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A WHITE BOOK APPROACH AS SUPPORT FOR SHARING EXPERIENCES

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ABSTRACT
Knowledge transfer is hard to manage in technical projects due to the fact that a lion part of the knowledge is based on experiences gained in daily work. The lessons learned depend on the individuals' distinct perceptions of their experiences. This provides learning, but complicates sharing and the build up of an organizational knowledge base. One effort to capture and disseminate experiences is a white book approach. Simply, white books consists of written text stored in documents, which is used to both reflect upon a previous project and to learn for a new one. The purpose for this paper is to find out how experiences are perceived and formalized in technical projects. Two types of empirical data provide the basis, namely text analysis of white books and interviews with engineers. The result shows that there is an evident difference between what engineers write about their experiences and what they say about them. Implications for the white book approach as a mean for sharing experiences are discussed, for example since pre-knowledge and context for the experiences are lacking in the written text the author and the reader of the text are likely to interpret it differently.

Keywords: knowledge management, knowledge transfer, expertise sharing, experiences, white book

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1 INTRODUCTION

Addressing the topic of knowledge transfer and sharing is important to firms, not to say all organizations. If the knowledge that is created in the daily practices is not managed to benefit the whole organization, any development project risks to repeat earlier mistakes and any innovation project will only reinvent the wheel. *"Those who cannot remember the past are condemned to repeat it"* (Garvin, 1993).

Simply, knowledge management is of utmost concern, since product development companies rely on building up and use relevant knowledge. Manufacturing company's processes for product development could be seen as the *"... process of gradually building up a body of information until it eventually provides a complete formula for manufacturing a new product"* (Smith and Reinertsen, 1998, p. 158). Hence, building up a knowledge base is crucial for all kind of product development work. There are various kinds of knowledge defined in existing literature, two dimensions of knowledge creation have gained particularly attention; tacit and explicit knowledge. They are outlined as two separate entities, however they should be seen as complementary (Nonaka, 1994; Polanyi, 1966). Briefly, tacit knowledge could be described as hard to express since it is context dependent, e.g. locally produced and related to culture and behavior, while explicit knowledge could be described as the opposite, e.g. commonly known and related to information and facts.

All knowledge is not accumulated at a company level; a main portion is generated at an individual or team level. However, to make the most out of the collective knowledge assets firm needs to incorporate new and additional knowledge from all types of sources. Tacit knowledge is a key factor in leveraging the experience based knowledge in product development, but tends to be perceived as an informal type of skill. It is mostly seen as a highly personal asset, even though it serves as a basis for the progress of explicit knowledge (Jasimuddin et al., 2005; Smith, 2001; Quinn et al., 1996).

Generally, product development processes are divided into stages or phases. Very simplified, the process commonly starts with an identification of a market or a development opportunity, followed by a conceptual design stage where the forthcoming product specification is settled. After this the production and product launch can be executed (Ulrich and Eppinger, 2008). In practice, the conceptual design stage could be described as consisting of Research and Development work, where advanced engineering project creates, evaluates and test new technological ideas and concepts, and new product development projects deals with detail design and lay down the plans for production. This means that advanced engineering projects and new development projects are dependent on an effective knowledge transfer between the projects. Yet, knowledge is built up at different organizational levels, i.e. learning occurs in different contexts, and this makes sharing of experiences into a complex matter (Levitt and March, 1988). Further, there are multifaceted structures defined for transfer of knowledge, i.e. an internal, an external structure and individual competence (Sveiby, 2001). The external structure responds most to the relation between customers, suppliers and to the reputation of companies. This mainly involves how to solve a costumer related problem. The internal structure relates to e.g. patents, concept models and development of the context. The contents in the internal structure are "owned" by the firm. If an employee leaves the organization some of the knowledge assets will remain in the structure of the organization, but knowledge will partly disappear with the leaving person. The structure, individual competence, is highly dependent on the lessons done by the individual employees. Texts in documents, such as for example white books or lessons learned systems, are used to capture, formalize, store and disseminate knowledge. Based on the description that tacit knowledge is hard to express, it can be argued that a lion part of such texts are explicit knowledge. The text are often stored in databases to make the knowledge organizational accessible. However, the difficulties to find the relevant documents have been identified, for example to find specific parts in the documents it is necessary to know some critical pre-knowledge about what terms that has been used to tag the documents, name of the project or the names of the project members (Nergård, 2009). As much as 80 % of an organization's knowledge base is stored in people's heads (Bell, 2006), this indicates two issues. First, despite being a significant part, such knowledge is not readily available for the whole organization. Second, capturing and formalization of such knowledge is not straightforwardly done. A reason for the problematical situation is that the main part of the knowledge is generated in practice, i.e. in the individual's execution of his or her daily business (Bell, 2006). Thereby, better described as experiences or "know-how" than by using the overall term knowledge.

