

# Using Moodle as a dynamic multi-purpose “e-Health Learning Management System”

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## Abstract

**Background & Aims:** Patients search online to find more information about their health worries. Misunderstanding, incurrent, or inaccurate health information, accompanied by lack of professional guidance, may cause emotional and physical health crises if patients do not consult their physicians about information they found. It is argued that Moodle can be used as e-Health Learning Management System in which not only health information is provided to patients (breast cancer), but also it provides a secure/private environment where psychologists and physicians can work together to educate patients, answer their queries, and manage their emotions.

**Proposed Methods:** Qualitative and quantitative research methods will be used: 1) Content analysis of breast cancer websites will be used to identify suitable health information that should be included in Moodle; 2) e-HLMS activity (discourse) analysis to evaluate how education and emotions are being managed; 3) Built-in questionnaire in which patients, healthcare professionals and psychology students and their lecturers are required to report their experience; and 4) Interviews with post-operative breast cancer patients and their physicians to evaluate their experience about health information provided and patient-physician communication.

**Expected Outcomes:** This research establishes a new orientation in health services beyond hospitals, surgeries, and medical practices – to consider patients themselves as informative bodies where they not only should be consulted, but also their thoughts and emotions should be considered while health information is being provided to them. This particularly will lead new perspectives in health learning management systems and patient education research. This research will highlights the need to consider individual differences and their needs and emotions through more tailored communications/feedback. In general, this proposed research project will reduce time and effort that healthcare professional spend to manage patient communications and patient education. Moreover, medical and psychology students will have risk-free hand-on experience with breast cancer patients.

# Using Moodle as a dynamic multi-purpose “e-Health Learning Management System”

## Background & General Statement

There is a shift in consumption of health and medical information, where more patients look for information online before consulting their physicians [1]. Patients go online to search for health information to find more information about their health worries, even after they visited their doctors, because of their high anxieties [2]. Finding health information online is tricky because the information is not filtered according to its quality and accuracy, and thus patients are left to evaluate what they see as a relevant content [3]. Nevertheless, online health information does not replace information provided to a patient by their clinicians who can tailor the health message according to patient's condition [4]. In general, the lack of guidance in surfing the internet may lead to misunderstanding or inaccurate health information which may cause crises if patients do not consult their physicians.

## Healthcare Education & ICT

Patients suffering serious illness have worries about their health status and their social & family life. These patients have questions that need to be answered. Healthcare education is now mediated by the use of computers and other information & communication technologies (ICT) [5]. Patients visit public online forums and blogs in an attempt to find answers to their questions if health information websites do not answer their questions or meet their information needs – more likely they read and share negative stories which increase their anxiety and negative emotions. Patients need information especially before and after they undergo surgery; and interviews conducted with patients revealed that preoperative education should include surgical details and physiotherapy, but at the same time, interviews revealed that there is a lack of information related to postoperative pain [6]. Such a finding shows that information should be not only accurate and reliable, but also should be complete to satisfy patients' (physical & psychological) needs. In other words, patients undergoing surgical procedures would like to get more detailed information about treatment options, preparation for the surgical procedures, the surgical procedure itself post-surgical care, and any possible risks. However, patients are not getting enough information from professional sources (including their surgeons) due to lack of allocated time per patient, which increases the dependency on online health information. Governments, too, are moving to provide health information, as a cost-effective mean, and to overcome known limitations in information leaflets in terms of its readability and visualization.



Figure 1: Health information about managing emotions due to cancer as presented in CancerAustralia.org.au

## e-Health Learning Management Systems

Learning Management Systems (LMS) such as Moodle and Blackboard are already extensively used in education for their features in managing educational contents, learning activities including quizzes and their many communication tools including instant messaging, blogs, and forums [7]. More importantly that such LMS ensure secure environment for communications and activities as well as they can be designed to include different roles. Moodle is, however, better as it is an open source software which allows customization to meet different organizational needs [8].

