FACILITATORS AND OBSTACLES IN THE INTRODUCTION AND USE OF TECHNOLOGY: SIMULATION AND SERIOUS GAMES AS SUPPORT IN FIREFIGHTER TRAINING

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ABSTRACT

This paper investigates reasons why new, promising and procured technologies designed to support training and learning are not being used. The aim is to identify missing information and knowledge gaps during the technology introduction phase that may impede proper use, and allow the promised benefits to materialize. The technologies examined are simulation and serious games (SSG), developed to support education and training for organizations involved in emergency service provision. The focus is on the training of firefighters.

Based on state-of-the-art knowledge from research into advances and the potential of SSGs, hypotheses dealing with obstacles in the user organizations were adduced in relation to knowledge management and as part of technology procurement and acceptance. The hypotheses contributed to constructing semi-structured interviews and interviewing the main stakeholders that influence SSG development and use: researchers, developers and educators and managers at user organizations. Data comes from thirty-two interviews from six European countries and are complemented by observations from practical educational elements and informal conversations with instructors. The analysis synthesizes the data collected and presents future directions.

After procuring technologies, the introduction phase is critical for successful acceptance of technology. Successful introduction is not articulated and is context dependent. Common agreements regarding the benefits of what a technology promises overshadow potential problems regarding how the introduction can be accomplished. While the results confirm the possible benefits of SSGs, they also highlight an urgent need for new methods to systematically integrate these new technologies into organizational practices, not only in educational plans or training but also aligned to strategies and processes at the user organizations.
INTRODUCTION

The use of simulations, serious games and gamification (SSG) is increasing in learning and education (Crookall, 2015). New and more intuitively supportive technologies promise a number of benefits for many organizations involved in emergency training and education. These organizations need to handle larger and more complex emergencies and they face a paradigm shift from being closed towards being more open. They also need to act in a larger, collaborative arena (Andersson et al., 2014). This is true for the main bodies responsible for public safety – the police, ambulance service and fire service – but also for other organizations that handle crises, i.e. the military, the coast guard, county management authorities and organizations responsible for the infrastructure. While more innovative technologies emerge and promise better support in everyday tasks as well as training and education, the benefits experienced do not necessarily meet earlier promises. It is difficult to argue for the effectiveness, because of limited or poor usage, or more general, because the lack of empirical evidences (Girard, Ecalle, & Magnan, 2013). Studies comparing the benefits of SSG based training with conventional training situations are also missing (Farrington 2011).

Promises from SSGs to support everyday tasks are, in the first instance robust and more entertaining collaboration. SSGs offer easier access to information and increased potential to be linked to other experts and databases in any location and at any time (Alklind Taylor, 2014; Roberts et al., 2006). Promises for better education and training include access to more naturalistic training situations, the potential to train under safer conditions, distributed training and learning, the possibility of training in groups, and the provision of evidence for debriefing and evaluations (see e.g. Gorard et al., 2013). Simulators, such as vehicle simulators, scenario simulators or patient simulators, can contribute to more naturalistic training and greater user experience. Serious games and gamifications contribute to technology or interface improvements with elements from games or game technologies. These are, for examples: more intuitive, easier, or more rapid updates, which are at the same rate that game technologies are evolving (Heldal, 2007). There are also new applications that offer logging to support repetition and analysis of situations, together with evidence needed for debriefing and learning and the possibility of learning from mistakes, which cannot be done in real-life settings (Ferracani et al., 2015). During the last decade, the cost of SSG applications and technologies has decreased and they have become more accessible (Lateef, 2010).

In Sweden, the Swedish Civil Contingency Agency (MSB) is responsible for the training of firefighters. It makes significant investments to keep pace with technological development. However, its experience regarding the promised benefits is lacking as the SSG technologies are generally not used or are underused by the Agency (Toftedahl, Hoffman Jenny, & Björk, 2012) except often smaller, applications at specific organizations. These applications often have clear and limited purposes for certain specific training situations (as an example at Attunda (Granlund, Granlund, & Dahlbäck, 2012)). There are countries, such as Estonia or the UK, and areas in emergency management, such as training at ports (Jansen, 2014), by the military (Smith, 2010) or in education (Miller et al., 2011), driving (Deniaud et al., 2015) and so on, where there is
clear evidence that SSG has been shown to contribute added value. However, SSG non-use is not a unique phenomenon and the potential of SSG technologies in general is still underutilized (Crookall, 2015).

