

Development of Information and decisions management Software for educational council minutes of Medical Sciences Universities

Hamid Mogaddasi ¹, Azam Shahbodaghi ^{2*}, Masoud Amanzadeh ³, Mohammad Tabatabaei ³, Maryam Shekofteh ⁴

¹Department of Health Information Technology & Management, School of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

²Faculty Member of the Department of Medical Library and Information Sciences, School of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

³Department of Health Information Technology & Management, School of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

⁴Faculty Member of the Department of Medical Library and Information Sciences, School of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

*Corresponding Author: email address: shahbodaghi@sbm.ac.ir (A. Shahbodaghi)

ABSTRACT

Minutes of educational councils in universities always contain valuable organizational knowledge and play an important role in micro and macro educational decision makings. Lack of storage system, organization and retrieval of these documents can be a major obstacle in the way of utilizing these precious documents. Designing and implementing of an appropriate software to manage minutes of educational councils can facilitate classifying these important documents and ease the access and visibility of their content as well. Therefore based on the structure and the content of educational council minutes of one school of medical sciences universities as a sample and the views of key stakeholders, researchers tried to design and implement a software for information and decisions management of minutes. This research is of developmental- applied type. In order to design the software, object-oriented analysis is used. In the analysis step, at first requirements are identified, extracted and defined based on the descriptive cataloging and subject analyzing of educational councils minutes and after final analysis, the required diagrams were drawn. Software architecture is determined based on the list of requirements and finally the drawn diagrams are converted to programming codes using C# programming language. In the end, the produced software has been tested to ensure its adaptation to the objectives of project and the defined requirements. In this study, it was tried that the designed software leads to the development of electronic database for minutes in order that the universities could have access to content and decisions of these meetings in due time and in appropriate manner. Despite the numerous capabilities of this software, it seems necessary that it be used more widely in order that we could review its improvement and optimization during its implementation in the actual operating environment. Subsequently, it is recommended that Universities of Medical Sciences use the software for information management and their educational meetings to facilitate the process of organizing, storing and retrieving of the documents. They can also contribute to the process of software upgrade for educational meetings in other universities.

Keywords: Educational council minutes; Software development; Information management; Gray literature management; Medical Sciences Universities

INTRODUCTION

The thought of organizing and storing organizational documents is not a new phenomenon and dates back to ancient times, but a new approach in this field has begun from west

and the French Revolution [4-1]. Since then, storing, organizing and making accessible the information contained in the organizational documents has become a major concern among organizations [9-5]. Its proof is that numerous

studies have been done with the purpose of managing organizational documents and evidence, with a focus on organization's memory [10-19], knowledge management in organizations [20-29], as well as management of gray documents. Despite the strategic importance of corporate documents, and due to publicizing limitations, tracking contents of some of these documents which can be classified as gray documents, is hardly possible [30-33]. Universities as organizations that have the responsibility of creating, evaluating, sharing and applying the knowledge and training knowledge community have always had the concern of gray document management. Minutes of the educational council of universities are one of the most important documents of these organizations [42-44] which play a decisive role in the process of decision making in the realm of universities' academic affairs. These minutes always include considerable content of knowledge and play an important role in micro and macro educational decisions. Therefore, lack of storage system, organization, and retrieval of these documents can be a major obstacle in the way of information retrieval and making decisions over these highly valuable documents. Descriptive and analytical cataloging of these documents and producing significant indexes such as subject index of the meetings as well as index of approvals is a solution which has been thought of in order to make accessible the valuable content of the documents. In this regard, designing and implementing appropriate software for information management of educational council minutes could also facilitate the archive and classification of the documents. They also provide easy access to information. This important action with respect to privacy and security and defined levels of access to information can lead to sustainability, visibility and accessibility of organizational memory. It can also facilitate the process of retrieving the documents, eliminating the unnecessary and repetitive processes in meetings as well as facilitating the processes of micro and macro management decision making. Development of an appropriate software to create an electronic database from minutes of educational councils will increase the safety of