A white book, i.e. a report written by a project leader, is one approach that is used in manufacturing firms to capture, store and disseminate project related knowledge. The intention is to support other project's startup and learning when understanding a new design task, solving problems or making decisions. However, it could be discussed that the text in a white book depends upon the person's (the author's) perspective, pre-knowledge and context for the experience, thus might not provide an optimal approach for the tacit dimensions of knowledge transfer. Technical reports are provided to capture product related information and explicit knowledge. The white books are intended to focus more on organizational, project, teamwork and other perspectives of engineering work. One part of the white books especially focuses on the experiences that the team has gained in the execution of the project work, hence should be transferred from one project to another.

The study in this paper has the particular purpose to find out how experiences are perceived and formalized in technical projects, and on the basis of the findings assess white books' function as means for sharing expertise. This is done to contribute to a more comprehensive knowledge transfer between different types of industrial and technical projects.

2 METODOLOGY

The study presented in this paper is based on an empirical study from manufacturing industry in a research project focusing on knowledge transfer in technical product development. A particular interest is on how experiences are captured, formalized and reused between an advanced engineering project, in short AE and new product development project, in short NPD. Simplified, the AE project could be described as having an innovation focus and also the project that generates new knowledge and builds new experiences, while the NPD project could be described, as an industrialization project thus needs to reuse and execute the new knowledge in a production process. Hence, for this study NPD is viewed as a receiver of the knowledge transfer activities. However, it should be stressed that in subsequent activities, the NPD project is generating new knowledge and new experiences, which in turn should be, transferred to product development projects.

Since the case company use white books to capture, formalize and reuse project related knowledge, 25 white books (each of them consists of 7-12 pages) have been analyzed for this study. The white books were provided by the case company, and as such relates to different technical projects. It should be noted that white books contain core company knowledge assets, and are commonly classified. Thus, data in this study are kept general and both company and respondents are kept anonymous as far as possible.

Moreover, semi-structured interviews have been conducted. Semi-structured means that the respondents could formulate their answers freely in relation to the topic and the researcher can pose follow up questions to, in-depth, probe the answers. The company has assisted to find a case project to follow, as well as provided access to respondents that are related to a knowledge transfer process between projects. Questions in the interviews were focusing on the topics; (1) knowledge and knowledge transfer, (2) experiences and (3) pros and cons with the white book approach. Intentionally, experiences were not defined, but were only stated as a topic to talk about. This approach provided the respondents the possibility to clarify and define their perspective of the term in relation to how they use it when authoring or reading white books. A semi-structured type of interview was chosen because it can provide a great breadth of data given its qualitative nature (Fontana and Frey, 2000).

In total, seven employees from four technical projects have been interviewed. Employees from both AE projects, in this case the transferring side, and from NPD projects, in this case the receiving side, have been interviewed. By this, both authors of white books and readers of white books have been interviewed. In relation to the interviews, the respondents were asked to rank the headlines in the white book template according to their usefulness. All interviews were recorded, transcribed and transferred into a document for further analysis. The excerpts presented in this paper provide examples for typical expressions. This implies that the different respondents views are not compared to each other, but used to provide a general description.

The transcribed interviews and relevant text from the white books were analyzed with software (NVivo) for analyzing qualitative research (QSR International, 2012). The software offers a text search queries, which made it possible to search for a word or sequence of words and analyze in what context the words appears. By this, it provided a pointer for the representation of those situations in which the term experiences were used. This analysis served as a base for establishing the sixteen themes in which documents, white books and interview material were analyzed. Using these themes in the text analysis

identified excerpts from the interviews. The coding was done manually after a first semi-automatically coding process, which guided the interest to relevant parts of the different documents. To exemplify, a phrase in an interview correspond to a category of definition for experiences, and also got related to an example of positive or negative experience from white books. This means that a phrase was coded to two themes, i.e. definition of experience and positive/negative experience. The analysis consisted of 624 coding reference points, which were summarized based on their relation to the themes. This analysis provided a general outlook of the data.
In addition, automatically constructed word frequency query have been used to find relevance and weighting in words that were used in the data, this step was represented as word clouds (Viégas and Wattenberg, 2008), see Figure 1 for example.