The aim of this paper is to identify missing information and knowledge gaps during the technology introduction phase that may impede future use. The examined technologies are SSGs that have been developed to support education and training in emergency service organizations, especially for firefighters. Since there are several possible reasons why the new, promised and already procured technologies designed to support teaching and learning are not being used, this study started with a literature study. To investigate the tension between SSG use and non-use in practice and at research laboratories, the following hypotheses were adduced:

A) Reasons for procuring technologies do not explicitly consider resources needed for technology introduction.
B) Resources for technology introduction depend on digital competence at the organizations.
C) Long-term benefits of SSGs require harmonization to SSG technology development and organizational settings.

Semi-structured interviews were constructed based on the above hypotheses and collected data from expert a) researchers, b) developers, c) managers responsible for procurement at potential user organisations and d) managers and teachers responsible for training and education. To the authors’ knowledge, no earlier studies have investigated the circumstances surrounding SSG implementation and use in emergency management. An overall plan for ongoing technology introduction can be important for many other organizations and training categories.

BACKGROUND

To examine reasons for non-use of promising technologies, this section provides a short overview of definitions of SSGs, describes theoretical approaches to handling and managing technologies in organizations, especially after procurement and with a focus on introduction and acceptance, and discusses advances in SSGs for education and training.

The terminology used in SSG comes from numerous disciplines and different definitions are used for the same concepts. Ambiguity may also result from translation or using the English name in Swedish. Simulators have been around for a long time and present environments where objects are rendered using computer graphics, such as aviation simulation, involving instruments in complex airplane cockpits to train pilots, and car simulators used to teach people how to drive. Patient simulators are used to train nurses and doctors how to treat patients and allow them to learn in safer conditions. Simulation usually follows a real-world process over a period of time. The difference between a simulator and a virtual reality environment is that simulators use more physical, real-life objects, while in virtual environments both the environment and the objects are graphical presentations (Heldal, 2010). Serious games can be defined as
the “application of gaming technology, process, and design to solve problems faced by businesses and other organizations. Serious games promote the transfer and cross-fertilization of game development knowledge and techniques in traditionally non-game markets such as training, product design, sales, marketing, etc.” (Susi, Johannesson, & Backlund, 2007). If elements from games are used to improve the already existing applications, this is referred to as gamification. Game-based training, game-based simulation, means working with Serious Games or applications designed using gamification in order to obtain better quality, more enjoyment and greater effectiveness and presence when working with applications for work purposes. This work uses the abbreviation SSG to cover all these technologies and applications.

SSGs in Organizations: From Non-use to Technology Introduction

Several research areas are investigating the use of new, innovative technologies in organizations. Use and possible benefits are more investigated than not use. Many motivations for non-use originate from fear of waste associated with technologies that begin with a fear of losing a strategically important position regarding procurement or non-procurement (Adner & Snow, 2010), and continues with problems determining resources needed for it (Heldal & Suneson, 2011). The non-use or nominal use can motivate research dealing with use that can always lead to more usable technologies or work routines. It is difficult to determine clear reasons for non-use or the right moment when a non-user become a potential user. For introducing new technologies only 2.5% are innovators and 13.5% early adopters (Rogers & Rogers, 2003). The innovators are not necessarily working at the same organisations as early adopters and they are not necessarily users. The managers responsible for procuring or introducing a new technology are responsible for planned and desired changes (DeSanctis & Courtney, 1983) and may not be familiar with innovations technology use.

One of the most influential models that explain technology adaptations is the technology acceptance model (TAM) developed back in 1989 by Davies (1989). He developed the model by focusing on the importance of understanding and differentiating and measuring the meaning behind the two concepts – the objective usefulness and the more subjective perceived ease of use. There are papers discussing its reliability and impact (e.g. the earlier mentioned Hess et al., 2014) and summary papers examining its applicability (Chang, Chou, & Yang, 2010) or relevance (Mihailescu et al., 2013). Many questions the usability of TAM generally, such as lack of knowledge about the motivational factors, intentions for use or even considering the thoughts about intentions and motivations for non-use, e.g. (Hess et al., 2014). TAM is important for this work since it differentiates two important phases, defined in one of the latest models based on TAM: the preimplementation and the postimplementation phases (Venkatesh & Bala, 2008).