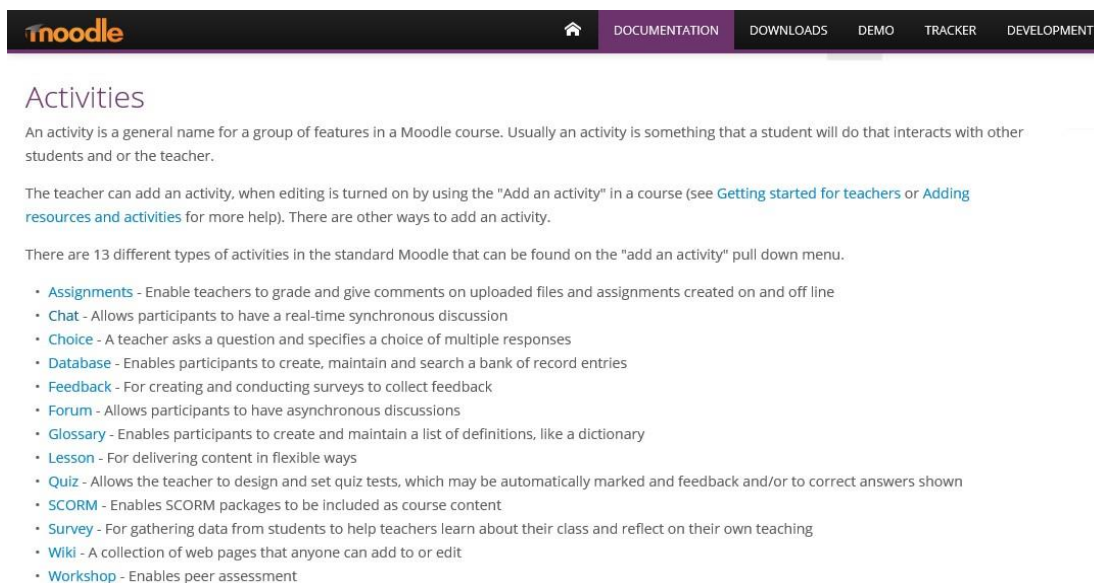


Figure 2: Activity features in Moodle as described in docs.moodle.org

There is evidence that Moodle has been used in health education. A previous study shows that collaboration between academics and healthcare professionals in two continents occurred through the use of Moodle, and such learning technology not only facilitated the scientific collaboration, but helped in promoting the crosscultural understanding and increasing the awareness of the use of

resources for global health education [9]. This research will investigate how such LMS, as Moodle, can be effectively used to educate patients and maximise the efficiency of healthcare delivery.

## **Research Problem**

Moodle, as a learning management system (LMS), allows tracking the participants' progress, in discussion forums and social groups, which later can enrich the online content; and the built-in web analytics help in conducting the statistical analysis of participants and their activities within the moodle (the HLMS of breast cancer) [10]. Furthermore, content analysis conducted on health education websites showed that there is low use of “interactive monitoring” in health education programs [11]. There are some regulating bodies responsible to ensure the “minimum” standards of publishing health information [12]. However, it can be argued that health information on the internet is not yet efficiently regulated, with a potential that these information is not reliable since the “minimum” standards of publishing health information is developing over the time with changes in the scientific information. Furthermore, it can be argued that e-HLMS can be used not only as an educating tool, but also as a professional development tool.

It can be argued that when HLMS is hosted on the hospital server and administered and managed by healthcare professionals (doctors, nurses, and admin staff), patient education and communications with healthcare professionals can be under control. Moodle, e-Health Learning Management System (*e-HLMS*), is argued to provide a new approach in patient education that *combine* the accuracy and availability of health information and allowing communications with informative and responsible healthcare professionals; and it can be an educational/professional development tool for students in health science field. More specifically, HLMS will not only reduce volumes of replicated communications, but also ensure that patients are receiving more accurate health information within secure and private venue. Communications within the LMS will enable psychology and medical students to learn about patient health conditions and their physical and psychological needs. Moreover, psychology and medicine students may have access to the Moodle to develop their professional experience. Previous studies show that students who have access to Moodle can bring their questions and experiences they develop to the face-to-face class setting with their lecturers [see for example 13]. Whether educating these psychology and medical students occur online or face-to-face, it is a “supervised practice” managed by their lecturers [14].

