

INTEGRATING BLENDED-LEARNING FOR HEALTH INFORMATION SYSTEMS TRAINING IN DEVELOPING COUNTRIES: TOWARDS A CONCEPTUAL FRAMEWORK

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Abstract: As health information systems(HIS) rapidly gain ground and expand its presence in even developing countries, keeping up with the demand for its training is a deepening challenge. While on-site face-to-face training has become the tradition for providing such training, rising cost, resource constrains and issues related to pedagogy hampers large-scale training in terms of adequacy, quality and relevance. In this backdrop, ‘blended-learning’ making use of ‘online’ and ‘face-to-face’ learning modes have been suggested as a potential remedy. In light of this, by making use of the theory of community of practice and the concept of ‘immutable mobiles’, the paper proposes a conceptual framework for utilizing blended-learning for providing HIS training in developing countries. The proposed framework was then evaluated using two instances of HIS training in developing countries, which made use of blended-learning. Based on the analysis, it was concluded that by adhering to the proposed conceptual framework, it is possible to improve participation, collaboration building, knowledge sharing and linking practice with learning throughout the blended-learning program. It was also concluded that future research should be directed in a more long term analysis of the HIS users’ community of practice and how learning through blended mode enabled its practices.

Keywords: Community of Practice, Blended learning, Online learning, immutable mobiles, participation, developing countries, health information systems, DHIS, HIS training

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1. INTRODUCTION

Training and education has been recognized as one of the most important aspects of Health Information Systems (HIS) implementation, as it can determine the success or the failure of such HISs (Hayrinen et al 2004 as cited in Lemmetty et al 2006). However, the progress had been slow in implementing HISs as well as in providing training for its users simply because of the magnitude of the training challenge (Brittain et al 2008).

The Health Information Systems Program (HISP) has been involved in developing and implementing Health Information Systems (HIS) in various countries over the last 15 years. A key component of this effort has been to provide training and support to users of the District Health Information Software (DHIS). At present, the DHIS academy, which was established by the HISP to provide training for DHIS users and implementers, conduct three workshops each year in West Africa, East Africa and South Asia. The workshops had been running for 10 consecutive days. On average, each workshop caters to around 50 to 60 participants, which includes implementers, super users and health data managers. Resource persons from the University of Oslo and HISP network also participate in these workshops in addition to the local resource people. Thus, the cost of conducting such workshops regularly has become a financial burden while the demand for such training is on the rise. Furthermore, the local DHIS implementers organize their own training programs aimed at the field level staff based on the needs of their setting. However, there are concerns in relation to the quality of such training and the wasted efforts in duplicating the learning material, which are already available within the HISP network. Thus, in its present form, the DHIS-training needs to address the issues pertaining to coverage, demand, quality standards, duplication of learning material, and the cost.

1.1. Developing a blended-learning program for HIS-training

In view of the growing challenges related to training DHIS users, the DHIS academy developed a 'blended-learning' program. 'Blended-learning' can be defined using many different perspectives. While some argue it to be a 'combination of instructional modalities (e.g. audio, video, text...etc)' (Bersin & Associates 2003), others see it as a 'combination of instructional methods (e.g. constructivist, behaviorist, cognitivist)' (Driscoll, 2002). However, as pointed out by Bonk and Graham (2004), such definitions may encompass almost all the learning systems presently in existence. Thus, for the purpose of this study, we took the viewpoint that 'blended-learning is a combination of face-to-face and online (distance) learning in view of achieving a common learning goal (Rooney 2003, Young, 2002, Garrison 2004).

The online learning component of the blended-learning program was based on the 'Moodle' Learning Management System (LMS). The platform allows the users to login using their own username and password and proceed through to an enrolled course. The courses were arranged in a way where it lasts for a designated period of time during which the participants need to complete the assigned tasks and achieve the designated 'learning objectives'. The tasks would include reading text extracts, watching demonstration videos, going through quizzes and participating in online discussion forums. The DHIS academy moderated the activities in the LMS and intervened appropriately to moderate the discussions and to provide necessary instructions to its users whenever necessary.