Non-use after procurement is an indication of problems with preimplementation and this phase is therefore important for this research. Examining this phase may highlight initial attitudes and beliefs that influence actual routines and habits and a willingness to tackle changes that are needed in relation to technology use (Venkatesh & Bala, 2008).
Discussing these properties with users and non-users may highlight motivational factors why SSG is not procured or implemented. By the not users we mean potential beneficiaries identified by important stakeholders from the area.

SSGs Supporting Education and Training: Practical Benefits

The goals for training and education usually aim to build up knowledge and obtain skills that deliver the right help at the right time at the right place. This requires continuous updates and improvements to facilitate the handling of new situations and settings (Girard et al., 2013). Since emergency situations are changing, professionals need to update their knowledge and skills and check and demonstrate their abilities via evidence under safer conditions. Emergency handling often involves collaboration, but there is not enough training often due to numerous associated coordination problems. Research and practical studies point towards a need to develop better education support that focuses on, for example, extending collaborative settings for training between different professionals or professionals and citizens (Chittaro & Sioni, 2015). Building believable training situations can also make collaborative training easier supporting technologies.

As was stated earlier, many areas, users and even organizations recognized the benefits of SSG applications after using it for remote training. Benefits included a higher degree of safety, the fact that it is environmentally friendly and it is possible to experience complex situations by handling difficult, rare or overly expensive (Girard et al., 2013) elements. Examples from development laboratories and concrete use situations for training and education include accident rescue training that would not be impossible otherwise – in harbours, tunnels, crowded or unsafe spaces etc. Logging and repeating real-life events and training certain elements provides data and evidence for debriefing and learning (Crookall, 2015). Replacing just small activities with game elements, such as challenges, surprises or shocks, in the different simulations in a common scenario can prevent people from becoming bored or tired and help to raise the level of involvement, generate more attention and improve learning (Backlund et al., 2013). The possibility of using the SSG for distance training is particularly attractive for many Scandinavian organizations due the large number of rural locations.

Several studies examining the role of SSGs for training and learning highlight the importance of instructors (e.g. Bennerstedt, 2013). A current summary of the instructors' and learners' role in influencing training and learning can be read in Alklind Taylor (2014). She considers the key role of the instructor, a role that should be examined already when designing new SSG technologies and applications. Another study acknowledging the role of instructors for broader, experimental learning is Kolb and her colleagues (2014). They organized the roles into ‘the Experimental Learning Cycle’, with recurring learning activities going through four states: Active Experimentation, Concrete Experience, Reflective Observation and Abstract Conceptualization. These are phases students can follow but also have the option to switch between depending on their own learning style needed to be considered by the instructors.
There are a number of issues important for effective learning in emergency management. Main issues are, for examples, determining the contribution to theory development from evidences and vice versa, debriefing (Crookall, 2015), identifying procedural support by instructors and technologies (Backlund et al., 2013; Ferracani et al., 2015), clarifying the role of instructors depending on training situations (Alklind Taylor, 2014), teacher-learner relations (Frank, 2007), or between individual firefighters (Williams-Bell et al., 2015). Professional learning requirements, corresponding to achieved competence and development, need to be defined. Lester (2014) presents a review of a number of such public protection requirements and describes the development of a framework that includes elements required to validate skills at different levels.

**Practical Motivations**

In the beginning of this century MSB implemented, successfully, several ICT technology solutions, from diverse e-learning platform to tailored digital radio communication which can be used in emergency situations. Based on experiences from these implementations they decided to use SSGs for better supporting firefighter education. 2011, an internal project was initiated with the aim of developing a proposal for a three-year action plan for introducing educational ICT tools with a focus on SSGs at the Agency. The project report stressed the importance of introducing SSGs, highlighting several reasons, such as quality, safety, environment, economy and flexibility, but also training of individuals and groups at the system level. This internal report was conducted parallel to an external report by a research institute which described examples of successful development projects using SSGs ending with two recommendations for MSB: to adopt a holistic approach and control for centrally managed activities, and to plan flexible learning focusing on aspects such as geography, time, content, pedagogy and technology (Toftedahl et al., 2012). These reports probably contributed to procuring SSG technologies, but they are, still not in use. In the light of new innovations, three or four years of technology development is a long time for only waiting to figure out what to do with the technologies.