## **Main Research Questions**

Can Moodle be used as “e-health learning management systems (*e-HLMS*)” as a dynamic multi-purpose tool to improve patient education & well-being, enhance the efficiency of patient-healthcare professional communications, and contribute to the professional development of students in health professions?

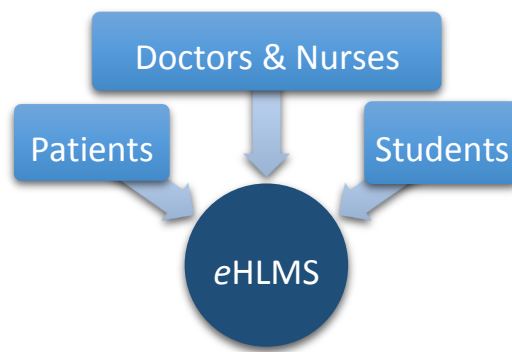


Figure 3: One venue (e-HLMS) for healthcare education, communication, and professional development

### Subsidiary Research Questions

To answer the main research question, to researcher will need to answer a number of subsidiary questions, of which answers to these questions contribute collaboratively to the answer of the main research question:

1. What are the criteria that should be considered when designing materials for patient education?
2. What health information should be used in Moodle, and how it can be presented?
3. What are the Moodle's users and what are their privileges and roles?
4. How ethics considerations be managed?
5. How research participants be recruited in this study?
6. What can patient activities tell about their experience within Moodle?
7. Are there any differences between expectations and experiences between healthcare professionals and patients?
8. What are the feelings and views of post-operative patients who have used and experienced the use of Moodle?
9. Are there any academic and professional views that should be considered when re-designing and re-implementing Moodle in the light of the study findings?
10. How Moodle can be designed to effectively accommodate both patients' and healthcare professionals' needs?

### Research Scope & Aims

#### Study Scope

There is a need to narrow down the research focus to be manageable within the research timeframe – from different health conditions, this research will focus on breast cancer. It can be argued that breast cancer patients search online for health information about their cancer treatment because they might be reluctant to ask questions in insecure venues on one hand, and they see online health information is reliable [15]. Breast cancer patients, like any information seekers these days, tend to search the internet for relevant information and sometimes they check untrusted health information websites, blogs and online reviews about doctors, medications, surgical procedures, and implications of surgeries on their social and business lives – leaving them uninformed and anxious.

Women diagnosed with breast cancer, who received computer-mediated social support, show positive emotional well-being [16]. Moreover, previous studies show that there is positive correlations between health information and both physical and psychological health conditions in the short-term and long-term [17]. When it comes to the use of internet, patient-Web-physician can be expected to significantly impact dynamics of relationship between the physician and the patient,

not only in allowing patients an access to their own health information and helping them to make informed health care choices, but also it helps in better use of clinical time and allow venues for online support groups [18]. Moreover, it was recommended that healthcare providers should consider perceptions of breast cancer survivors when designing patient education programs [17]. Psychological intervention to those who received oncological intervention for breast cancer may reduce stress and negative emotions and enhance the mindfulness [19].

A previous study used a discourse analysis of communications occurred in online discussion group between subscribers to breast cancer list, and the analysis shows that seek these discussions for the purpose of information sharing, social support and personal empowerment [20]. However, in studies, used self-reported questionnaire, conducted on with cancer survivors to explore psychological intervention through support groups/education programs show such participation reduces anxiety and stress, and enhances coping and quality of life [21; 22]. These studies show how importance the need to the interactive learning with patients not only to inform them, but also to manage their emotions – and such interactions should be “tailored”.

However, it is evident that “*tailorism*” in current interactive learning spaces is not efficient as it is should/expected to be. More specifically, a previous study conducted on breast cancer survivors to know their views about a breast cancer health information website they used, patients reported in questionnaire that although the website uses good language and its content is structured, they were unsatisfied about the content itself as not providing them with information they need [23]. Moreover, provided health information is needed to be tailored to what patients already know. Another study reported that breast cancer survivors agreed that the most important source of information is healthcare professionals; however, their perceptions of received information decreases when patients’ knowledge increases... suggesting that patient education should be individually tailored to accommodate patient’s expectation [24].