1.2. The challenge of implementing blended-learning for HIS-training in developing countries

However, when implementing blended-learning initiatives, it was evident that unless the participants make use of both the online and face-to-face training and participate actively in the learning process, the training may fail to achieve its intended goals. This also epitomizes the need to adapt a learning approach that would link learning with actual practices pertaining to a given context. This notion is also supported by the fact that information systems (IS) users being considered ‘social actors’ instead of just ‘users’ for reasons that they [the IS users] not only use ICTs but also work with multiple applications pertaining to various roles and in various social contexts (Lamb et al 2003). At the same time, the failure to take into account the healthcare culture, concentrating more on ‘how’ the HIS works instead of ‘why’ it should be used, and delaying the training during HIS implementations, are also recognized as reasons for failure of such interventions (Littlejohns et al 2003). Given the complexities associated with HIS’s-training in developing countries, we felt the need to theorize the processes associated with learning in HIS settings. Such an understanding would allow us to provide the HIS-trainers with a conceptual framework that can be used when adapting blended learning to provide HIS-training. This paper will therefore work towards a conceptual framework, which will be discussed later in relation to two instances of HIS training that made use of the blended learning approach.

2. ORGANIZATION OF THIS PAPER

In the next section, we will state the aim of this study. We will then discuss the theoretical viewpoints in relation to the learning that take place within a HIS context similar to that of DHIS use, aided by the theories of Community of Practice (CoP) (Wenger 1998) and by the concept of ‘immutable mobiles’ (Latour 1987). We will then utilize these concepts as lenses to visualize the DHIS learning network. Informed through the theoretical perspectives, the development of a conceptual framework will follow. Thereafter, two HIS-training instances will be discussed using the developed conceptual framework. The paper will conclude by stating its contributions and by stating a potential future direction for HIS training research.

3. AIMS

The aim of undertaking this study is to conceptualize how online learning, face-to-face learning and work practices can be integrated in a blended learning program aimed at HIS-training in developing countries.

4. THEORY AND RELATED RESEARCH

4.1. The community of practice

As described by Wenger, communities of practice (CoP) describes group learning instances which are evolutionary in nature and are formed out of the necessity to accomplish a task and provide the group members with learning avenues (Wenger 1998). These COPs would be having members of which some are central to its activities while some perform a ‘peripheral’ function. However, the establishment of a CoP is dependent upon three characteristics and these are the domain (the shared interest), the community, and the shared practices (Wenger 1998). In establishing the notion of CoP, the concept of ‘legitimate peripheral participation’ seems to take the center stage as it describes the process of learning taking place within a CoP (Lave and Wenger 1991). As pointed out by Lave and Wenger, the novices will learn from the more experienced colleagues or ‘experts’ in gaining ‘expertise’ with time. In such a CoP, the learners not only learn but also contribute to the ongoing work practices. In the beginning, these contributions will be ‘peripheral’ or ‘minor’ in nature although as the time elapse and experience accumulate; the novices will gradually start to contribute more. At the same time,

Brown and Duguid (1991) points out that there may be sub-communities existing within a CoP and contribute to the overall organizational learning. In fact, the sub-communities were individually described as CoPs while as a whole; an organization was described as a 'community of communities of practice'.

4.2. HIS users as a Community of Practice

In general, our experience tells us that most HIS users who participate in training programs represents a cohort of health care workers providing health care and related services to the population as their primary role. When considering these participants, almost all of them would be part of an organizational structure such as that of a countries health care services (e.g Ministry of Health, Provincial Health Service, Maternity and Child health program, Non-governmental organizations...etc.). Within such an organizational structure, most of these participants are already engaged in handling health information at various levels. Thus, they can be perceived to be part of already established communities of practice of which the central task is the handling of health data and information. However, the same participants can belong to certain other communities of practice depending on their other work commitments. In some instances, where there is an already implemented DHIS system, participants may already be working together with other DHIS users locally or else from outside their organizational structure. Thus, in most HIS training instances, members from multiple CoPs are brought together to learn and share knowledge pertaining to a common interest and practice.

4.3. Processes of learning within a CoP

When trying to understand the creation of knowledge within a CoP, we perceive that the term 'power', which is defined as "*the ability or capacity to achieve something, whether by influence, force, or control*" Roberts (2006), can play a key role. In relation to learning, understanding the different communities formed within an organization and the distribution of power within them is important to realize the way learning is constructed and travels within the same (Brown and Duguid 1991). One explanation to this is, novice learners becoming experts by initially participating in peripheral practices and gradually gaining a more central role, where transition of power take place in the form of 'actions' (Lave and Wenger 1991).

However, not all novice participants would receive the same 'access' when it comes to engaging in practice, creation of knowledge and therefore gaining power within the CoP (Davies 2005). In fact, gaining legitimacy would be paramount before gaining access to participate by the newcomers. Depending on the level of legitimacy, some would remain peripheral as in the case of 'marginalized' participants while the others would enter an inbound trajectory towards becoming experts or gaining 'full-membership' of the CoP (Lave and Wenger 1991, Davies 2005). This shed light to the fact that social structures do allow the formation of hierarchies within a CoP (Eckert 2000) and therefore could govern 'who learns what', 'when' and to 'what extent'. We experienced that similar circumstances could even be present among the HIS users of a particular context.

