results:

Table 2 Effort expectancy

Effort expectancy (Alpha = .697)	Mean	SD	Skew	Kurt	α 1D	F
...Using the mobile information platforms will be free of effort	3.56	1.822	.121	-1.102	.708	.761
... I would find the mobile information platforms easy to use	4.80	1.354	-.354	-.322	.327	.918
... Learning to operate the mobile information platforms is easy for me	5.64	1.167	-.801	.337	.736	.718

The results showed that, overall, the respondents perceived mobile information platforms easy to use (mean: 4.80), and learning to operate the mobile information platforms was easy (mean 5.64). On the other hand, using the mobile information platforms will be free of effort had the lowest mean (3.56), and the respondents did not perceive that the use of mobile information platforms would be free of effort.

These results were supported in the unstructured group interviews. And, in particular, two aspects were mentioned frequently by the respondents. First was the dependency of the networks. Not all locations have sufficient network coverage. Some military operations depend on updated information and reliable networks, and this issue could introduce some extra work. According to the respondents, battery and charging was the second major concern with respect to effort expectancy. Charging the mobile information platforms when needed could be challenging. Being in the field, power for charging is not always easily available and could contribute to the fact that use of mobile information platforms was not free of effort.

4.3 Attitude

To investigate to what extent the respondents had a positive or negative attitude towards the mobile information platforms we asked the respondents questions regarding their attitude. The table (table 3) below presents the initially results:

Table 3 Attitude

Attitude (Alpha = .873)	Mean	SD	Skew	Kurt	α 1D	F
Using mobile information platforms is a good idea	5.95	1.120	-1.129	1.162	.834	.889
I like the idea of using mobile information platforms	5.74	1.190	-.844	-.320	.829	.896
Mobile information platforms makes work more interesting	5.22	1.619	-.777	-.163	.810	.893
Working with mobile information platforms are fun	5.44	1.403	-.792	-.159	.875	.760

Table 3 shows the means of the questions' scores. Overall, we can say that the respondents had a positive attitude towards the use of mobile information platforms. "Using mobile information platforms is a good idea" had, for example, a mean score of 5.95. Furthermore, most of the respondents look forward to working with mobile information platforms (mean: 5.70). The unstructured group interviews also revealed a very positive attitude towards this technology. Often they would relate to, and seemingly build their expectations on positive non-professional experiences with this technology.

4.4 Compatibility

The questions used with this variable were to investigate to what extent the respondents perceived that the use of mobile information platforms was compatible with existing values in their work. The table (table 4) below shows the initial results:

Table 4 Compatibility

Compatibility (Alpha = .803)	Mean	SD	Skew	Kurt	α1D	F
Using mobile information platforms is compatible with all the aspects of my work	3.16	1.741	.250	-1.011	.900	.721
I think that using mobile information platforms fits well with the way I like to work	4.88	1.567	-.572	-.298	.578	.935
Using mobile information platforms fits into my work style	4.93	1.607	-.615	-.319	.689	.891

Table 4 shows that the means of the questions concerning compatibility is lower than for the other variables. For example, using mobile information platforms is compatible with all the aspects of my work had 3.16 as a mean score. This means that the respondents had a positive attitude and perceived learning to operate the mobile information platforms as easy. However, the use of mobile information platforms was not compatible with all the aspects of their work.

Table 5 shows, in detail, how the respondents answered to the question of compatibility with aspects of their work. 52.8 % of the respondents disagreed (from strongly disagree to partly disagree) that using mobile information platforms were compatible with all the aspects.

Table 5 Question: Using mobile information platforms is compatible with all the aspects of my work

Q: Using mobile information platforms is compatible with all the aspects of my work	N	%
Disagree	46	52.8
Neutral	20	23
Agree	20	22.9

The unstructured group interviews revealed more details regarding compatibility. Most participants recognized challenges with this technology not honouring classification schemes for particular sensitive information. A few participants said that this technology is not something they could use in their job, as they only handled classified information. One respondent even referred the technology as being "*useless for my tasks*". Problematic areas were intelligence and information sharing in high risk scenarios, but also sharing information that was sensitive for the persons involved, as with the military police or medical personnel, could be problematic.

Others gave an impression of being much more willing to "bend the rules" to make this technology work for their tasks, as one respondent stated: "*I rather use this technology, than nothing at all*". Further, the respondents talked about concerns regarding classified information, and the fact that with mobile information platforms, the users have less control with the information. One respondent was worried about exposing his location or details of a mission being revealed to adversaries.

With respect to information security, there were two problematic areas. First was the trade-off between honouring the classification schemes and that of completing the mission and being exposed to minimum risk. These are not always in accordance as disclosed information is a risk, but sometimes "information not shared" may also be a risk to mission safety. The other area of concern is the correct classification to assign to a piece of information.