Patients especially those with chronic disease and cancer search online for more information about their health conditions: prevention, diagnosis, and treatment [25; 26]; however, health information represented in health websites needed to be tailored to each patient [26]. Moreover, patients, although they are interested to be provided with links to medical websites, they were struggling in obtaining useful information related to their health conditions [27]. Engaging patients, practitioners, and patients’ families in decision making helps achieving desired results; and a previous agrees that with the use of e-health technologies including Interactive Health Communication Applications (IHCAs), they can support participation in decision making [25].

The private/secure environment for health education and personal communication between patients and their healthcare professionals proved to improve health conditions of patients who used the online health portals compared to traditional health management approaches [28]. Moreover, this project plays as educational and psychological intervention for breast cancer patients, through more personalised and secure online communications between patients and healthcare professionals - which is argued to reduce the cost associated with the “supportive care” [29]. Although a study found that teaching the practical skills to undergraduate health science students is better for face-to-face settings compared to the online settings [30], it can be argued that the immediate feedback, through the learning management system, by their lecturers/supervisors may enhance learning outcomes.

## **Study Aims**

This research aims to:

- 1) Test the applicability and efficiency of using HLMS in breast-cancer patient education and anxiety control.
- 2) Evaluate the effectiveness of HLMS in reducing the consultation time of breast-cancer patients with healthcare professionals.
- 3) Assess the applicability of using HLMS as an educational tool for health science students.
- 4) Explore the lived experience of breast-cancer patients and healthcare professionals in relation to access, adoption, design, implementation of HLMS and recommendations for developing breast-cancer HLMS.
- 5) Consider the feasibility of generalising breast-cancer HLMS to wider healthcare branches.

## **Research Innovation & Significance**

- 1) LMS is currently in use in education. However, LMS is not being used as dynamic mean for patients' health education – or as can be called e-HLMS.
- 2) In Moodle, patients within are prevented from getting negative stories and/or inaccurate health information as they will be guided by informative and responsible healthcare professionals who provide them with quick and accurate health information as they will be accountable.
- 3) e-HLMS allows the mix between health information and information-based communications between patients and knowledgeable healthcare professionals in private and secure environment – where patients will have the opportunity to communicate directly, anytime anywhere, with healthcare professionals to answer their questions .
- 4) e-HLMS is an educational tool for health science students (psychology & medicine), which enables them to develop their knowledge of physical and psychological conditions of patients – as “virtual riskfree hands-on” experience.
- 5) In HLMS, patients within Moodle are prevented from getting negative stories and/or inaccurate health information as they will be guided by informative and responsible healthcare professionals.
- 6) HLMS allows the mix between health information and information-based communications between patients and knowledgeable healthcare professionals in private and secure environment.
- 7) Time saving of healthcare professionals by avoiding and reducing volumes of replicated communications.

## **Expected Outcomes**

It is expected that this research will add to:

### ***Research-related Outcomes***

- Establishing a new orientation in health services beyond hospitals, surgeries, and medical practices – to consider patients themselves as informative bodies where they not only should be consulted, but also their thoughts and emotions should be considered while health information is being provided to them. This particularly will lead new perspectives in health learning management systems and patient education research.
- Establishing new research partnerships between academic research centers and health institutions.
- Developing more effective well-being and educational strategies for individuals with breast cancer.
- Identifying ways that will heighten the quality of information provided to patients using LMS.
- Developing the orientation and awareness of how health information presented in the HLMS in a way that considers individual differences and their needs and emotions.

- Reducing time and effort that healthcare professional spend to manage patient communications and patient education.
- Creating the awareness among HLMS content developers, and healthcare professionals about better ways of providing health information to individuals suffered and survived breast cancer.
- Studying the feasibility of generalising (adjustment may be required) breast-cancer-patient LMS to wider health LMS applications.
- Publishing journal articles that discuss findings of important phases of this research.
- Educating medical and psychology students about the experience of breast cancer patients.