**RESEARCH CONTEXT AND METHODOLOGY**

Based on experiences of non-use of SSGs by authorities and initial knowledge from literature and practice, certain hypotheses regarding the impediments to use were deduced. These hypotheses focus on obstacles identified after technology procurement and prior to technology acceptance regarding required resources (A), digital competence (B) and recognizing long-term benefits (C) presented earlier.

The interviews were constructed around eight open-ended questions regarding information on the SSG’s potential, use, support for training and education, experienced benefits within the participant's expert area, risks of use, resources and conditions needed for success, requirements for transmitting a pedagogical view, and expectations and opinions regarding future use. Each interview lasted from 45 minutes to two hours.
It took place at the interviewee’s own organization or via Skype during the period September 2014 – February 2015.

The interviewed groups were: researchers, developers and educators and managers from user organizations from six countries: Sweden, UK, Estonia, Denmark, the Netherlands and Norway and complemented with observations of practical educational elements from MSB and illustrative quotes are presented below.

To pick up on reasons and exemplify consequences for non-use, this article aimed to identify examples that illustrate how users who experience efficient use identify the concrete benefits after procuring the technologies with a focus on their experiences of stipulating, delaying or preventing use at users and non-users. While the focus was on using SSG for firefighter training and education, the use of SSG was examined from a broader context of user organizations responsible for important emergency functions or emergency management in the different countries.

The role of the researchers was to complement the author’s quick literature study and to ensure the quality of findings regarding state-of-the-art research applications under development and use in the area. Researchers and participants from MSB suggested interviews with developers from a number of organizations they know about or they had contact with. Developers were from Saab Security Defense AB, Esemble, VSTEP, Serious Games Interactive, and Digital Combustion. Their role is important for understanding market and visions for future development. For this study they also contributed by suggesting users who could be interviewed.

For emergency functions and emergency management, the regulatory perspective is important in terms of bearing the responsibility for training and education. MSB has such responsibility for the Swedish rescue services (Regulation 2008: 1002). User organizations with responsibilities similar to MSB interviewed were: Directorate for Civil Protection (Norway), the Emergency Services College (Finland), the Swedish Civil Contingencies Agency and the Police Academy at Umeå University. Sometimes the references suggested that a new, more experienced employee be interviewed. Within MSB, the following managers were contacted: the leader for effective emergency response, the person responsible for the management and cooperation project, the responsible for procuring technologies, managers responsible for implementing training and education activities. The study attempted to identify those educators who are responsible and manage new technology needs. Within this group there are a variety of affiliations and responsibilities, here the common term ‘instructor’ is used.

FROM RESEARCH TO PRACTICE

Reasons for Procurement and Resources Allocated for Technology Introduction

The main benefits of using SSGs were recognized by almost all the interviewees, even if certain groups were not familiar with SSG definitions. Managers and teachers from user organizations were not always aware of differences between SSG or e-learning.
While the interviews acknowledged the need for more training and self-training for learners, many learners also felt that they needed more instruction regarding training and education. For part-time firefighters in rural areas in Sweden in particular, the opportunity to train from home alone or following sections of the training on a distance learning basis would be essential. Even if the participants come to campus meetings there is little time to do what needs to be done. More training would be needed."

(U7) A teacher expressed a wish to play together in "multiplayer" settings, with and without a teacher present.

Interviewing users from different countries led to the observation that cost has different meanings for different organizations. The cost of simulation-based training phases at some places are compared to live training (Estonia, Cheshire in the UK, Port of Rotterdam) while in Sweden, for example, the cost also includes travelling costs from faraway places to one of the two training locations in Sweden, with additional costs for part-time learners. Accordingly, being cost effective means something else for the Cheshire Fire and Rescue Service, which in 2013 had 700 occasions for training and assessment with the help of a virtual platform. If compared with the cost of these training sessions live, this number represents a saving of several million pounds. The Oxfordshire Fire and Rescue Service trained all its 200 truck leaders (60% are part time employees) at least every second year, and 25 managers in hazardous substances on various training levels and in various scenarios. Cost effectiveness in Scandinavia, however, means much fewer ‘savings’ due the smaller number of people involved in the training situations.