these documents and minimize the risks of their retrieval. Providing various facilities in the search of the documents and access to the information contained in them with more speed and ease enhances the efficiency and effectiveness of organization's decision making system at micro and macro levels. Researches showed that until now no proprietary software has been designed to manage information and educational minutes. Accordingly, based on the structure and content of minutes of educational council in a college and the views of key stakeholders, researchers developed a software to manage information and decisions of educational council meetings of Universities of Medical Sciences and in addition, to meet the described needs, provide a system for storing, organizing and making accessible the education minutes of universities.

MATERIALS AND METHODS

This research is of development-applied type. In order to design the software, object-oriented analysis has been used. In the analysis step, based on the views of key stakeholders and descriptive cataloging and subject analysis of minutes of educational councils in one of the colleges pertaining to Medical Sciences University, software requirements have been identified, extracted and defined with respect to Anglo-American cataloging rules [45] and permutation and pre-coordinate indexing rules [46]. In the next step, along with numerous meetings with stakeholders and key users, the software requirements were refined and analyzed and the required diagrams were designed. At the design step, software architecture was determined based on the requirements and was converted to programming codes using programming language C#. Then, the produced software was tested to ensure its compliance with project objectives and defined requirements. At implementation step, the software was installed on a station and was presented to custodians for information management of minutes of education councils in the research environment.

RESULTS

The software for minutes of education council has been developed based on object-oriented

analysis. Therefore, the results of this study are provided in the form of major phases of this method. Since the requirements of the software has been identified based on literary warrant, in the analysis step, necessary data items for organizing the minutes was extracted using descriptive cataloging and indexing the minutes of educational councils that were held in the one of the colleges of medical science universities in the period of 1385 to 1391, using the rules of Anglo-American cataloging and permutation and pre-coordinate indexing techniques. Then, these essential data items were reviewed, defined, and determined with reference to documents and interviews with key stakeholders. At the first step, data items including code, date, time and location of meeting, as well as bibliographic information of meeting secretary, conventional title and agenda were defined as the necessary data elements for describing minutes of education council. It was decided that to assign a code to each minute, a unique number should be considered to identify and locate the document digitally and physically. Likewise, it was decided that to create coherence and consistency in the descriptions of minutes, a conventional title, according to specification of each meeting, including meeting number, place of meeting, and date was determined for every document. It should be noted that the number of each meeting represents the assigned unique code of that meeting. For agenda, after doing investigations and interviews, it became clear that there is a constant list of agendas. So the researchers decided to define a documented list of agendas for system to create more homogeneity so that it facilitates the data entry process and prevents heterogeneity in data insertion. Session summary and descriptive notes, index of approvals, and the name of invitees and participants of the meetings are other necessary data items to describe each document. It should be noted that to create consistency and avoid insertion of incorrect names, researchers decided to define a documented list of names for the fields of secretary of the meeting and the names of invitees and participants. This list was documented after extraction from minutes of meetings and through consultation with administration and personnel department. To increase software integrity and