In addition to the research-related outcomes as mentioned above, there are a number of health-related outcomes, which can be divided to primary and secondary outcomes – as follow:

### ***Health-related Primary Outcomes***

This research will approach patients who have been referred to the hospital regarding doubts of breast cancer, and consequently this health learning management system will provide these patients with:

- An interactive learning opportunities that are secure and private - which will enhance their knowledge and well-being.
- The communication tools such as blogs, forums, and instant messaging that will be administered by healthcare professionals will help improving patient awareness about breast cancer understanding; taking them through different diagnostic procedures, available treatment options, including chemo/radiotherapy, and +/- surgeries - explaining risks & benefits of each treatment option - in a way that is patient-centred.
- Providing emotional support to breast cancer patients by psychology trainees - which controls their anxiety and well-being.
- Study the applicability of generalising the application of breast cancer HLMS to wider health issues.

### ***Health-related Secondary Outcomes***

- Reducing consultation time and times between posting the questions and receiving the answers.
- Reducing effort and cost of the communications between patients and healthcare professionals.
- Reducing the unnecessary visits to specialists to answer simple questions that could be managed and answered online by medical students or specialist.
- The analysed data from the activity analysis, survey and interviews will help better planning for breast cancer patient education strategies.

## **Research Approach & Methods**

This research consists of the following phases:

### ***Phase 01: Literature review***

Literature review conducted so far shows that patients are now active consumer of health information, of which healthcare professionals have to act very assertively to inform their patients with their ‘expert opinion’; and it thus there is a need to educate healthcare professionals of a new trend in “patient informatics” [31]. Therefore, it must be to critique the available studies concerning breast cancer online health information, to determine which health information is to be provided to patients in breast cancer Moodle (including various information sections: prevention, self-



examination, diagnostic procedures, treatment options [chemo/radio therapy & surgical option], and post treatment care complications). If there are limitations in availability of these studies, the researcher will consider content analysis of breast-cancer websites.

**Phase 02: Content analysis of breast cancer websites**

Content analysis is a less-common qualitative research method, although it is a reliable method [32]. It involves analysing text. It requires first establishing a sufficient set of predetermined categories/themes into a codebook, and then reading the text to identify reported instances - these instances will be counted for the purpose of statistical analysis [32]. Content analysis conducted on health education websites showed that there is low use of “interactive monitoring” in health education programs [11]. Therefore, content analysis of breast cancer websites will be conducted using credibility tools such as HoNCode and DISCERN and readability grades using readability software (such as Readability Studio). Phases 1 & 2 are very important to the current research as will determine the content that will be implemented within breast cancer Moodle.

**Surgery for breast cancer**

**Contents**

- [Breast conserving surgery](#)
- [Mastectomy](#)
- [Removing lymph nodes](#)
- [Physical side effects](#)
- [Recovery after surgery](#)
- [Your feelings about surgery](#)
- [Further treatment](#)
- [Breast reconstruction](#)

**Surgery**

Surgery for breast cancer will involve one of the following:

- breast conserving surgery – removes part of the breast
- mastectomy – removes the whole breast.

In most cases breast surgery also involves removing one or more lymph nodes from the armpit.

The operations have different benefits, side effects and risks. Talk to your doctor or breast care nurse about the best option.

**Breast conserving surgery**

Surgery to remove the breast cancer and some surrounding healthy tissue is called breast conserving surgery. It is also called lumpectomy, complete local excision, partial mastectomy or wide local excision. Breast conserving surgery is offered if the cancer is small compared to the size of your breast.