Even if there are many training situations at the training centre in the UK, resources for training can be problematic, which also influences developers:

“Budget is the largest concern for Fire Rescue training today. In a troubled economy, many cities and states reduce budget to Fire Rescue making it difficult to get the right equipment needed for training. Fortunately, our software is also helpful in this regard because live training is often more expensive, especially when compared over the long term to what simulation-based training can provide. Additionally, mobile training is becoming more important as it allows a single person or unit to train several departments or station personnel, instead of each unit training on their own.” (UTV4)

Similar comments on tight resources allocated for developing serious games is described by a developer from Denmark.

In this part we illustrated that reasons for procuring technologies do not take into account resources required for technology introduction.

**Introduction Depends on Digital Competence**

The interviews acknowledged the need for a more coherent technology that not only supports training and learning but also different levels of competence development based on given situations (Lester, 2014) and taking into account the instructors'
competence. The role of the instructors is also important for the introduction of technology, since aligning goals for overall objectives differs from aligning goals for "daily" use (Alklind-Taylor, 2014). Especially for the latter, the instructor may require additional technical support. Furthermore, teachers need to receive continuous information about the person responsible for gathering information, for current updates and for accessing new opportunities.

There are too many different technologies available at the different organizations. At the MSB one can find, for example, XVR, RescueSim, FireStudio, Vector Command and several smaller SSGs. Too many and too different technologies can result in confusion. When interviewing participants from nursing and prehospital education from Norway, for example, they expressed worries about handling too many different technologies or versions of technologies. Accordingly, their opinion on utilizing many technologies can take up more time and resources and can cause communication problems internally between the instructors. They believe that instructors needed to help each other out, and have roughly the same skills in managing technologies, and SSGs should not be too diverse to be leaned easier and also technologies from different vendors should be avoided. Earlier experiences on potential problems and errors entail risks that service technicians from several vendors need to be on site and cooperate, which can result in unnecessary delays. This information differs from manufacturers who claim the importance of acquiring various types of simulation solutions, for various functions.

There are some worries regarding 'games', such as. According to an instructor:

"Games and learning do not usually belong together. Maybe it's a generational issue. From my perspective I may have a hard time to convince some people to use it ..."(U7)

There were a few instructors with limited or no practical experience who expressed their fear of using SSGs. They considered games to be too complicated and too costly. They do not consider scenario development as a job for instructors (with XVR), since changing or further development of scenarios already takes too long time. Another instructor felt there was the risk of having untrained instructor colleagues and learners and their unwillingness to adopt new technologies:

[The scenario is...] "Lifelike, but also not. It can easily be used in the wrong way. If you do not have knowledge about how it works, there is a risk that they will reject it after testing it a little. Not having a trained instructor is a risk. But there are risks in all educational situations ... a risk that you are careless or do not have a plan. Approach things carefully and assess what is appropriate."(U6)

One person from the group of user organizations expresses a fear of building up a false sense of security by using SSGs:

[I can imagine there are...] "...possibly false security experiences based on simulations. Like training chemical spills. There is a risk that the learner does not really appreciate the seriousness when later he is standing there in a real-life situation."(M1)
Five of 16 trainers in the study believed that the greatest risk occurs when the teacher is not sufficiently trained to master the technology or the scenario training and assessment.

Cadets from the National Defence University studied use of commercial entertainment games in education (Frank, 2014). His findings show a phenomenon, as the author chooses to use the term *gamer mode* that needs to be considered by instructors for planning training and debriefing. This resulted in some students playing the game to win and they no longer maintained the same professional attitude to the game as they would in a real training session. The author defines *gamer mode* as a conscious attitude of the player to accept and not question the game rules and objectives and not accept the educational goals. Also this, and the whole part illustrates the SSG introduction depends on the digital competence of the instructors a competence not necessarily built up at the organizations.

**Long-term Planning**

To continuously develop illustrative examples for training while also receiving technical updates needed to be taken in consideration. One of the interviewees from a user organization in Estonia recognized the added value of SSGs and he has used it for the past four years with benefits in both training and assessment. He describes the risks that instructors can face. They are not necessarily good enough in their role and they are aware of this in subsequent updates and training. To provide training situations with increased user experiences requires the instructor to provide good counter play and present appropriate consequences for decisions and actions. He illustrated a few negative aspects of not working with professionals from the various areas.