A few respondents expressed concern if one should use this technology and then start to deviate from existing communication patterns. Their main concern where of information and responsibility: in a

hierarchy, when information follows command lines, there is also some responsibility to act on that information. With new, and unpredictable, information flows, responsibilities could be fragmented and less clear. A few participants also pointed to limited ruggedness of the terminals and claiming that regular consumer smartphones and pads were too fragile and would easily break. Further, and as mentioned with the variable effort expectancy, limitations of commercially available networks, and in particular coverage and robustness were seen as problematic and also a compatibility issue.

4.5 Correlation matrix

Since this study is preliminary, we only present a correlation matrix, and not an in-detailed analysis. We wanted to see whether there existed relationships among the variables. Table 6 presents the matrix of correlations among the variables: Performance expectancy, attitude, compatibility and effort expectancy.

Table 6 Correlation matrix

	Performance expectancy	Attitude	Compatibility	Effort expectancy
1. Performance expectancy				
2. Attitude	.631**			
3. Compatibility	.620**	.686**		
4. Effort expectancy	.258*	.349**	.400*	

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed)

The results indicate that performance expectancy is significantly correlated to attitude, compatibility and effort expectancy. We also observe a significant correlation between attitude, compatibility and effort expectancy. All correlations were significant at the 0.01 level, except effort expectancy to performance expectancy and compatibility (significant at the 0.05 level). We want to pinpoint that the correlations do not explain all the relationships between the factors in a study; however, the correlations can be used as a foundation to understand the relationship among the different variables. Further research should use a multiple regression analysis to reveal the direct and indirect effects of the various factors and use control variables, such as age, gender and education.

5 DISCUSSION

Mobile information platforms, like smartphones and pads, are not much utilised in military settings. This technology is rarely recognized officially as technology that the Norwegian Defence uses, but still it is the origin of much enthusiasm amongst military personnel. Mobile information platforms provide a different set of parameters than military decisions makers are normally used to, so we wanted to investigate into performance expectancy of this technology. More precisely we wanted to investigate performance expectancy regarding improved information sharing and whether effort expectancy, attitude and compatibility, as independent variables, affect the potential user's expectation of performance.

To a large extend, our research confirmed the enthusiasm we have seen this technology generate: The respondents had high performance expectations, and they had a positive attitude towards mobile information platforms. Both attitude and performance expectations are described in the literature as determinants for user acceptance (cf. Chen et al. 2011; Davis 1989; Tan et al. 2014; Venkatesh et al. 2003). We interpret this as there being acceptance for this type of technology in the military. The respondents in our study saw the potential of using mobile information platforms in their work, and also supplied numerous potential use-cases during the unstructured group interviews. Among the respondents there is a belief that the use of this type of technology could increase the performance outcome (cf. Venkatesh et al. 2003).

Even though the respondents had high performance expectations to mobile information platforms, there are some areas where the technology's impact is prescribed to be less substantial.

Compatibility to existing tasks is identified in the literature as important aspects of whether a technology is accepted or not (cf. Moore and Benbasat 1991). Our study supports that claim, since the respondents consider certain tasks to be more problematic than others. The respondents gave low scores for compatibility, so given the high performance expectancy and positive attitude this indicates that there might be fundamental compatibility issues. As the results showed, there are multiple problematic areas that may be related to low compatibility: risk perception, the correct classification to be assigned to information, unpredictable information flow, limited ruggedness of smartphones, and reliability and robustness of commercial infrastructure.

The respondents showed very different views on risk taking and perception of risk associated with using this technology. Disclosing sensitive information could put the mission at risk. This is the main reason for honouring the classification schemes. On the other hand, information not shared may also be a risk to mission safety. All types of risk, and indications of such, are important to share to all relevant people, often low in the hierarchy, as quickly as possible. If information needs to be passed up and down in the hierarchy, the ability to take action within appropriate time would decrease. As the results showed, some would want to use mobile information platforms, and particularly if they had no alternative, others would not touch the technology, but both parts would argue with risk and mission safety. So a fundamental question, left for later research, seems to be "What risks does one take by using this technology?"

Another compatibility concern was that of correct classification to assign to a piece of information. This is a well-known dilemma in the military. Mobile information platforms introduce new types of shareable information and makes possible new communication patterns, also between the lower parts of the hierarchy. To some people this new information and hypothetical communication patterns seemed highly problematic; however, most of the respondents showed little or no concern.

At large, security and reliability issues seem to overshadow the possibilities of mobile information platforms, despite the respondents' high expectations and positive attitude. Our study indicates that the technology may be used for some tasks, but not for all. More information about what tasks may or may not be addressed with this technology is needed.