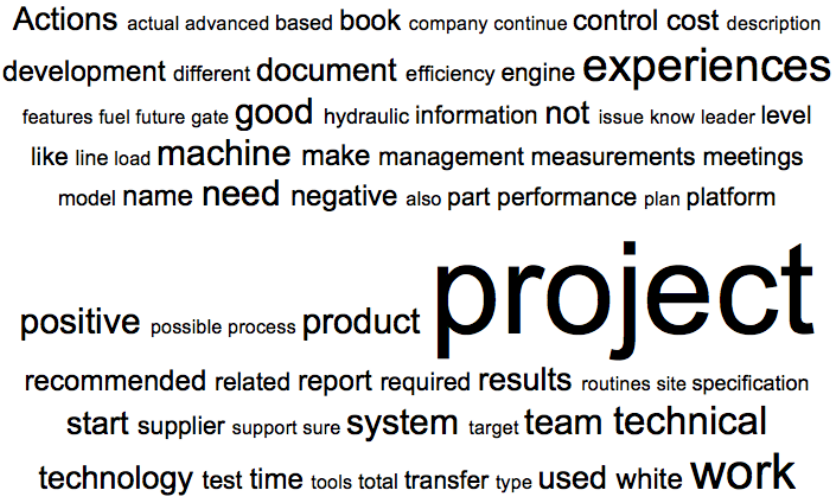

Figure 1. Example of a word cloud from this study

The kind of word cloud shown in Figure 1, have also functioned as material in a workshop, discussing the findings with company representatives in order to validate and highlight the outcome from such study.
Longitudinal empirical data from following actions taken in the AE project for over 2 years is used as background for this study. Company visits, project meetings and workshops have been attended. Shadowing of employees and following them when doing ordinary tasks, has been used to gain insights into daily knowledge sharing activities. Regular check-ins on project portals also contributed to a general view of the work.

3 KNOWLEDGE AND EXPERIENCES

The division of knowledge into an explicit and a tacit dimension is a prevailing view (e.g. Nonaka, 1991; Nonaka et al., 2000; Holste and Fields, 2010). In parallel with the explicit and tacit dimensions, knowledge can also be seen as theoretical, e.g. erudition, or as practical, e.g. skills. Polanyi (1966, p.8) states that; *"Skill combines elementary muscular acts which are not identifiable, according to relations that we cannot define".* By this, skill is to act according to rules, which depends on feedback from a non-social setting. For instance, the skill to chop wood, the actor is able to evaluate whether the action was successfully performed or not.
Experiential knowledge assets consist of shared tacit knowledge, which built on hands-on experiences (Nonaka et al., 2000). This knowledge asset is shared between members of an organization, but also with its customers, suppliers and other partner firms. Skills and know-how are examples of such knowledge accumulated by individuals from e.g., experiences at work. Moreover, such knowledge asset includes emotions, love and trust or other physical dimension of knowledge such as expressions and gestures. Its tacit nature makes it specific to the organization in which it has emerged, therefore experiential knowledge are difficult to fully grasp and formalize, hence companies have to build their own knowledge base including the development of their own experiences.
Also, the concept "know-what" relates to the theoretical part of knowledge, and also to facts and more explicit knowledge. While the concept "know-how" relates to the practical part of knowledge, and also

to, e.g. muscular memory and tacit knowledge. A common view is that experiences often refer to practical knowledge in a specific context (Ipe, 2003).
In plain language, knowledge is often expressed as "knowing" or "doing", and in the same vein this also describes a difference between two types of knowledge. These two types are intertwined because individuals apply their pre-existing knowledge as a coding key for building new knowledge when doing something new, i.e. the reflective processes of problem solving (Schön, 1983). Polyani (1961, p.476) states; *"Knowledge is an activity which would be better described as a process of knowing"*, by this the argument also emphasizes the importance of learning. In turn, learning is a process in which experiences are applied to build new knowledge (Fong, 2008).
Experiences arise in interactions between individuals, and for example situations, conditions, context and a task at hand; often this process includes some kind of product (Yoo, 2008). One absolute and commonly agreed definition of experiences seems out of reach, and it could be argued that this is because of its relation to the concept of knowledge. However, to provide a shared vision for practical use experiences could be described as *"…valuable, stored, specific knowledge that was acquired by an agent in a previous problem solving situation"* (Bergmann, 2002, p.28).
Simply, experiences are set into action in organizational decision-making, and are, over time, transformed into rules and routines. Therefore, organizational learning at all levels of the company is important (Levitt and March, 1988). One approach to capture experiences is white papers or white books.