reduce dependence on physical archive of documents according to the official form of papers and documents, it was decided that to allow the attached electronic image of minutes and related documents of them in the field called 'attachments'. In this step, for capturing the essence of the topic of educational council documents, 'key words' field was defined to insert index terms resulting from subject analysis process of the minutes. In order to control the indexing language, the researchers decided that based on the outcome of indexing of minutes of education council in research environment, a documented list of index terms should defined in advance so that at the time of data entry, the user has to only select relevant terms. To insert new index terms to describe a document as needed, it was decided that after carrying out the necessary reviews and validity justification of the necessity to add a new index term, and in coordination with the system manager and under supervision of relevant experts, adequate controls should be exercised and the new index term should be added to the documented list, so that the heterogeneity in index terms will be minimized. Due to the nature of language of these documents and at the discretion of research team, it was decided that pre-coordinating indexing language should be used for subject analysis of minutes of education councils. In this respect, to control language and to increase content retrieval, researchers defined essential terms by referring to the thesaurus and got comments of relevant experts for each index term. In general, to organize terms, the extracted index terms were classified in four categories of individuals, departments, topics of courses and other issues. The outcome of the mentioned function was a list comprising of index terms with the frequency of their presence in documents which according to studies and experts' views, was defined as a 'documented list of index terms' to control indexing language in the system. It should be noted that with regard to using pre-coordinating indexing technique to enhance visibility from the point of retrieving indexing terms, the possibility of single word in the field of keywords is considered. Also, with regard to determining proper retrieval points to search for descriptive information of minutes, all main fields have been defined with the possibility of being

searched. Reporting from minutes with respect to search fields is another need that was defined. In this phase and to define a software for minutes of education council, after determining data elements and the type and range of each item,

conceptual model of database was developed. To do this according to the defined needs, entities and their attributes and relationships were determined and at last Entity Relationship Diagram (ERD) was plotted.

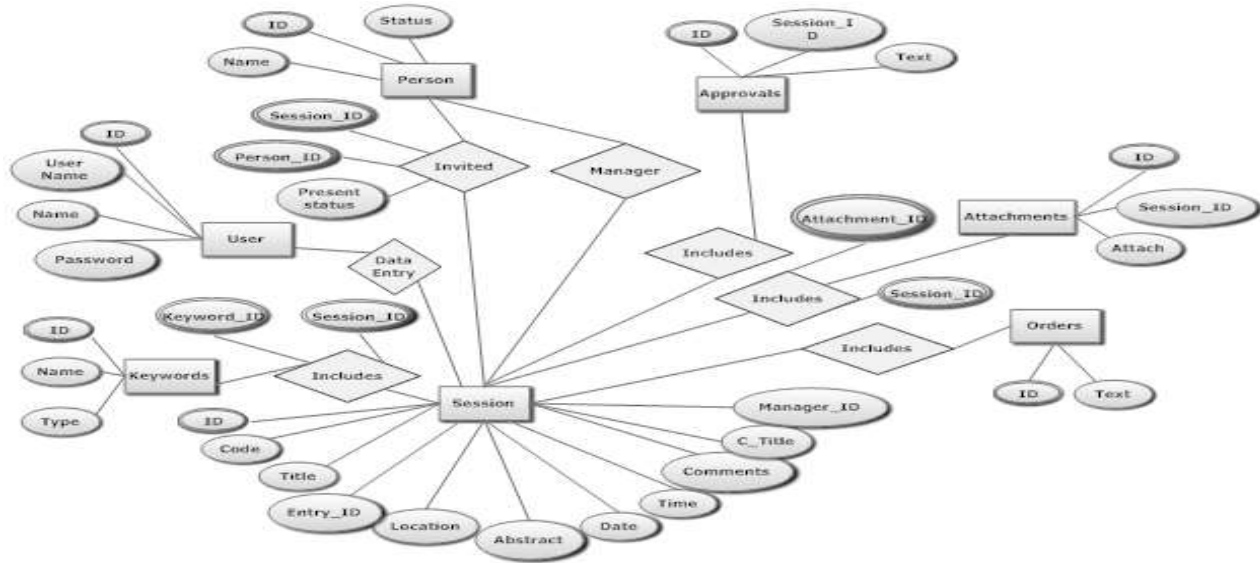


Figure 1. Entity-Relationship Diagram (ERD)

In the design phase, the logical model was defined based on the conceptual model in the analysis phase and software architecture and database were determined. Depending on the type of database which is relational, entity relationship diagram in the previous phase was converted to the relational model and all relationships of

databases and the type of each characteristic in relationships were determined. Furthermore, primary and foreign keys of each relationship were selected for referral based on database design principles. After determining the mentioned items, the logical model for database was designed relationally and was outlined according to diagram 2