4.4. 'Immutable mobiles' and 'blended learning spaces'

With the experience gained through conducting multiple DHIS training instances, we realized the fact that unless the training instances and the work practices becomes supplementary to each other these instances tend to remain in isolation. At the same time, it was also observed that the participants of these training instances should be exposed to a continuum of learning pertaining to each of the intended learning objectives. In other words, the learning objectives should stay stable while it traverse through different learning modalities [online/face-to-face] and when it is translated into actual work practices, for such learning to be meaningful to its learners as they are part of a community of practice intended to utilize DHIS for its practices.

In theorizing the said behavior, we realized that the concept of ‘immutable mobiles’ (Latour 1987) can provide us with the necessary guidance. According to Latour, ‘objects’ of a network are ‘an effect of stable arrays or networks of relations’. Their existence or holding-on depends on the holding-up of its relations and not altering the ‘shape’ of the object. As illustrated with the example of a sailing ship [which is an object of multiple relations and elements], which retains its shape through stable relationships while moving from one location to another navigating through the rough seas. The high seas is also considered a ‘relational network’ in the sense that it consist of tides, wind, rock formations...etc that needs to hold steady [to some extent] if the ship is to navigate safely. In such instances, Latour describes objects such as the ‘ship’ [which itself is a network of elements and relations] as an ‘immutable mobile’ as it retains its shape and relationships although it is mobile from one location to another. In other words, the ship moves through the ‘Euclidian space’ while remaining ‘immutable’ in the ‘network space’ (Law 2002). The same concept can be illustrated in relation to a DHIS blended learning instance.

The vessel described by Latour can be compared with a ‘learning task’ in blended learning. One example would be the learning task, ‘developing an indicator’. The learning task ‘developing an indicator’ itself contains many elements, actions and references which provides it with a unique set of relations in order to derive its full meaning. In case of a DHIS blended-learning instance, the learner should be able to make use of the distance-learning platform to grasp the concept of an indicator, the steps in creating the same in DHIS, as well as how it can be used for analysis. However, while the concept is been taught in a distance mode, the learner will make use of the knowledge gained in order to perform the same function in the actual work setting, initially with the guidance of ‘experts’ at the face-to-face workshops. This would prepare the participants of a blended-learning program to function within their respective ‘workplaces’. But, in order to make meaning, the elements, actions and references which were the ‘network relationships’ of the learning task [the object] ‘developing an indicator’ should remain stable and unchanged while the learner translates what he has been taught into real world practice. (Figure 1). At this point, the challenge is to determine how such stability can be maintained and how the learning can be allowed to translate into actual work practices, overcoming the perceived “gap in translation”.