**Related Information**

**Breast cancer in men**  
Women and men can both get breast cancer although it is rare in men.

**Breast reconstruction**  
The surgical rebuilding of a breast at the time of, or after a mastectomy.

**Cancer and work**  
Continuing or returning to work after a cancer diagnosis.

**Cancer Council Helpline**  
Call 13 11 20 to speak with an experienced cancer nurse.

**Chemotherapy for breast cancer**  
Treatment for breast cancer using drugs that are toxic to fast growing cells.

**Hair loss**  
Hair loss can be a side effect of many cancer treatments.

**Hormone therapy for breast cancer**  
Treatment for breast cancer by blocking the action of oestrogen.

Figure 4: Surgery for breast cancer as presented in CancerSA.org.au

**Phase 03: Designing and implementing the content of breast cancer HLMS**

Learning Management Systems (LMS) are providing a platform for active collaboration and interaction between users, via built-in social software which enable networking and managed learning [33]. However, it is important to study threats to security including privacy with IT department. It is also important to plan for the IT budget for establishing and maintaining the project and study other factors that enable the project to be sustained [34]. This proposal provides an initial plan for a healthcare information system project where a wide range of users are working together. Therefore, there is a need, before implementing this project, to identify users, roles, scope of access, and responsibilities among different organisational functions/roles.

Health information on the internet should be suitable for averaged reading level [35]. However, studies show that most patient education materials were written to above-average level [36]; and

this result suggests that patients may have further questions need to be answered and/or they need to be guided to locate and simplify relevant health information. Therefore, in this phase, findings of phase 1 & 2 will be used to determine the relevant health information that will be implemented in breast cancer Moodle and cover different information sections of breast cancer (prevention, self-examination, diagnostic procedures, treatment options [chemo/radio therapy & surgical option], and post treatment care complications).

#### ***Phase 04: Ethics approvals***

The researcher will seek relevant HREC to get approvals to recruiting the study participants – as an ethical approach before conducting research on life beings [37; 38]. As an ethical and confidentiality matter, names of patients participating in the e-HLMS of Moodle will be replaced by nick names.

#### ***Phase 05: Recruiting of participants into health LMS***

The recruiting methods will differ according to the following categories of participants [38; 39]. Participants in this study fall into three categories:

- 1) Patients referred to hospitals for examination by their specialists regarding doubt about breast cancer. This category will be approached by invitation letters that will be mailed (or e-mailed) to them by the clinic booking officer who normally has access to patient contact details.
- 2) Healthcare professionals (including GP, specialists, nurses and admin staff). Recruiting this group will be encouraged by their hospital managers.
- 3) Medical and psychology students who will be advised by their lecturers to use this breast cancer Moodle.

#### ***Phase 06: HLMS activity (discourse) analysis***

Discourse analysis has been used to analyse qualitative communications [40]. Discourse analysis has been used to analyse communications occurred in online discussion group between subscribers to breast cancer list, and the analysis shows that seek these discussions for the purpose of information sharing, social support and personal empowerment [20]. The analysis will assess types (blogs, forums, or instant messaging), times (quick or delayed), and quality (short & concise or long & not-informative) of communications within breast cancer HLMS. Also, quick/short feedback survey will be used in this phase.

Data analysis of qualitative data of communications between clinicians and cancer patients & their families to exchange information should be effective: "patients want sensitive, caring clinicians who provide information that they need, when they need it, in a way that they can understand; who listen and respond to questions and concerns, and who attempt to understand the patient's experience" - calling the need to improve the multi-levelled communications and actionable feedback [41]. It is argued that the amount of data gained from the interactions within HLMS is big. The analysis of this big data enhances the ability to identify emerging patterns of learners (patients in this study) which helps in enhancing the capacity of prediction, developing health professionals, and identifying suitable actions to be taken [42].

#### ***Phase 07: HLMS built-in surveys with patients, doctors and nurses***

Research in patients-physicians communication raises the issue that patients require more attentive care in which a focus should be given to their wants and needs with understanding to their contexts [43]. Healthcare communication experiences between patients, doctors, and nurses in Moodle need

to be evaluated and understood, and to see whether there are still any gaps between the actual and the expected. Patients are usually looking after more personalised forms of communication between themselves and their physicians, in which they can develop the trust [43; 44].