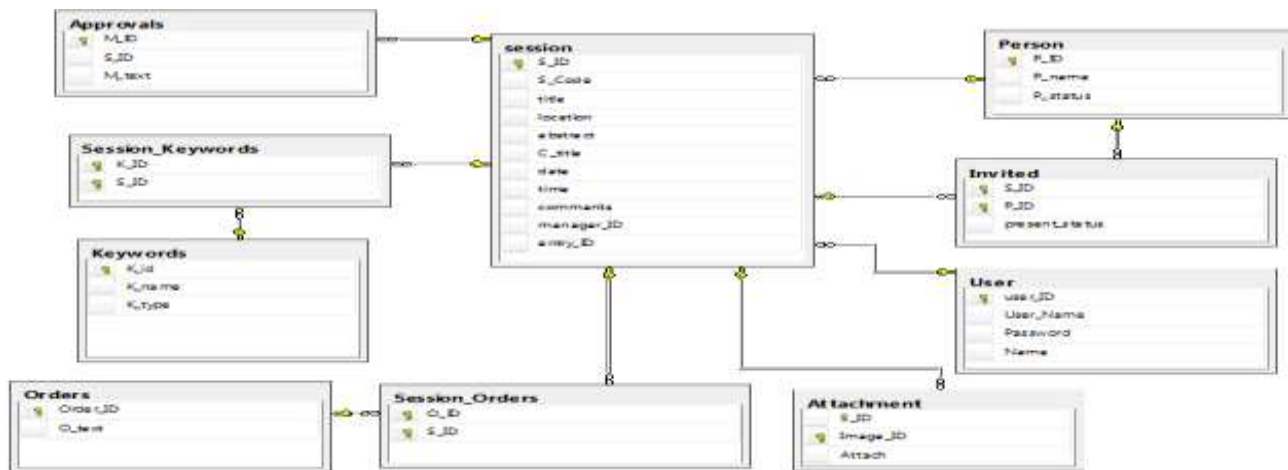


Figure 2. Relational Model of Databases

In the development phase, programming the software was done by C# programming language and based on the designed model. Software was performed in Visual Studio environment 2010. It should be noted that in this phase, the logical model of databases that was created in the design phase was implemented physically. Implementation of designed database was done using version 2008 of Microsoft database management software SQL Server (Microsoft SQL SERVER 2008) and all database tables and fields of each table were created completely. Due to the features of the software, all required procedures were defined in Stored Procedure section to store and retrieve information in SQL language. After implementation of databases, the relationship between software and database was created and defined procedures were invoked.

In order to correct possible errors after implementation and ensure compliance of software with defined objectives of the project, testing phase was designed. In this phase in several sessions, the implemented software was presented to the deputy of time and other key users and as a result of these negotiations, drawbacks were resolved and necessary changes were applied. Also in this phase, data of some minutes was registered, retrieved and reported in the software; based on that, technical errors during work were identified, corrected and resolved. After these steps, to do the final review, the designed software ran on the computer of the deputy of education. It should be noted that at this stage, 4 different versions of this software were created and presented and at last the final version was approved.

EDUCATIONAL COUNCIL MINUTES SOFTWARE

Educational minute's software is designed to be installed. The installation prerequisites of the software are components like Net Framework and SQL Server on the user's system and in their absence, the system will ask the user for permission to install them. To run the software, username and password is required and only authorized users are able to run it. Because of compliance issues related to information security