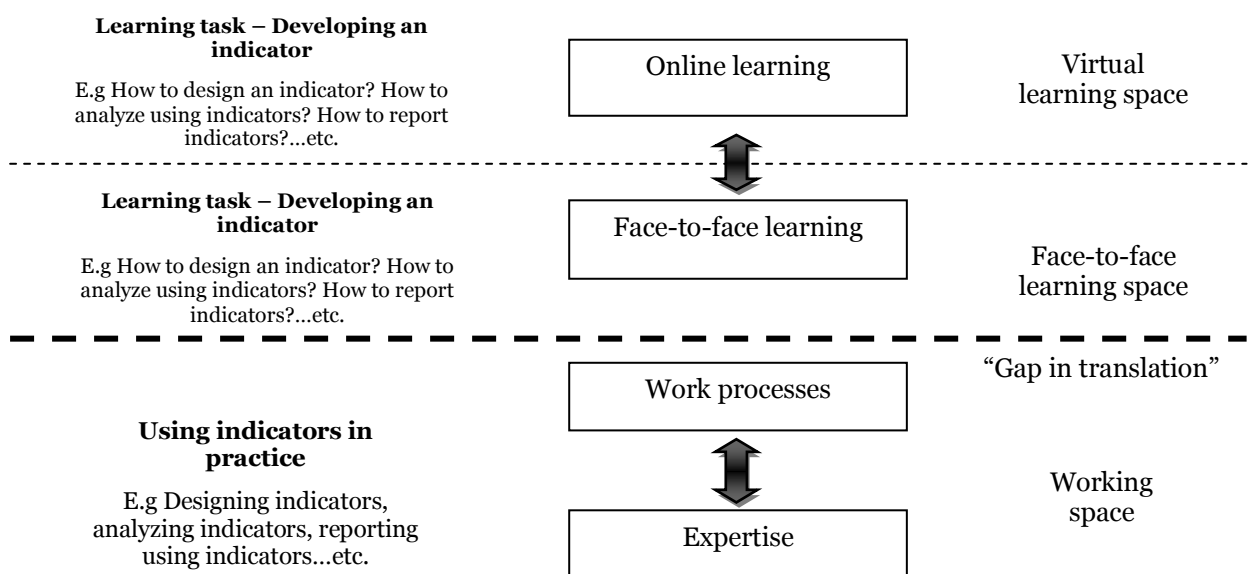


Figure 1 : Diagrammatic representation of learning taking place through a blended-learning program in a potential HIS setting.

In the above scenario, a learning task needs to traverse three perceived spaces, the virtual learning space, face-to-face learning space and the working space. However, in order to maintain ‘shape’, the learning task needs to be meaningful to its learners in terms of being useful for actual work practices that they intend to undertake. A failure to recognize the constructs that form the learning task would mean that learners would not be able to make use of the learning when they start to negotiate real world problems, giving rise to the perceived “gap” as illustrated in Figure 1. In other words, the ‘immutability’ of the learning task could be lost if its relationships [emanating from the actual work practices] are not maintained during the translation.

As discussed earlier, the participants of HIS-training are usually ‘members’ of already established CoPs. Given the process of learning within a CoP, it can be argued that ‘experts’ and the ‘level of engagement’ or the ‘participation’ in work practices are two important elements for negotiating meaning for novice members of a CoP. Based on this argument, it can be emphasized that the ‘experts/expertise’ and the ‘work practices/participation’ should reinforce the learning taking place in a blended-learning instance, if the learning tasks to be successfully translated into real world practices. In other words, the ‘gap’ perceived in figure 1, could well be bridged using these two elements as it will allow the participants of a blended-learning instance to ‘make meaning’ and ‘be a part of the CoP’ formed around health information systems in their own settings.

5. CONCEPTUAL FRAMEWORK

The conceptual framework shown in figure 2 illustrates this perception by expanding the earlier diagram (Figure 1).

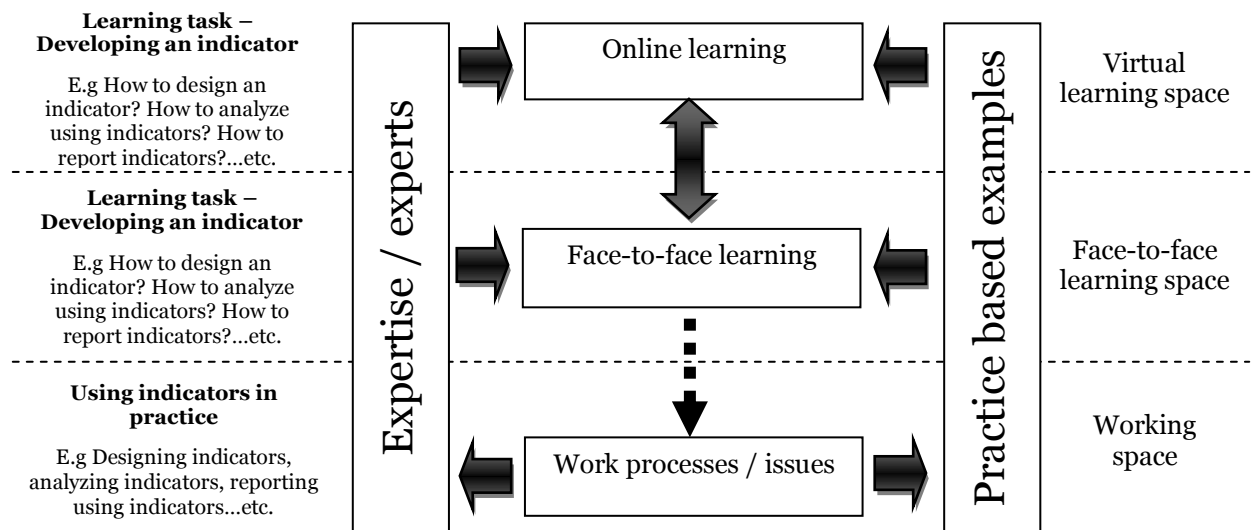


Figure 2 : Conceptual framework depicting the learning taking place through a blended-learning program in a potential HIS setting.