Mobile information platforms do not only consists of smartphones and pads, but also the networks, the services, the knowledge of the people that are using it, and how they are using it (cf. Reitan et al. 2012). The structure of military communication and information sharing is usually tightly coupled to the military organization. Some respondents also pointed to this coupling as a potential compatibility issue. However, a consequence of using mobile information platforms could be more dynamic work processes, not constrained to the hierarchical organization. The information would not only be shared up and down in the hierarchy through mobile information platforms, but also across the structure and existing processes. This means that utilising mobile information platforms most likely would change the work processes. Changing the work processes are complex and the literature has identified several critical success factors to achieve a successful outcome of the change, such as effective communication and change management. (see, for example, Françoise et al. 2009; Grabski et al. 2011).

The results on effort expectancy (cf. Venkatesh et al. 2003) may also be used to shed some additional light on the low compatibility or other problematic areas. Mobile information platforms were said to be both easy to use and easy to learn to operate, so the smartphones and the apps were not seen to be an issue. However, the more general question on effort seemed to be more of an issue, so there may be aspects not related to the smartphones or the apps. These may be issues related to mobile infrastructure, organizational structure or existing processes. We have some vague indications that this may be the case, but this should be researched further.

Persons in the military use smartphones as an integrated part of their daily life, and when we talked to them, they easily found potential military parallel use-cases. However, our initial claim was supported in this study, when we argued that mobile information platforms were ignored as an officially supported technology. In general, when we sample the organizational attitude towards the technology and arrangements of mobile information platforms, we find points as low-security, low-reliability and low-robustness adding up to "irrelevant for most military tasks". However, our study indicates that the use of mobile information platforms in the military will be used in the future, and that the use most likely will increase considerably.

6 CONCLUSION AND SUGGESTIONS FOR FURTHER RESEARCH

Utilising mobile information platforms could be one initiative to achieve a more network based organization with the goal of a flatter structure and more effective information sharing. In the non-military world mobile information platforms has given new ways to communicate, coordinate, and share and manage information. Mobile information platforms could help improve collaboration and information sharing within the military and even between the military and the emergency functions such as police, fire and health. Some of the potential use-cases introduced new types of shareable information and proposed new communication patterns, for example information sharing and coordination between military police and medical personnel before arriving at a scene.

The discussion above revealed that an introduction of mobile information platforms to military settings is likely to challenge existing work processes. Perhaps mobile information platforms in the military are a disruptive technology, even though mobile information platforms are a part of the daily life? Mainly, disruptive technologies are seen from managers as unattractive, and the managers typically conclude that the new technology are not meaningful for improving the organizational effectiveness, and therefore, are not worth the effort (Bower and Christensen 1995). Several examples of technologies that were disruptive and become valuable exist, such as the Internet. Another example is Apple, that was unsuccessful when they started up, however, Apple learned by experience and Apple used information from a group of customers regarding what they wanted and did not want, and changed to a successful technology (Bower and Christensen 1995).

Research on mobile information platforms in the military domain is important. Our study revealed that the respondents had high expectations to mobile information platforms regarding improved information sharing through more relevant and timely information. On the other hand, this study reveals that security and reliability issues, and existing work processes is not in accordance with the characteristics of mobile information platforms. However, mobile information platforms are, to some degree, already in use in the military. A question is whether mobile information platforms, in some years, are an inevitable part of most processes, and therefore more emphasize on the concept is needed in order to attain all the effects.

This study is a preliminary study, and more in depth knowledge are required in order to understand the phenomenon. Our study is limited, although the data is collected in 2013 and 2014, there is a need for longitudinal studies to increase the in-depth knowledge.

Like any study there are limitations, especially with concerns to our use of a cross-sectional survey data. The theoretical arguments for our model provide support for the existence of causal relationships among constructs. Our preliminary analysis provided support for significant correlation among the concepts. However, conclusive statements about causality in survey research cannot be made since alternative explanations cannot be ruled out. Longitudinal design is the approach that should be employed to settle the issue. Further, control variables such as age, gender, experience and military degree should be included in the study. Furthermore, in our sample, we have respondents who are involved in both high risk activities and low risk activities. Future research should emphasize differences among groups. For example, our interview data showed that people with experience from intelligence were more reluctant than those who did not. Therefore, future research has to emphasize on different needs in the different user groups.

It may also be useful to test more specific elements of mobile information platforms, for example a relevant mobile app, during a military exercise in order to map potential acceptance and intention to use. Finally, there are several variables that are worth studying in addition to the ones that were part of this study. These include variables such as perceived usefulness, perceived ease of use, facilitation conditions and social conditions as suggested by Venkatesh et al. (2003).

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