and monitoring access level, defining a new user will be possible only by system administrator. Original form designed in software contains options like "record meeting information", "record members' data", "record keywords", "accession attachments", "search and reporting" and "exit" option. Data and time, unique code, meeting location, title, secretary, agenda, summary, explanatory notes and approvals of meetings are data elements included in the software. It should be noted that the list of meeting's approvals is the most important output of the software and is considered an important tool in decision making of managers of educational affairs. Registration of information on meeting's invitees and their presence status are among other features included in the software. Inserting index terms of minutes is performed via Registering Keywords. As mentioned in the requirement analysis phase, due to writing diversity resulting from common problems in Persian language and in an effort to control indexing language and maintain the integrity of keywords, it becomes possible that system administrator defines index terms in four categories of individuals names, educational groups, titles of courses and other issues, so that user can select required keywords for each session at the time of data entry. Another defining feature is 'attachments accession'. This option allows the user to attach images of all documents of a meeting to its worksheet. Reporting and searching minutes through descriptive and analytical retrieval points are other features defined in the software so that the user will be able to create variety of reports from defined retrieval points. Defined retrieval points are date, title, agendas, keywords, and name of individuals. It should be noted that for each point, dedicated fields are defined to improve results precision coefficient.

In order to display search results, a preliminary page is designed which contains fields for meeting code, title, venue, data and secretary, attendees including those absent and present, as well as agendas. In addition, the possibility to view detailed information of minutes is defined in the system. Also, the user can generate printed and electronic output in the form of text or image file.

DISCUSSION

Educational council minutes of universities are important documents in support of decision making in universities and electronic organizing of these documents facilitates accessibility to their knowledge content. Due to extensive functionality and multiple benefits of object-oriented analysis [47-49], this method has been used in creating software for documentation of educational minutes of universities. In this study, it has been tried to use designed software to create electronic database for education minutes so that universities could access to the content and decisions of the minutes in due time and properly. According to the list of requirements identified in the analysis step, designed software has the ability to organize, store and retrieve all essential descriptive and analytic information of educational minutes. In the system, each minute will be identified with a unique number which is assigned at the time of registering initial information. This facilitates the processes to organize, retrieve and positioning the documents. Organizations that their policy to electronic management of documents is along with maintain and archive paper form can use the number to classify and locate the documents physically. Other features of the software are inserting the list of invitees and determining those present and absent from meetings which can provide adequate information about the willingness or accountability of invitees to attend the meetings regularly. As for the importance of setting agenda in order to justify the validity of meeting as well as time and discussion management [50-54], in the software the user is required to insert agenda. Since including meeting's approvals is another feature of the software, it is easy to review and assess the agenda and approvals of meetings. In designing the software, issues like confidentiality of documents are considered and monitoring users' access levels is defined in the field of performance management. The software is designed to minimize redundancy and repetitive data entry. In order to control the accuracy and quality of information where appropriate, documented indexes are defined so that instead of data entry by the user that can increase error rate, required information will be acquired from the list. Documented list of names and list of subject

terms are among these indexes. In the software, in addition to the ability to organize, store and retrieve minutes electronically, the possibility to attach scanned images of printed copies of minutes and its attachments is considered. It can increase the comprehensiveness of software and considering all aspects, minimize or eliminate dependence on paper documents. To assess and report on meetings, researchers have considered various retrieval points, so that visibility of minutes' content will be available to authorized users. The possibility to prepare printed and electronic records is another feature.

CONCLUSION

Despite the numerous capabilities of the software, it seems necessary for the software to be widely used to get optimized in the actual operating environment. At first it is recommended that centers of Medical Sciences Universities use the software to manage information and decisions of educational meeting and facilitate the process of organizing, storing and retrieving documents and help universities upgrade the software. Next, the widespread use of this software is recommended in schools of universities of Medical Sciences.