3.1 White paper and white book

The white paper approach originates from the government domain, and is explained as; *"White papers are documents containing proposals for Community action in a specific area… When a white paper is favourably received by the Council, it can lead to an action programme for the Union in the area concerned"* (European Union, 2012). The white paper approach is commonly used in business-to-business marketing to help decision-making, where the white paper can inform or influence customers' or employees' decisions (Stelzner, 2006). A high-level white paper definition includes the idea that it is a persuasive document, which describes problems and how to solve them. It is suggested that such white papers should be written in an objective, educational approach and in a format somewhere between a magazine article and a brochure. A more detail definition of white papers states that it is has a technical or a business benefit focus. It introduces a challenge and provides the arguments for a certain way to solve the problem. However, white papers can also introduce new concepts or describe how to perform technical assignments. White papers are categorized in four types (Stelzner, 2006, p.4):

1. Technical – targets engineers, describes processes and procedures in detail.
2. Business benefits – targets decision-makers in management positions, describes advantages and competitive leads.
3. Hybrid technical/business benefits – targets both influencers and decision makers, includes description of technical processes and are used in sales situations.
4. Government – discusses implications of policy decisions, targets a very narrow audience.

In addition, Stelzner (2006) states that the grace of white papers are found in the details, but provide also a high-level ten-step view for how to write white papers:

1. Clarify the topic
2. Identify your ideal reader with precision
3. Decide on an objective
4. Develop an outline
5. Interview the experts
6. Conduct research
7. Write the first page first
8. Write the title
9. Write the core
10. Hire an editor

Some business-to-business companies in manufacturing industry have adapted the white paper approach, or use the term white books. Yet, such white books are, in opposite to the marketing approach to white papers, considered to contain intellectual properties of the company.

4 WHITE BOOKS AS CARRIERS OF EXPERIENCES

White books are in the case company intended to carry lessons learned and experiences gained from the product development processes. White books are in an internal document explained as a medium to deliver *"relevant lessons to the organization and to roles involved in the project".* Further, the employees are encouraged to: *"'turn every stone' to find root causes in gaps related to the project".* The white books also contain descriptions of positive and negative experiences, as well as recommended actions to improve forthcoming project work. Such experiences and lessons learned should encompass, not only product and service related issues, but also aspects related to the internal and external work routines. This is to support effective learning from successes, but also from mistakes. The target audience for white books is mentioned to be the members of future projects, ordering functions or departments, steering committees, process owners or other concerned. A white book template has been developed by the company to aid authoring and to provide for a structured knowledge transfer process. The template consists of a number of headlines and sub-categories that to some extent guide the authors and direct their efforts into relevant areas. Also, one section guides the white book authors to provide a bulleted list of experiences made in the project. The template is hence intentionally designed in a fairly simple way, and the informants see pro and cons with the layout of the template. However, as one informant expressed: *"it is more important to make sure that individuals have time to practice white book reporting and improving those skills, rather than to control their learning with a template that makes people feel stupid and not creative."*

Project managers are responsible for obtaining and formalizing the experiences that all project members have done, thus also responsible for authoring white books. As the informants also mentioned, how they interpret the situation has an impact on the content in the white books. From the analysis of the white books, it quickly became obvious that text is often reused from previous white books from similar projects, i.e. a cut and paste approach. In a follow-up interview, one informant explained the approach: *"I don't start from scratch, I'll take an old one, and I use it as a base."* On one side, the cut and paste approach *"makes life a lot easier"* and save time for the project managers. On the other side, it could be argued that the reused text will over time build up tacit dimensions, i.e. new experiences, and thus have another meaning for an experiences manager than for a novice one. To exemplify, the expression "good collaboration" will not contain the same dimensions if used a second and a third time, because you build up new experiences in collaboration for each time you practice it. Further, the repeated sequences in the white books where not linked to each other, hence did not show any progress of experiences. The template including the bulleted list provides a structure for the authors of the white books, and also a guiding "framework" for interpretation for the readers. The bulleted list provides easy overview. But, basically, the work procedures, e.g. high tempo, lead-times or other project resources, makes it plausible that white book authors 'work the template' and get things done rather than focus on reflecting, learning and sharing experiences.