The conceptual framework depicted in figure 2 illustrates how a learning task could be made ‘immutable’ as it traverse the three spaces of online, face-to-face and work space. By maintaining immutability, it is expected that learners would be able to make meaning out of what they learn and would be able to make use of what they learn in their work practices. The way the immutability is maintained is by having experts participating in the process of learning and by having practice based examples feed the learning in both online and face-to-face spaces. These experts are to originate from the CoPs of which the learners are already part of or else is expected to be taking part. In other words, during the blended-learning

instance, the learners are invariably exposed to a learning that transcends from their actual work practices and therefore is expected to give the learners a better chance of being accepted within the CoP in which they will make use of their learning.

6. METHOD

In order to evaluate the derived conceptual framework, we made use of two DHIS-training instances as case studies. These training instances were part of DHIS workshops organized by the DHIS academy in India and Kenya. Both training instances were part of an action research approach (Baskerville 1999, Baskerville and Wood-Harper 1996, Argyris and Schön 1991) adapted for developing the blended learning program for DHIS-training in developing countries. The data was collected from field notes, paper based questionnaires, online questionnaires, interviews, observations made during face-to-face and online training, e-mail conversations and informal discussions with the trainers as well as with the participants at each instance. The collected data was used to prepare a complete narration of the learning instance and was subjected to a thematic analysis.

7. CASE DESCRIPTIONS

The idea behind presenting these cases would be to analyze the blended-learning instances in light of the conceptual framework presented earlier and critically evaluate how such training instances performed and could have made more useful to its participants by utilizing the said framework.

7.1. DHIS workshop in Shimla, India

Shimla is the capital of Himachal Pradesh in India. Its importance to HISP is that a Health Management Information System (HMIS) is being implemented in Hospitals in Himachal Pradesh based on the DHIS platform. The Shimla DHIS workshop was intended for Asian countries where DHIS based information systems are implemented or is in the process of being implemented. It followed a similar pattern to other DHIS workshops and was held for 10 days with the participation of around 40 implementers from several countries.

Prior to the workshop, the trainers in India and the trainers from DHIS academy agreed on utilizing the blended-learning approach. It was also agreed during e-mail conversations that the aim of the online module shall be to provide the participants with a basic understanding of DHIS. In order to bring all the participants together within the online platform, a discussion forum was added as the last step of the online training. As the designers of the pre-workshop activity did not know the background and the learning needs of each and every participant, the online activity consisted of the 'minimum required knowledge'. The activity was scheduled to conclude within 5 days of which the last two days were devoted to online discussions. However, the pre-workshop activity was not made mandatory or canvassed as a prerequisite for the face-to-face workshop.

During the training, it was observed through the LMS data that many have logged-in to the LMS at least once. However, only one person contributed to the online discussion. During the face-to-face session, there were few issues raised by the participants in relation to the technical difficulties of using the LMS. However, it was observed that most participants were not so fluent in communicating in English, which was the language used for the online learning. Because of the technical difficulties in allowing all the participants access internet at the same time, Shimla participants did not get a chance to interact in the LMS during the face-to-face session. During informal discussions, some participants expressed their inability to login using the given username and the password while some said they did not have enough time to prepare. Some Shimla participants also said that, '*we would have liked it [the LMS] to*

be in Hindi' or otherwise in their own language. At the same time, there were participants suggesting to have more varied and in-depth learning activities as they thought '*the activities were too simple...*'. It was also apparent that the poor participation in the discussions might have also been influenced by its timing as some mentioned, '*if it had been timed earlier, we would have been able to participate more...*' For some, the information regarding the pre-workshop activity never reached them although their emails were in the group mailing list for the Shimla workshop. It illustrates that email communication could sometimes evade certain people who are not used to checking emails regularly.

We were also able to recognize the willingness of the participants to undergo further online training in relation to their needs, through a paper-based questionnaire. These needs were much more specific than what we have addressed through the pre-workshop online activity. For instance, some of the needs included *server installation, importing and exporting data, designing reports and customizing DHIS*, which were not addressed through the LMS. At the same time, they also emphasized the need for video demonstrations to be either in their own language or else in simple English with a locally understandable accent. Furthermore, some participants felt that by giving the users an 'online training guide', it could facilitate the integration of distance learning in their own setting and that the guide should be in a native language for its better understanding. However, most participants thought the use of online learning should be aimed at training implementers and developers of DHIS based on their experience of ground realities such as lack of internet connectivity, time to interact online, lack of English knowledge and lack of basic IT skills, when the same is used to train the field level staff.

