

Conceptual Framework for Mash-Up Development and Their Usage in Higher Education

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Abstract— Mash-ups have played an important role in finance and business processes. Regardless of the extensive presence of Mash-ups in these domains, Mash-ups are much less prevalent in education. Furthermore, there is no standard process flow, procedures, architecture, and framework to support Mash-up development. This paper hereby introduces a conceptual framework for Mash-up development in Higher Education (HE). The conceptual framework elaborates on the potential steps needed in the HE Mash-up development process and its subsequent application

Keywords— Mash-up; Conceptual framework; Web 2.0; Higher Education; semantic web

I. INTRODUCTION

The introduction of Web 2.0 changed user interaction with websites from being passive to active, through the introduction of a number of applications [1]. Web 2.0 was intended to be easy to use, facilitating the creation, description, sharing and reuse of resources on the Web. It was realized through the development of various technologies such as blogs and social networks [2]. These technologies have been further enhanced by the exposure to developers of application functionalities via Web APIs (e.g. the APIs of the Google search engine, Amazon Maps, and YouTube) and the inclusion of data feeds, in several formats, such as RSS and ATOM [3]. These developments have created new, exciting possibilities for the providers and consumers of services, as they enable the mixing-and-matching of features so as to create new applications [1]. Furthermore, the web operating system has continued to improve its functionality from Web 2.0 to Web 3.0 and then to Web 4.0 [4].

A Mash-up is defined as “a web page or application that uses and combines data, presentation or functionality from two or more sources to create new services” [5][1]. Mash-ups are Web 2.0 applications that reuse pre-existing data and services on the Web, reconstituting this information to form new applications in a rapid, ad-hoc manner [6], [7].

II. RESEARCH FOCUS

In Higher Education (HE), Mash-ups have assumed greater prominence due to increasing numbers of individuals and organizations utilizing Mash-up technology [8], [9]. Despite the remarkable amount of interest in Mash-ups, there are only a few published works that propose a development methodology or process for HE Mash-ups. The research described in this paper is therefore seeking to address this gap in the literature by formulating a development methodology or process for HE Mash-ups. The scope is restricted to certain types of Mash-up editor and certain types of Mash-up. Later in this work the types of Mash-up editor that are being considered will be stated.

In this research, numerous potential areas of application in HE are considered for Mash-ups. These can be categorized into teaching and learning, the library, research, administration, and campus security. In this research, only three of these categories were focused upon, the remaining two only being touched upon. To date few studies have proposed an application for Mash-ups in HE let alone a methodology. A brief overview of how, in this research, Mash-ups have been used in HE is given, commencing with their use in the teaching and learning context.

A. Teaching and Learning

The example provided here relates to the teaching of Web 2.0 Architecture to Information Technology undergraduates who are new to Web 2.0. The concept of a Mash-up is a component of Web 2.0. In the tutorials, students were instructed how to develop their own Mash-up application, using and reusing data from local and remote locations. A common Mash-up tool, Yahoo! Pipes, was used. The students became familiar with the Pipes environment and its modules and how to use them to produce a Mash-up. In practice, the tuition on Mash-up development could be given to any group of students, irrespective of their discipline.

The research was interested in understanding how easily the students learn to develop Mash-ups, the usefulness of Mash-ups to them, and what effect Mash-ups and their development can have on learning

processes. This research is also looking at the ways that Mash-up can support students.

B. Research Activity

As Mash-ups can be used for the collection, reordering and analysis of data, together with the generation of new data from the original material, postgraduate students can utilize Mash-ups for their research. Initially, usage for research bears a similarity to pedagogic usage, as discussed in section 1.2.1 above; however, the process may differ as the research activity might involve closer collaboration with the supervisor.

A Mash-up can be used in the collection of data, the remixing the data, the analysis of data and in the generation of new data from the original data. Postgraduate students can make use of a Mash-up to get a real-time update on their research area, can use a Mash-up for the fast collection of a data sample, can gain rapid access to the local developments in the research area, can easily access research materials, etc.

In this regard, only a few systems having functionality suited to the research activity are to be found; a target of the research has been to look through the existing systems and compare them with the Mash-up that this research is proposing. On the other hand, one can look into the challenges to be overcome and identify the factors of a Mash-up that make it the best alternative research tool. At the end of this paper, the final result and recommendation are provided.