"The authors declare no conflict of interest"

REFERENCES

1. Cook T. Archival science and postmodernism: new formulations for old concepts. *Archival science*. 2001;1(1):3-24.
2. Schwartz JM, Cook T. Archives, records, and power: the making of modern memory. *Archival science*. 2002;2(1-2):1-19.
3. Schellenberg TR. *Modern archives. Principles and techniques*. 1956.
4. Tyrvaainen P, Paivarinta T, editors. On rethinking organizational document genres for electronic document management. *Systems Sciences, 1999 HICSS-32 Proceedings of the 32nd Annual Hawaii International Conference on*; 1999: IEEE.
5. Porter ME, Millar VE. How information gives you competitive advantage. *Harvard Business Review*, Reprint Service; 1985.
6. Gurbaxani V, Whang S. The impact of information systems on organizations and

- markets. *Communications of the ACM*. 1991;34(1):59-73.
- 7.Gorry GA, Morton MSS. A framework for management information systems: Massachusetts Institute of Technology; 1971.
- 8.Grabara J, Kolcun M, Kot S. The role of information systems in transport logistics. *International Journal of Education and Research*. 2014;2(2).
- 9.Moon MJ, Lee J, Roh C-Y. The Evolution of Internal IT Applications and e-Government Studies in Public Administration Research Themes and Methods. *Administration & Society*. 2014;46(1):3-36.
- 10.Dow KE, Hackbarth G, Wong J. Data architectures for an organizational memory information system. *Journal of the American Society for Information Science and Technology*. 2013;64(7):1345-56.
- 11.Irani Z, Sharif AM, Love PED. Mapping knowledge management and organizational learning in support of organizational memory. *International Journal of Production Economics*. 2009;122(1):200-15.
- 12.Chang DR, Cho H. Organizational memory influences new product success. *Journal of Business Research*. 2008;61(1):13-23.
- 13.Nevo D, Wand Y. Organizational memory information systems: a transactive memory approach. *Decision Support Systems*. 2005;39(4):549-62.
- 14.Staab S, Schnurr HP. Smart task support through proactive access to organizational memory. *Knowledge-Based Systems*. 2000;13(5):251-60.
- 15.Kingston J, Macintosh A. Knowledge management through multi-perspective modelling: representing and distributing organizational memory. *Knowledge-Based Systems*. 2000;13(2-3):121-31.
- 16.Hackbarth G, Grover V. The knowledge repository: organizational memory information systems. *Information Systems Management*. 1999;16:21-30.
- 17.Anand V, Manz CC, Glick WH. An organizational memory approach to information management. *Academy of management review*. 1998;23(4):796-809.
- 18.Stein EW, Zwass V. Actualizing organizational memory with information systems. *Information systems research*. 1995;6(2):85-117.
- 19.Weinberger H, Te'eni D, Frank AJ. Ontology-based evaluation of organizational memory. *Journal of the American Society for Information Science and Technology*. 2008;59(9):1454-68.
- 20.Bhatti WA, Zaheer A, Rehman KU. The effect of knowledge management practices on organizational performance: A conceptual study. *African Journal of business management*. 2011;5(7):2847-53.
- 21.Holan PMd, Phillips N. Remembrance of things past? The dynamics of organizational forgetting. *Management Science*. 2004;50(11):1603-13.
- 22.Tsoukas H, Vladimirova E. What is organizational knowledge? *Journal of management studies*. 2001;38(7):973-93.
- 23.Hackbarth G, Grover V. The knowledge repository: organizational memory information systems. *Information Systems Management*. 1999;16:21-30.
- 24.Schoenherr T, Griffith DA, Chandra A. Knowledge Management in Supply Chains: The Role of Explicit and Tacit Knowledge. *Journal of Business Logistics*. 2014.
- 25.Meihami B, Meihami H. Knowledge Management a way to gain a competitive advantage in firms (evidence of manufacturing companies). *International Letters of Social and Humanistic Sciences*. 2014(03):80-91.
- 26.Toledo CM, Ale MA, Chiotti O, Galli MR. An Ontology-driven Document Retrieval Strategy for Organizational Knowledge Management Systems. *Electronic Notes in Theoretical Computer Science*. 2011;281(0):21-34.
- 27.Smith EA. The role of tacit and explicit knowledge in the workplace. *Journal of knowledge Management*. 2001;5(4):311-21.
- 28.Brown JS, Duguid P. Knowledge and organization: A social-practice perspective. *Organization science*. 2001;12(2):198-213.
- 29.O'Reilly CA. The use of information in organizational decision making: A model and some propositions. *Research in organizational behavior*. 1983.
- 30.Debachere M-C. Problems in obtaining grey literature. *IFLA journal*. 1995;21(2):94-8.