4.1 Different views on experiences

The informants were requested to provide their perception and definition of experiences. For one informant the question was found hard to understand, rendering in a request to explain what kind of experience that we asked for. This could be an indication of how hard it is to reflect and express experiences, because the question was straightforward, i.e. how do you define an experience? When talking about how to gain experiences, the informants stressed that they do not come from reading a book, but rather assimilated from known situations or performed actions. As expected, distinct informants described the experiences differently. However, some characteristics of experiences could to some extent be viewed as a common view, however those were related to how experiences are gained, i.e. in daily work, rather than what it is. Other characteristics of experiences as an issue were, for example, facts, information, feelings, lessons learned, encountered eye-openers, procedures, and muscular memory.

One informant explained experiences as something you have been working with for a while, the more time and intense spent on an issue, the greater the experiences will be. Such description of experience does not say anything of the know-how or skills of doing something. Drawn to its extreme, it is possible to argue that an individual is not necessarily successful in accomplishing a task just because s/he is experienced in terms of having dealt with the issue for a long time or with great passion.

The perceptions of experiences from the informants are displayed in Table 1. From the analysis of the excerpts it can be seen that one informant relate experiences to explicit knowledge (facts, information,

i.e. more tangible aspects). Yet, also explain that such explicit knowledge is subjective, i.e. depend on the individual's preferences, and if so, contains tacit dimensions. In general, the descriptions relate to tacit knowledge, i.e. not easily expressed and depending on a context. Thus, descriptions are given in the context of the learning process in daily work.

Table 1. Perceptions of experiences

"Facts and information and how you share it… I think it would be quite subjective."
"Something you have learned, maybe from doing something."
"An experienced person is one that have been working on something for a period of time, the longer and the more intensely you have been working with it, the more comprehensive experiences you have. But it does not necessarily mean that you are good at something."
"What we learnt as a team."
"An experiences could be feelings, an eye-opener, procedures or muscular memory, or something you have learnt in your education.
"Something that one has learned throughout previous work, for example if you have been involved in a specific situation and learned from that, not what you have studied in school."
"Experiences are not gained from reading a book, rather assimilated from a known situation or performed actions."

4.2 A comparison of what is said and what is written in white books

The analysis of white books and the analysis of the interviews have showed a clear distinction in what is said and what is written. Tables below (2-5) exemplify the gap between the experiences that has been gained in the project work and the experiences that are transferred in the white books' texts. The excerpts are provided as examples of a distinct context, which are not directly related to the technical problem solving practice. The contexts are team collaboration (Table 2), activities related to project cost (Table 3), issues related to project hand-over (Table 4) and from payment issues (Table 5).

Table 2. Experiences from team collaboration

Example of an experience	*"The team collaboration, I would have to say the global network. Cause most of the projects we are running were global. That is definitely a positive experience, the project run pretty efficient, considering the distance and the communication methods. Another positive experience was that we got to know more about what people where doing in other parts of the organization as well. Areas that I may not have been exposed to in the past… I actually liked the diversity within the global team; otherwise I always focus on things I am used to. So, you know team collaboration helps you to not over look things."*
Experience from white book	*"Good teamwork between X-site and Y-site personnel."*

Table 3. Experiences from activities related to project cost

Example of an experience	*"The product cost rushed during the project. It depended on a number of things. It is possible that we did not follow the costs well enough during development. We could not assess the reliability of the offers that the provider/supplier gave us. We had conflicting views on an earlier offer and the cost increased because of that. This made it difficult to keep track of product costs during the project, which complicated the work internally as well."*
Experience from white book	*"Increase in product cost during the project."*

5 CONCLUDING REMARKS

Starting from the purpose to find out how experiences are perceived and formalized in technical projects, this paper provide information from text analysis of white books and interviews with both authors and receivers of those white books. White books are used in firms with the intention to support other project's startup and increase the engineers' understanding for a new design task, problem solving or decision-making. In the company's guiding template for white books it is stressed that the

focus should be more on organizational, project, teamwork and other more social perspectives of engineering work. This study has especially focused on the experiences that the team has gained in the execution of the project work and thereby highlighted as project experiences in the relevant white books. Initially, the study set up the assumption that experiences depend upon the individual's perspective, pre-knowledge and in what context the experiences have been obtained.