C. Library

Mash-ups can provide a valuable service to the library and the library information system through resource organization and distribution, as effective data integration and data organization are required to locate a particular item. At ABC University, the university in this study, the requirement was the location of a specific article in an online journal. Using a Mash-up, the user had direct access to all of the subscribed journal databases instead of having to check each database individually.

Data integration and data organization are the things needed in the standard library. Locating the item and having a clear view of the item record is the key function for a user in the library. Being a library, there should be the availability of physical and digital items, yet the accessibility of both the physical and digital items remains the issue - how the information can be discovered by the user, and how to disseminate the information to the users. A Mash-up helps to make use of the current system and solves all the issues of discovery and dissemination of information.

III. PROBLAME

Many HE environments have diverse systems of information and this diversity may create issues in terms of data integrity across the HE environment. A number of studies have analyzed the problems of data integration in HE. One study mentions how IT managers are failing to make a successful integration

in HE [10]; a second raises concerns in relation to the integration [11]; a third emphasizes the need for an integrated information system in HE and states the associated issues [12]; whilst another focuses on the foundation and strategic planning necessary to implement data integration [13].

It is suggested that these issues may be mutually dependent and it would be beneficial to discuss these issues in terms of their relative attributes, i.e. if data integration is considered, then data reusability, data integrity and data customization should also be discussed. However, many of the systems used in HE are independent and under the control of individuals in their respective roles or departments. From the studies presented, it is suggested that a few possible issues in each of the identified areas could be analyzed.

However, the literature suggests few ways in which Mash-ups can be used in a Higher Education setting. This research therefore takes advantage of Mash-up technology features to solve the parts of the problems stated. A framework that can be used in this respect does not exist.

IV. AIM

The main aim of this paper is to introduce a conceptual framework for Mash-up adoption and usage in HE.

V. PROPOSED CONCEPTUAL FRAMEWORK FOR MASH-UPS IN HE

This research is believed to be the first of its kind; for this reason the research considers the production of a conceptual framework to outline possible courses of action and preferable approaches to Mash-up adoption and usage.

There are a few phases in this proposed conceptual framework: those involving the preliminary studies phase; the procedures and design phase; the factor identification phase; and finally, the assessment phase. Each of these phases will be discussed consecutively.

A. Preliminary Study Phase

The preliminary study phase comprises three activities: a study on the implementation of Mash-up's and their application in the HE environment, a highlighting of the problems and opportunities, and lastly the identification of principal areas that are suitable Mash-up applications in HE.

B. Procedures Design Phase

After the identification phase is complete, it is followed by the procedures design phase, which is concerned with the implementation of the Mash-up in each of the principal areas. The activities involved are: evaluation on the area's activities, which include the type of existing tools, the existing system, benchmarking the performance, the development, and the requirements. Specification of the requirements to implement the Mash-up based on the principal areas follows. Lastly, a new architecture for requirement development is proposed.

C. Factor Identification Phase

The factor identification phase follows the procedures design phase. The phase is used to identify the factors contributing to Mash-up development in the three principal areas of activity in

this research. These factors include the implementation of the Mash-up system, usage of the Mash-up system, and development of the Mash-up so as to optimize its usefulness, acceptance, effectiveness, and capability for improving learning in selected areas.

