

## Aptikom Open Education Architectural Framework

A Strategic Platform to Implement Online Learning in Higher Education Environment

Erick Dazki, Richardus Eko Indrajit

Perbanas Institute

[erickdazki@gmail.com](mailto:erickdazki@gmail.com)

**Abstract** - As the association of higher education institutions in computer science and information technology, APTIKOM has been appointed by the government of Indonesia to promote a massive implementation of open education system within the archipelago. Through a consortium of prominent colleges and universities, APTIKOM has introduced a framework of collaboration in open education ecosystem. Working together with the office of Indonesian Vice President and the Ministry of Education and Culture, APTIKOM launched a national program on promoting, educating, and socialising open education initiatives throughout the nation. In order to align this movement with several related initiatives in the past, a harmonisation and a synchronisation effort should be done. The open education movement in Indonesia can be divided into three domains: Open Content, Open CourseWare, and Open Campus. These three categories are being used as a foundation of understanding the open education movement within higher education environment. Together with PUSTEKKOM, the National Center of Information Technology for Education, APTIKOM is also developing an infrastructure architecture for implementing those open education domains. This article presents the open education architectural framework that is used as a common language among stakeholders in harmonising the initiatives nationwide and the infrastructure framework as the reference to develop the technology ecosystem.

**Keywords** - Open Education, Open Content, Open CourseWare, Open Campus, Architecture, Framework

### 1. First Wave: Open Content

In Indonesia, <http://www.ilmukomputer.com> was the first website that encouraged internet community to share digital contents in the area of computer studies for the benefits of all people who wanted to learn on various topics in information technology. Such initiative was welcomed by the internet community and grew up significantly during the era of open source movement reached its peak. More and more materials were uploaded, shared, and downloaded by various people into the website. The success of this site had invited more practitioners in different areas and communities to build the similar initiatives, which starting the era of Open Content movement in Indonesia in a non formal way. Currently, Aptikom is introducing <http://www.oer-indonesia.com> for the association members (around 1,000 colleges and universities) to share any digital contents produced by them.

### 2. Second Wave: Open CourseWare

The data from the Indonesian National Accreditation Board showed that out of 3,017 higher education institutions, only less than 5% which had a high qualified accreditation (Grade "A"). Most of them (more than 50%) is still in a Grade "C" level (below the expected quality of Grade "B"). Based on the depth review conducted by the ministry, the core components

which every Grade "C" institution are still lack of are the number of qualified lecturers and course materials (BAN PT, 2010). Judging from these facts, the government decided to allocate and to distribute grants to several Grade "A" institutions to develop digital based course materials that would be shared to the other colleges or universities. This was the born of Open CourseWare movement in the country. Most of the course can be seen in <http://www.KDITT.com>. Note that in the Law on National Education, a university is encouraged to conduct distance education to help other universities in enhancing their quality (UU-RI, 2003).

### 3. Third Wave: Open Campus

It was four years ago where the report on the condition of higher education environment in Indonesia was published. Several problems were indicated through several indicators, such as: (i) Gross Enrollment Rate (26%); (ii) PhD ratio per institution (average 1:8); (iii) access to quality education; (iv) level of graduate competencies; and (v) distribution of modern resources. At that time, the Indonesian Vice President himself expressed his concern and asking the rectors/presidents of prominent colleges and universities to design a mechanism of credit transfer among higher education institutions. He used the terminology "online campus" and "e-

learning” to refer to the environment where all scholars (students, lecturers, practitioners, and public) can access quality courses designed and authored by well-known professors openly (Kompas, 2013). The course materials should be designed such that any person can conduct an independent study and earn credit from it to be acknowledge by the institution where he/she registers (credit transfer/earning through e-learning mechanism). A special ministry decree on conducting distance education and e-learning has been introduced to the education ecosystem to accelerate this idea (Permendikbud, 2013). This is where the concept of Open Campus is initiated.

**4. Open Education Architectural Framework**

Apparently, these three waves of open education development have a strong link to each other. The materials of open campus are taken from the opencourseware repositories that have been equipped and completed with pedagogy aspects of e-learning delivery. At the same time, the raw materials of opencourseware are taken from the open content sources that have been mined openly. The knowledge aggregators and e-course developers are introduced as the parties who have capabilities to do the conversions: from digital content to open courseware, and from courseware to open campus materials. By using these three domain approach, any institution who is willing to participate in the movement can be easily choose which type of role it is going to take, since every domain has its own characteristics:

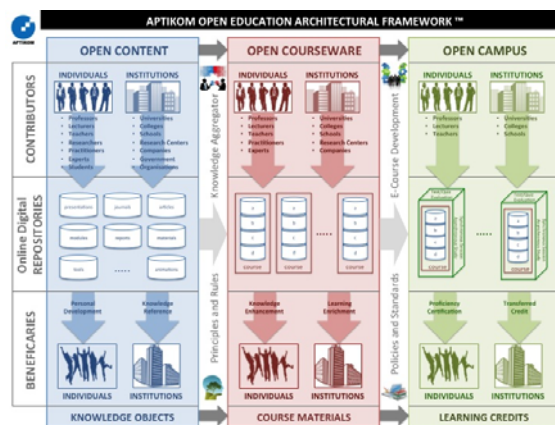
**1. Open Content Domain:**

- a. Everybody can become the contributors of the digital contents (individual or institution).
- b. No standard format of the contents being shared is enforced as requirements since there is no “censorship” is taken place.
- c. Anybody who is willing to download the contents can be done it freely and easily – without having to undergo any registration procedure or other identification recording mechanism.