Online surveys can be used to collect information from participants who are geographically distributed [39]. However, potential participants in this study not only located in different locations, but also they share the same online venue of Moodle. Moodle has its own built-in survey functionality. Patients, doctors and nurses will be asked to answer a survey about their experiences in using breast cancer HLMS, and whether they are able to make any comparisons with the traditional ways of health information websites and phone, face-to-face and email communications.

#### ***Phase 08: Interviews with individuals post breast cancer treatment and their doctors***

Studies show that there is lack of education for both doctors and patients; and thus there is a need for better health education, in which patients should be in control of their medical records and in which doctors can report transparently medical results for the sake of better shared decision making [45]. Learning is developed better when designed around “knowledge-in-action”, which is promoted by discussions and collaborative knowledge [46].

Although the online survey will collect data about learning and interaction experiences, more in-depth qualitative information will be needed to further the understanding [32]. More specifically, this phase aim to collect more qualitative data about experiences of patients and their specialists about patient-specialist communications, and how such communications improve the well-being of patients and enhance health education outcomes in general. Furthermore, lecturers of medical and psychology students will be required to provide their feedback about the progress and achievements of students who participated in breast cancer HLMS compared to those students who have not participated in this study.

#### ***Phase 09: Publishing research results and the academic and professional recommendations***

There will be articles that present and discuss results and findings of each stage of data collection and analysis (website content analysis, activity analysis, HLMS built-in survey, and interviews). A general research paper will also be discussing the feasibility of generalising using HLMS in patient education, and ways of improving its applications.

#### ***Phase 10: Re-implementing the HLMS in accordance to the study findings***

The study general findings obtained from website content analysis, activity analysis, built-in surveys, and online interviews will be used to implement the study recommendations in relation to the design of health learning management system of breast cancer.

### **Deliverables and Milestones**

#### ***Implementation of breast cancer HLMS***

Phase 01, 02 & 03: Analysing and implementing contents for HLMS [(3 months)] Deliverable 1: Implementation of breast cancer HLMS.

#### ***Obtaining Ethics Approvals***

Phase 04: Ethics Approvals

Deliverable 2: Obtaining ethics approvals [(4 months)]

#### ***Reporting Findings of Activity Analysis***

Phase 05 & 06: Activity analysis of breast Cancer patients in HLMS [(6 months)]

Deliverable 3: Academic Journal Article & Conference Presentation that outline results of activity analysis & important findings and recommendations for patients, healthcare professionals, and health information providers/designers.

**Reporting Findings of Online Survey Study**

Phase 07: HLMS built-in surveys with patients, doctors and nurses [(3 months)]

Deliverable 4: Academic Journal Article & Conference Presentation that outline results of survey data analysis & important findings and recommendations for patients, healthcare professionals, and health policy planners.

**Reporting Findings of Online Interviews Study**

Phase 08: Interviews with individuals post breast cancer treatment and their doctors [(3 months)]

Deliverable 5: Academic Journal Article & Conference Presentation that outline results of interviews data analysis & important findings and recommendations for patients, healthcare professionals, health information providers/designers and health policy planners.

**Reporting General Findings of Project Subsequent Studies**

Phase 9 & 10: Publishing research results and re-implementing HLMS according to the study professional recommendations [(6 months)]

Deliverable 6: Academic Journal Article that outlines results of data analysis & important findings and recommendations for patients, healthcare professionals, health information providers/designers and health policy planners.

**Re-implementing Breast Cancer HLM**

Phase 9 & 10: Publishing research results and re-implementing HLMS according to the study professional recommendations [(6 months)]

Deliverable 7: A re-implemented breast cancer HLMS according to the professional recommendations obtained based on the general findings (obtained from website content analysis, activity analysis, built-in surveys, and online interviews) in this study.

**Research Timeframe**

Phases	Year ONE				Year TWO			
	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12
Phase 01								
Phase 02								
Phase 03								
Phase 04								
Phase 05								
Phase 06					◆★			
Phase 07						◆★		
Phase 08							◆★	
Phase 09								★★
Phase 10								

■ Phase in months  
 ◆ Conference paper/presentation  
 ★ Journal article

Figure 5: Post-doctoral project timeframe in years and months and other research activities

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