Another characteristic recognized among the Shimla participants was that most of them were unaware about the different uses or the issues that could arise with DHIS as they did not have any work experience with DHIS in their own setting. However, most of them were aware about HISs and were engaged in similar activities. It was noticed during the face-to-face workshop that many had the enthusiasm to log-in to the LMS at least after learning that the workshop presentations would be uploaded to the LMS each day. During the face-to-face session, there was little reference to the online component apart from using the same as a repository for workshop presentations.

Case discussion

In the Shimla case, it was apparent that the 'virtual learning space' and the 'face-to-face learning space' were exploited during the blended-learning activity. However, the online learning component did not take off as expected due to several reasons. It was perceived that not recognizing the participant competencies and the desires for learning HISs lead to the formation of 'uninteresting' online content for its participants, which did not emanate from their own work practices. Having not being able to cater to the participants own language could have also affected their level of engagement, motivation as well as acceptance of the online learning as a useful entity. Furthermore, the non-complimentary nature of the online and face-to-face learning was also evident throughout the workshop, which depleted the value of having online learning prior to a face-to-face session. Thus, the perceived immutability of a learning task traversing between 'virtual learning space' and the 'face-to-face learning space' did not materialize in this instance of blended-learning.

With the recognition of participants whom were not aware about the functionality of DHIS or even not used to work with a similar HIS previously, the difficulty in meaning making was made apparent. Thus, there was not much scaffolding for participants to relate what they learn to their own setting through the online instructional arrangement although it followed a 'story telling' method using case vignettes. Thus, capturing the actual work processes with regard to the health information collection, its processing, reporting...etc and using the same as

instructional content would have been a better approach to allow the participants translate what they learn to actual work practices when they return to their working space.

In general, the scaffolds [the local expertise and the practice orientedness], which would have maintained the stability of the learning tasks, traversing between the online and face-to-face learning, either did not exist or failed to materialize during the Shimla workshop. However, there were many practice oriented and context specific learning events taking place during the face-to-face session which itself might have contributed to bridging the 'gap in translation' discussed earlier. However, this study was not geared to assess the same, as it requires a long-term follow-up of the participants at their work settings.

7.2. DHIS workshop in Kenya

The DHIS workshop in Kenya was conducted for the DHIS implementers from the East African region. It attracted around 50 participants from several different countries. The participants were classified mainly as English-speaking health information managers and technical officers with few medical doctors. Most of them were already involved in managing health information in their own setting while many were already using either DHIS 2 or its older version, the DHIS 1.4.

The Kenyan workshop consisted of a 5-day online training program followed by a 10 day face-to-face training component. Prior to planning the workshop, the DHIS-trainers and the local resource personal from East Africa discussed the potential learning needs of the participants and their ability to follow distance learning as a preparatory course for the face-to-face program via email communications. The content that should be delivered through the online mode was decided to include fundamentals in DHIS use and 'implementation' related knowledge. The face-to-face workshop was planned to supplement the training that take place in the online environment. It was also decided to form four discussion streams, which would run the entire length of the online training program. The discussion topics included, 'my experience with DHIS 2', 'implementation issues', 'design issues' and 'DHIS terminology'. The discussion forum 'my experience with DHIS' was opened earlier than the rest of the discussion forums and was expected to gather participants own views and experience with regard to handling HISs, particularly with regard to DHIS use.

The online component was introduced as an essential part of the training and in order to motivate the participants, they were told that they have to make three or more postings to receive a certificate of successful completion. During the online training, those who made the most contributions were made public in order to acknowledge their contribution as well as to motivate the other participants. Furthermore, the DHIS-trainers ("the experts") frequently communicated with the participants by means of emails reminding them regarding the ongoing activities, links to discussion forums and regarding the important discussion topics.

The discussion forums attracted almost all the participants while many of them made significant contributions in terms of posting their views and queries. Each discussion forum attracted around 30 postings from the participants as well as from the trainers. The thread, which was opened to gather the experiences of the participants, attracted the most postings. It was also noted that around 17 participants answered the online questionnaire, which was embedded within the LMS and was scheduled as the last activity of the online training. Through the online questionnaire, it was derived that most participants believed online training to be '*helpful in building knowledge*' as well as to '*build a sense of community among the participants*'. Furthermore, they also perceived *poor access to internet, lack of computers and inadequacy in the number of available online resource personal* as the main challenges when implementing online training in their own settings. During the online discussions, the trainers of DHIS also had the opportunity to learn from the participants with regard to their