31. Gokhale PA, editor. Grey literature varieties-definitional problems. Third International Conference on Grey Literature: Perspectives on the Design and Transfer of Scientific and Technical Information; 1997.
32. McDermott JC. Defining grey literature for the 21st century. *Farace D*(1996). 1996:9-17.
33. De Blaaij C. Grey literature from invisibility to visibility. *Publishing research quarterly*. 2004;20(1):70-6.
34. rost H, Schöpfel J. Grey Communities A Scientometric Approach to Grey Literature, In and Outside of GreyNet. *Grey Journal (TGJ)*. 2014;10(1).
35. Corlett RT. Trouble with the gray literature. *Biotropica*. 2011;43(1):3-5.
36. Tripathi M, Jeevan V. Grey Literature archiving in Open universities: A model for India. *Grey Journal (TGJ)*. 2007;3(2).
37. Mason MK. Grey literature: Its history, definition, acquisition, and cataloguing. Digitally available via: <http://www.moyak.com/researcher/resume/papers/var7mkmkw.html>. 2006.
38. Banks MA. Towards a continuum of scholarship: the eventual collapse of the distinction between grey and non-grey literature. *Publishing research quarterly*. 2006;22(1):4-11.
39. Sulouff P, Bell S, Briden J, Frontz S, Marshall A. Learning about grey literature by interviewing subject librarians A study at the University of Rochester. *College & research libraries news*. 2005;66(7):510-5.
40. Genoni P. Content in institutional repositories: a collection management issue. *Library Management*. 2004;25(6/7):300-6.
41. Nixon WJ. The evolution of an institutional e-prints archive at the University of Glasgow. 2002.
42. Grey Literature Network Service. Document Types in Grey Literature. [Internet]: GreyNet International; 2014 [cited 2015 Feb 17]; Available from:<http://www.greynet.org/greysourceindex/documenttypes.html>.
43. Coad J, Hardicre J, Devitt P. Searching for and using grey literature. *Nursing Times*. 2007;102(50):35-6.
44. Farace D, Schöpfel J. Grey literature in library and information studies: Walter de Gruyter; 2010.
45. Gorman M, Winkler PW. Anglo-American cataloging rules. 2nd ed. American Library Association; 1988.
46. Lancaster FW. Indexing and abstracting in theory and practice. London; Library Association publishing, 1998.
47. Alagic S. Object-oriented database programming: Springer Science & Business Media; 2012.
48. Booch G. Object-oriented development. *Software Engineering, IEEE Transactions on*. 1986(2):211-21.
49. Booch G. Object-Oriented Development. *High-Integrity System Specification and Design*. 2012:237.
50. Geimer JL, Leach DJ, DeSimone JA, Rogelberg SG, Warr PB. Meetings at work: Perceived effectiveness and recommended improvements. *Journal of Business Research*. 2015; 63: 2015–2026.
51. Doyle M, Straus D. How to make meetings work: Jove Books New York; 1976.
52. Garcia ACB, Kunz J, Fischer M. Meeting Details: Methods to instrument meetings and use agenda voting to make them more effective. CIFE technical Report, 2003.
53. Svennevig J. The agenda as resource for topic introduction in workplace meetings. *Discourse Studies*. 2012;14(1):53-66.
54. Rogelberg SG, Shanock LR, Scott CW. Wasted time and money in meetings: Increasing return on investment. *Small Group Research*. 2011; 43(2): 236–245. 1046496411429170