“One, for example is that if you do not have a good team of instructors the games do not work together. They [the instructors] need to be very competent in their professions and know the learning methods and technologies. The wrong approach sticks in a student’s mind very easily. The development of those products is resource-intensive.” (U14)

Many instructors mention that learners do not accept new forms of training:

“Some people may be sceptical about simulation or use it as an excuse if they fail to pass an assessment. Frequently the term “I would have done this in the real world” is heard from candidates by our instructors. However, we are four years into using virtual training and candidates should be used to our organization’s training and assessment methods.” (U10)

As mentioned earlier, some of the respondents were not aware of the possibilities of SSG. These technologies are often treated as e-learning technologies. Since e-learning technologies are used by almost all organizations and the added value of SSGs is not known, there is an unwillingness to change to something that is unclear. This is an opinion described in Sweden, Estonia and Denmark.
TECHNOLOGY INTRODUCTION

Experiencing benefits of technologies often depends on the costs and resources needed to be invested in technologies. Introducing technologies in organizations is usually done in three steps, requires three different allocations of resources: for procurement, for integration, and not just for acceptance, but also for use and updates that may follow.

The resources required for integration or even handling the updates after the acceptance phase are often neglected. In general, using new technologies requires new competences on the technologies at organizations (Heldal & Suneson, 2011) or understanding issues about the technologies in society (Bennerstedt, 2013). Therefore, one of the interview questions was about the necessary competence and resources needed, not only to procure, but also to use the technology at organizations. As the interview responses indicated, the resources required for technology integration and updating are not necessarily clear during procurement. As the responders at several authorities indicated procurements are often set equal with ability, possibility to use. At some organizations (e.g. at the authorities in Estonia, UK) this equation was clear. These organizations had allocated resources, included fire souls engaged in following SSG development and use and also research. Research interests were considered to be important, but not enough if resources were not allocated (e.g. at developer company in Denmark and in Sweden).

While the stakeholders involved are usually in agreement on the main benefits promised, it is not necessarily clear how they should begin to use them. To adjust technologies to everyday goals is a process, and its success depends not only on technologies but also on aligning it to everyday organizational goals (Bennerstedt, 2013). Managers responsible for the procurement do not necessarily see and invest resources in this implementation from the outset (Hammar Wijkmark & Heldal, 2015), but support in terms of resources is necessary, a project can fail when it is missing (Farrington, 2011) or have experiences as success if considered as a process with a resource allocation plan in time (Heldal et al., 2015). Many instructors who will use the new technology may have at the time a full schedule and not enough time or the mandate to do activities necessary to learn how to familiarize themselves with the new technology. In general, the answers indicate that only a few introductory courses are not enough, as the vendors cannot possibly be familiar with everyday goals at user organizations. To learn technologies may also need a change in daily routines or prioritization of activities. If an instructor has only a very limited amount of time, this may affect the ability to see technical advantages or ways to assess settings or plan debriefing. Sometime, the authorities realize the need for new technology competence and technology responsibility at the organizations and hire new expertise, which also means recognizing the need for resource allocation for longer time (as it was shown during the interviews with involved professionals in Norway, Estonia and some police departments in Skåne in Sweden). Higher SSG competence can be achieved by collaboration with research groups (Heldal et al., 2015).
DISCUSSION

The interviews from this study demonstrated that when using technologies, account needs to be taken of work routines, which in turn comes about through the new possibilities offered by a new technology.

New SSGs influence structures that support training and education, which may in turn lead to developing newer structures. While changes take time, and there is not enough time to consider a change at an occasion that happens and bring benefits. Handling continuous changes need to be taken into consideration. An example that illustrate this phenomenon for technologies, in general is using the adaptive structuration theory (AST) suggested by DeSanctis and Poole (1994). Accordingly, current development can be considered as a change process for the types of structures that are provided by advanced technologies, and the structures that actually emerge in human action as people interact with these technologies. While the second approach is studies and explained by literature and practice explanations and experiences are hard to connect and generalize for both perspectives. Considering the preimplementation phase Venkatesh and Bala (2008) described the design characteristics, user participation, management support and incentive alignment are enhanced to be important. While research and SSG user organizations acknowledge the importance of all four interventions, these interventions are not enough to begin to use SSGs. Additionally, researchers enhance the role of instructors influencing design and users’ participation (the trainees’ participation). The responders from user and possible user organizations enhance the need for continuous support for SSG from management. This means not only resource allocations for learning, using and continuously updating the technologies, but also defining supportive processes for it at the organization. Since instructors and procuring managers are often different individuals, their role in relation to handling the SSGs needs to be clarified.