- d. Repository of knowledge objects are the collective assets on this domain that have intrinsic values for the beneficiaries.

**2. OpenCourseWare Domain:**

- Any individual, institution, or knowledge aggregator can become the developers of these courseware.
- There is a common standard of format that should be followed – mimicing or imitating the conventional course delivery, such as number of sessions, spectrum of topics, presentation materials, etc.
- Anybody who is willing to get these open and free materials should register first so that the developers can have proper statistics for analysis and other related purposes.
- Course materials are the entities that are collected within the domain.



**3. Open Campus Domain:**

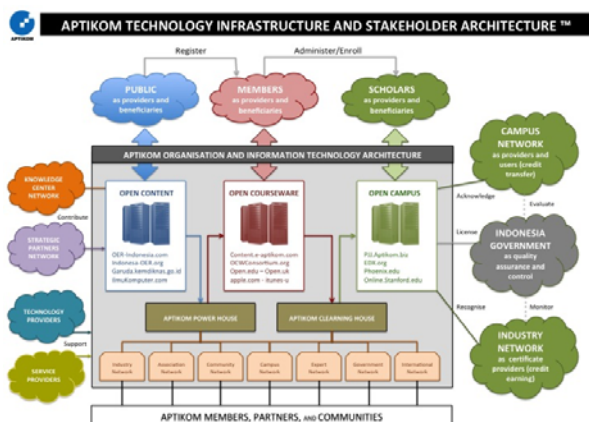
- a. Any individual, institution, or e-course developer can become the developers of these credit-transfer based course materials.
- b. There exist rules and standards that should be follow in developing the materials so that required pedagogy aspects can be adopted effectively – ISO 19796 and ISO 29163 are the examples of standards that relate to the conduct of information technology based learning activity and the format of digital materials.
- c. Anybody who is willing to download the materials should administer first to the related campus or institution to enable

the credit transfer and/or credit earning mechanism.

- d. Transferred-credit based opencourseware materials are the objects that are governed in this particular domain.

**5. Open Education Technology Architecture**

Aligned with the Open Education Architectural Framework, there are three major server-farms that should be build in the infratructure, each one for Open Content, Open CourseWare, and Open Campus repositories. All websites or other sources which are willing to join the national communities of open education can join the ecosystem by selecting the domain and corresponding their technical resources to the main architecture (through mirroring, referencing, appointing, hosting, or other linking mechanism). At the same time, Aptikom develops a power house (production house) to aggregate open content for the purpose of developing open courseware; and a clearing house which plays as a party to develop e-course materials from the opencourseware that has been collected.



The framework also shows the position of all stakeholders within the open education ecosystem. By having this map, all parties can have a clear understanding on their strategic roles and parts, so that they can position themselves appropriately within the movement.

**6. Values of the Frameworks**

- a. The main values of having such frameworks for Indonesia are as follows:
- b. It ease the common people who do not know anything about open education

movement to understand the whole ideas on the initiative.

- c. It helps the education team in promoting the open education initiatives to different types of stakeholders.
- d. It assist the government in developing proper policies and regulations to expedite the open education adoption.
- e. It harmonises and synchronises many sporadic initiatives within the nation into one national movement to gain a massive big impact.
- f. It segregates the roles of many different stakeholders to optimise the use of resources and to enhance strategic collaboration and cooperation among them.
- g. It aligns the various open education movements with the national educational strategy to improve the access to quality education for all citizens.

**7. The Next Wave**

What is next after the third wave has been through and accomplished? There are several innovative ideas that have been discussed intensively, such as: (i) credit transfer implementation between Indonesian colleges or/and universities with other high education institutions from other countries/worldwide; (ii) credit earning mechanism that links with industrial based certification system; (iii) recognition of prior learning integration with degree based program; (iv) national qualification based courseware model adoption; and (v) courseware stock exchanges sytem development. All of these propositions are still being discoursed intensively by educational practitioner and other stakeholders.

Many campus organizer of E-Learning, especially in Indonesia do the learning model based on information technology, most do so in a "trial and error" is not based on principles, paradigms, and the correct frame. One issue in the face is not its architecture E-Learning reliable (qualified). Due to the lack of architecture, the risks faced was the implementation of E-Learning becomes not qualified, they are not in accordance with the regulations applicable to the good practices that exist, the performance of the systems and infrastructure of concern (not effective), the system is adaptive over time, especially when a

growing number of participants and the content changes.

Various problems arise during installation, implementation and maintenance of LMS Moodle, which is often the overload of data in storage so that when users access the LMS will be disturbed and do not want to use it again because it is slow, often during installation Moodle no attention to server architecture worthy to be installed Moodle so that storage for storing content and databases together in one folder, storage Moodle LMS will weigh on storage for all data gathered in storage. Thus the authors will make Architecture Design System based on Moodle E-Learning can be used as a standard for the installation of Moodle on any server.

The education system in Indonesia requires a container of E-Learning for activities E-Learning can be run properly, then made LMS (Learning Management Sytem) is a system created as a medium to hold all the material available and incorporated into a system that will will be accessible to all users of the system such as teachers and learners. LMS that is widely used is Moodle, Totara, Edmodo and others. In the study focused on the E-Learning LMS Moodle (Modular Object Oriented Dynamic Learning

Environment), because one of the Moodle LMS is widely used in more than 150,000 institutions in more than 160 countries around the world, including in Indonesia. A discussion of Moodle did little but the authors want to raise about Architectural Design Based E-Learning System Moodle, not many users Moodle using Moodle architecture design standards, there is no standard of how architectural design moodle good and workable.

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