experience on training their own staff. For instance, one of the participants from Uganda mentioned his experience related to DHIS 2 implementation as “*Over 120 hours of workshop training (local and regional) in DHIS2 customization for National Roll out in Uganda (eHMIS). Over 12 months of intensive customization for country use and over 5 months of first-level district and facility end-user training for the current 83 out of the 112 districts in Uganda. Limited experience in DHIS2 server maintenance and customization and use of the beneficiaries module*”. This kicked-off a discuss involving many others whom were interested to learn from this participants and ultimately, the participant became a discussion leader and an ‘unintentional resource person’. When analyzing the discussions, it was evident that those who contributed significantly were the ones with the most experience with regard to DHIS while the newcomers were mostly posting questions following reading the training material or as a response to a post made by a trainer or a more experienced participant. Such behaviors were reminiscent of the behaviors expected of novice learners of a community of practice who tend to learn from the experts by playing a peripheral role within the community.

Case discussion

The Kenyan case can be described as a DHIS-training instance, which followed the conceptual framework depicted in figure 2. To summarize, the online and face-to-face training programs were derived following the feedback received from the ground level experts and coordinators. They were able to profile the participants attending from their settings and therefore allowed the DHIS team to better focus its training. The introduction of a discussion thread, which ran from the first day onwards, was aimed at gathering participant details and experiences, which allowed building a sense of community within the group. In addition, the same thread also functioned as a means of relating learning with the practice. This made it easy for even the newcomers to relate what they learn and understand what issues to expect in the field based on the postings made by such newcomers. During the face-to-face training, hands-on work was much in the line of resolving the practical issues, which supplemented what had been mentioned in the online discussions. Because of bringing out the issues faced by the participants through the online discussions, the DHIS-trainers were aware about what specific learning tasks that should be stressed during the face-to-face training sessions. Furthermore, the face-to-face learning did not run in isolation from its online component but instead supplemented the learning that took place online. However, because of prior learning, trainers were able to build on what has already been taught instead of starting from scratch during the face-to-face session.

It was also evident in the Kenyan case that there were several motivations for the participants to interact in the online discussion forums. Among them, the presence of experts in the form of those who actively engaged in their own settings, the necessity to participate in order to receive accreditation, being given to understand that the online learning is an essential part of the whole DHIS-training program as well as catering to their learning needs could be highlighted. In general, having expert participation and acquiring practical examples at all levels of learning made the two learning spaces to supplement each other and therefore may have aided in maintaining the immutability of a learning task during its translation into the participants work practices.

8. CONCLUSION

Based on the case analysis, it was evident that the proposed conceptual framework is better suited to describe the case with the most participation and online/offline interactions. It also demonstrates that by allowing the participants to come-up with their own experiences, it was possible to build a sense of community among the participant group. As depicted in the conceptual framework, having a sense of community enables better integration between virtual and face-to-face learning spaces. Similarly, by bringing-in ‘expertise’ and practical

experiences, it was possible to enrich the discussions and allow the emergence of ‘leaders’, in the discussion forums. In the Kenyan case, where the participation was better, the practice-oriented nature of the online discussions could have made the learning tasks to traverse through to the ‘working space’ much more efficiently. From the two cases described, it was also evident that there are multiple factors that contribute to the designing of a blended-learning program for HIS-training, which may vary from one context to another. Thus, it can be argued that the expertise originating through such contexts could be useful in recognizing these factors and therefore adjust the blended-learning design accordingly. However, given the relatively short duration of the case studies, this paper was not able to evaluate if the learning tasks have actually enabled practices in the perceived CoPs. Thus, we believe the future research should focus its attention on evaluating how the proposed framework enabled HIS learning tasks to translate itself into work practices within the perceived CoPs. This should ideally be done over a period of time after such training initiatives have taken place.