The study reveals a somewhat hesitant attitude towards integrating SSGs into firefighter training, even if their use as independent elements is often recognised in Sweden. Many of these independent elements are smaller applications, often available for free or at low cost, and support specific components in the training programme. Procurement and use are often initiated privately as a result of personal interest among the managers or teachers responsible for finding new methods and tools. Informally, the benefits of these applications to learning and the transfer of knowledge to other situations are known. The responses indicate how a number of organisations abroad, including Estonia, the Netherlands, Norway and the UK, could integrate and use SSGs in their everyday training and experience the benefits. The perceived benefits are considerable and are based almost exclusively on recognising the value of considering and explicitly supporting resources for the introduction of technology. The introduction was grounded on formulating concrete improvement needs or the impossibility of training in other ways, together with having the requisite resources. The Estonian Academy of Security Sciences recognised the value of SSGs, it had the motivation and need to build up an academic programme for emergency management and it was supported through EU funding. The Port of Rotterdam in the Netherlands needed to train large groups in the
light of the impossibility of setting up live training at a huge port that could never be shut down.

The answers from the practitioners acknowledged the value of organisational support, funding, time and understanding technologies in an organisational context as key elements for successful introduction and use. This also implies being able to define goals and procedures to procure, implement, adjust and use more complex SSGs in a multi-step process. Procurement is not enough; beneficial use requires these steps to be handled and continuous involvement by different players. While the study shows examples and conditions for successful use, it must be recognised that most of the successful use examples involved specific players and not several players from public safety agencies. Furthermore, they covered regions but not whole countries, and they were incorporated into selected training elements but not into complete certified or formal education plans (except for the example from the Estonian Academy of Security Sciences). However, opting not to use SSGs and waiting until a perfect suitable technology appears for the organization is not realistic. Organizations must begin to use potentially less perfect solutions in order to move ahead with international development and be able to adopt and rapidly make use of increasingly better solutions.

One of our findings, and perhaps the most important, is completing earlier studies (Aklind-Taylor, 2014; Frank, 2014) acknowledging the teachers' responsibilities for the introduction to and the use of the SSGs, their role in procuring information and the requisite support from organisational management. They have a key role in describing requirements and access to higher technical skills within the organisation, not only to formulate learning goals but also for ensuring the quality of debriefing and evaluations (Crookall, 2015). Technical competence is vital due to the need for continuous monitoring of available technologies and updates, and at the current stage this is a role that is missing at MSB and many other organisations. In order to achieve long-term benefits of SSGs the introduction and use of it needs to be treated as a process and harmonized with technology development and the organizational setting.

CONCLUSIONS

SSG is not a solution, a "magic bullet" which per se contributes to learning after procurement. In the majority of research papers, it is the lessons that indicate the importance of understanding that the result of serious gaming depends on the educational approach that forms the setting for the game and the actual gaming process. Information on the successful introduction of technologies differs between the different stakeholders. Common agreements regarding the benefits of what a technology promises overshadow possible problems related to how implementation can be accomplished and how successful use can be achieved at user organizations. While the results confirm the possible benefits of simulation and serious games, they also enhance an urgent need for new methods to systematically integrate these new technologies, not only in educational plans or training, but also in aligning them to strategies and processes at user organizations. Formulating clear requirements with supportive routines and tactics is needed, especially in the introductory phases. To
handle new technologies and their updates, continuous monitoring of changes needs to be considered. This imposes new demands on the educators’ digital competence and additional support is needed from the decision-makers and leaders. To handle technology introduction as a process and not as a step at user organizations may resolve unconscious lockups and barriers to development and may impede up-to-date training and learning.

Further investigation into linking technology introduction to digital competence in an organizational context is needed. Earlier studies call for illustrative examples of non-use and problematic introduction, especially with regard to promising technologies.

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