4.2.1 Preliminary Study Phase

4.2.2 Procedure Design

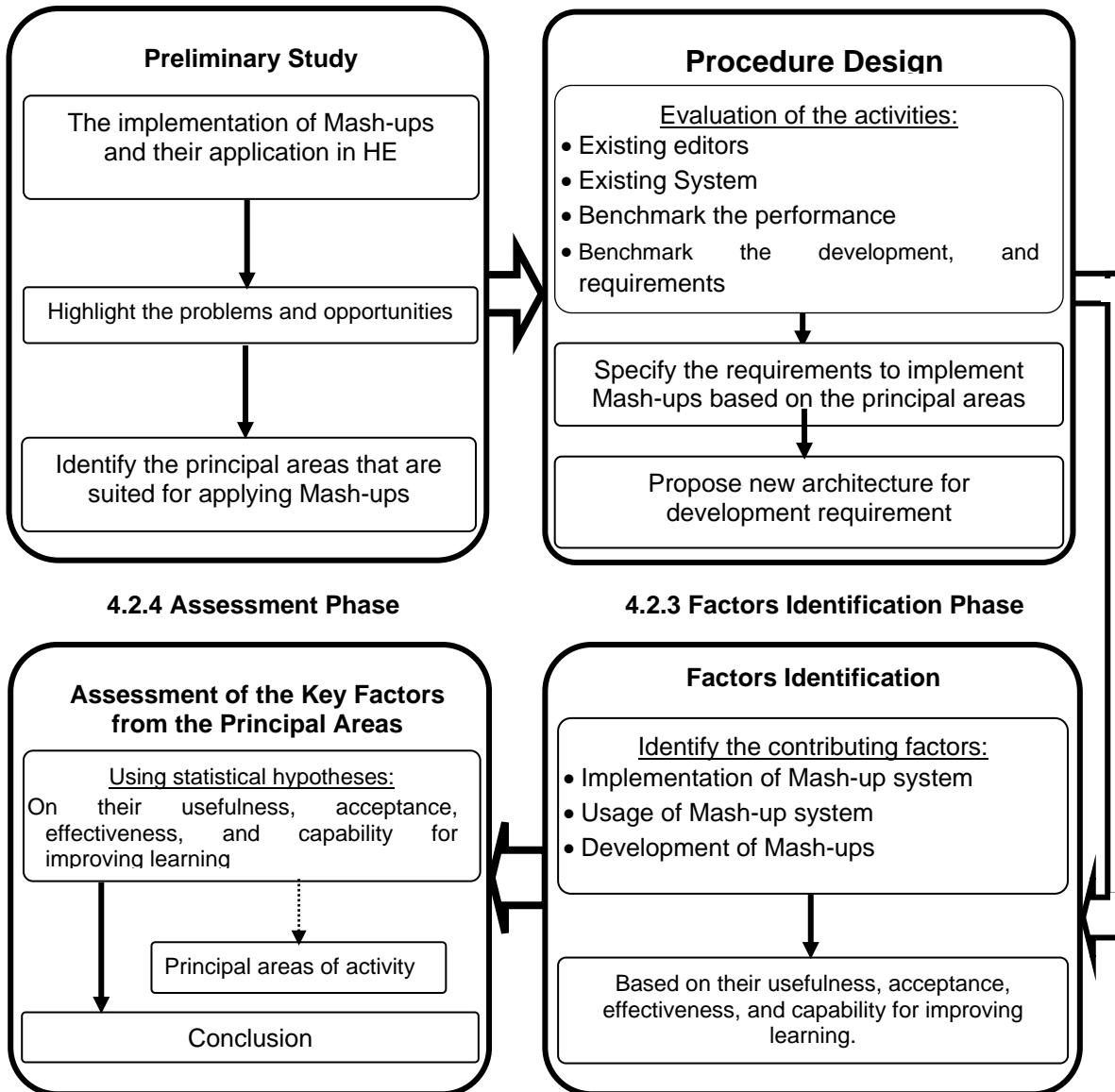


Figure 1. Conceptual Framework for Mash-ups in HE

D. Assessment phase

This phase follows the factor identification phase, and involves a statistical assessment to ensure that the expectations are met and the results verified. The assessment phase process consists of an assessment of the key factors from the principal areas using statistical hypotheses on the usefulness, acceptance, effectiveness, and capability for improving learning. The assessment also includes: factor analysis, a reliability test, a chi-square test, a T test and cross tabulation.

VI. DISCUSSION

Following the steps in this framework carefully and completely will contribute significantly to the success of the task for which the framework is being used. At the start of this research, there was no evidence of the existence of a framework or conceptual framework for HE Mash-up development or usage. The authors have devised a comprehensive conceptual framework for HE Mash-up development and usage; the result shows great promise.

VII. CONCLUSION

This paper provides an elaboration of a newly introduced conceptual framework; this framework has been used in research and there has been clear evidence of the impact of its use.

VIII. FUTURE WORK

Mash-up development can be done rapidly and in an ad-hoc manner and so future research will elaborate on the architecture for Mash-up development; this is envisaged to be a layered architecture, where the stage of development and roles are shown in each layer.

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