9. BIBLIOGRAPHY

1. Argyris, C., and Schon, D. (1991). "Participatory Action Research and Action Science Compared", in *Participatory Action Research*, Whyte, W.F. (ed.), Newbury Park, N.J.: Sage, pp. 85-96.
2. Baskerville, R., and Wood-Harper, A.T. (1996). "A critical perspective on action research as a method for information systems research", *Journal of Information Technology* (11), pp. 235-46.
3. Baskerville, R.L. (1999). "Investigating information systems with action research", *Communications of the AIS: Article 19* (2).
4. Bell, F. (2003). "Framing e-learning communities within a wider context". in *Proceedings of the ALT-C 2003: Communities of practice*, Sheffield: ALT-C, pp. 13–26.
5. Bersin & Associates. (2003). *Blended learning: What works?: An industry study of the strategy, implementation, and impact of blended learning*: Bersin & Associates.
6. Bonk, C. J., & Graham, C. R. (2004). *The handbook of blended learning: Global perspectives, local designs*. Pfeiffer.
7. Brittain, J. M., & Norris, A. C. (2008). Delivery of health informatics education and training. *Health libraries review*, 17(3), 117-128.
8. Brown, J.S., and Duguid, P. (1991). "Organizational Learning and Communities-Of-Practice: Toward a Unified View of Working, Learning, and Innovation", *Organization Science* (2:1), pp. 40-57.
9. Callon, M. (1986a). "Some elements in a sociology of translation: domestication of the scallops and fishermen of St. Brieuc Bay", in *Power, Action, and Belief: A new Sociology of Knowledge?*, London: Routledge.
10. Callon, M., and Latour, B. (1981). *Advances in Social Theory and Methodology: Toward an Integration of Micro and Macro Sociologies*, K. Knorr-Cetina (ed.), *Routledge*, pp. 277-303.
11. Davies, B. (2005). Communities of practice: Legitimacy not choice. *Journal of Sociolinguistics*, 9(4), 557-581.
12. Driscoll, M. (2002). Blended learning: Let's get beyond the hype. *E-learning*, 1(4).
13. Eckert, P. (2000). *Language variation as social practice: The linguistic construction of identity in Belten High*. Blackwell.
14. Fox, S. (2000). "Communities of Practice, Foucault and Actor-Network Theory", *Journal of Management Studies* (37:6), pp. 853-867.
15. Garrison, D. R. & Kanuka, H.(2004). Cognitive presence in online learning. *Journal of Computing in Higher Education*, 15(2), 21-39.
16. Heinz K. K., and Myers, M.D. (1999). "A set of principles for conducting and evaluating interpretive field studies in information systems", *MIS Quarterly* (23:1), pp.67-93.
17. Huang, H. (2002). "Towards constructivism for adult learners in online learning environments", *British Journal of Educational Technology* (33:1), pp. 27-37.
18. Lamb, R., & Kling, R. (2003). Reconceptualizing users as social actors in information systems research. *MIS quarterly*, 197-236.
19. Latour, B. (1999). "The trouble with Actor Network Theory", *Soziale Welt* (47), pp. 369-381.

20. Latour, B. (1987), *Science in action: how to follow scientists and engineers through society*, Cambridge, MA: Harvard University Press.
21. Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge university press. Lave, J. and Wenger, E. 1991. *Situated learning: legitimate peripheral participation*, Cambridge University Press.
22. Law, J. (1992). Notes on the theory of the actor-network: ordering, strategy, and heterogeneity. *Systemic Practice and Action Research*, 5(4), 379-393.
23. Law, J. (2002). Objects and spaces. *Theory, Culture & Society*, 19(5-6), 91-105
24. Lemmetty, K., Kuusela, T., Saranto, K., & Ensio, A. (2006). Education and Training of Health Information Systems-A Literature Review. *Studies in health technology and informatics*, 122, 176.
25. Littlejohns, P., Wyatt, J. C., & Garvican, L. (2003). Evaluating computerised health information systems: hard lessons still to be learnt. *Bmj*, 326(7394), 860-863.
26. Palloff, R. M., & Pratt, K. (2003). *The virtual student: A profile and guide to working with online learners*. Jossey-Bass. Palloff, R., and Pratt, K. 2003. *The virtual student: a profile and guide to working with online learners*, John Wiley & Sons.
27. Petraglia, J. (1998). The real world on a short leash: The (mis) application of constructivism to the design of educational technology. *Educational Technology Research and Development*, 46(3), 53-65.
28. Roberts, J. (2006). Limits to communities of practice. *Journal of management studies*, 43(3), 623-639.
29. Rooney, J. E. (2003). Blending learning opportunities to enhance educational programming and meetings. *Association Management*, 55(5), 26-32.
30. Stacey, E., and Wilson, G. 2004. "Online interaction impacts on learning: Teaching the teachers to teach online", *Australasian Journal of Educational Technology* (20:1), pp. 33-48.
31. Tam, M. (2000). Constructivism, instructional design, and technology: Implications for transforming distance learning. *Educational Technology & Society*, 3(2), 50-60.
32. Wenger, E. (1998). "Communities of Practice: Learning as a Social System", *Systems Thinker* (9:5)
33. Wilson, G., & Stacey, E. (2004). Online interaction impacts on learning: Teaching the teachers to teach online. *Australian Journal of Educational Technology*, 20(1), 33-48.
34. Young, J. R. (2002, March 22). 'Hybrid' teaching seeks to end the divide between traditional and online instruction. *Chronicle of Higher Education*, pp. A33.