Table 4. Experiences related to project hand-over

Example of an experience	*"The split between AE and NPD not always felt natural and satisfactory, after all it is one technology that we will develop over time, it is just in respect to processes we have a break and differentiate the work. However for all of us that are involved it is a constant flow of activities. There are questions popping up later in the NPD-project that relates to the work done in the AE phases and vice versa. For instance lessons learnt from collaboration with suppliers and investments that relates to subsequent steps in a industrialization-project, which is crucial to consider in all part of the development in order to bring a product to the market as quickly as possible. In early technology development there is not the same demand on the quality of specifications to the suppliers as in NPD. I would claim that, considering strict knowledge transfer we try to document as much as possible in the final report, however the personnel involved are the most crucial knowledge carriers. It is challenging to find and get the full attention from those individuals that are not longer involved in a project, but still possess important knowledge related to the work. If they continue to work with a certain task they continuously share new insights with other members of the team. The typical, and to some extent abrupt, change in team setup in the project hand-over is hard to managed. However we experienced a positive effect with the overlap of personnel in the transition this time."*
Experience from white book	*"The transfer to the new project has been more or less seamless due to an overlap of personnel (project leadership and deeply involved development engineers) in the development phases."*

Table 5. Experiences from payment issues

Example of an experience	*"We had issues in the project where, we had to actually hold the last gate because our policy allows us to pay suppliers within 90 days. So we found that we had to hold the project so that we could pay the external contractor, uhm, so we where asking, we mentioned that, that was a big issue for us. We hadn't control over this so we asked if our project could be allowed to register the payment when it's approved instead of when it is paid out. Uhm, this was presented to steering committee, yet nobody took any action on it, but this is something that needs to be managed. Though, everything is project specific."*
Experience from white book	*"Long payment terms with suppliers/consultants required the project to hold the End Gate in late May in order to pay the supplier. We had no control over paying the bill."*

First, the study investigated how the informants defined and explained experiences. Common characteristics among the respondents were that experiences are subjective, gained in interaction and in doing things. The informants described technical aspects and learning aspects as separate entities. Thereby, the difference between formal technical knowledge and experiences can be discerned. Second, the comparison of what is written in white books and what is said about experiences gave a clear distinction between the two ways of communicating experiences. The differences are exemplified in Table 2 – 5 above, and from this a few implications of white books as carriers of experiences can be stressed:

- There are advantages and shortcomings of expressing the experiences in short sentences (e.g. Table 2 and 3). For providing quick overview and pointers to critical issues the short sentences are helpful, while they do not support gaining new experiences due to the lack of, for instance, context description and in-depth analysis of the situation.
- It seems like the authors of the white books tend to express themselves as objective as possible, despite the fact that they have expressed experiences as personal learning and subjective. This

behavior, which in our view is "natural" for an engineer, has the implication that it becomes tricky to relate the experience to a stage or phase in the project. For example in Table 4 the informant make an effort to both describe the stages in the work, cf. product development process, and what happened in each stage when telling the story. But, the written text objectifies the, in reality complex, process of transfer of the contents from one project to another.

- In the interviews the informants started to reflect on a previous situation and from that hindsight they suggested actions to be taken to prevent or to make sure that something happens. For example, in Table 5, the informant suggests a change in procedure when talking about the situation, but in the written text the proposal is left out. Instead, the written text more or less only explains that it was not the internal project issues that caused the delay. Overall, suggestions for actions where very limited in the white books.

Finally, the template for authoring the white books provide structure and hence helps both writing and reading because all white books will have the same layout. However, the template has been investigated, and, for future studies, the potential to improve it based on the findings in this study seems like a good effort. For example, the issue of how to integrate continuous reflections into the authoring of white books is interesting. Further, the study might benefit from including in-depth investigations of how the receiver interprets and translates information from previous white books. Also, things that have not been considered in this study need further research. For example, the area would benefit from studies based on sociological and/or psychological theory.

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