

# virtualMe: A virtual teacher environment

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## Abstract

With an ever increasing integration of web technologies into our lives, there is a need to look at how this technology can be capitalised on. In a teaching and learning environment students, teachers and administrators are increasingly embedding web technology in their daily work.

This paper describes research into an internet based, teacher centred framework that can be used in a teaching and learning environment. It describes a web-based prototype that is being used to investigate what features are desirable in a web-based teacher focused information and knowledge system. A survey of existing and potential users is discussed in order to identify the perceived usefulness of some of the dimensions of the framework.

*Keywords:* Computing education, virtualMe, teaching and learning, computing education, computing practice, computing research.

## 1 Introduction

Over the past few years there has been an increasing reliance on the internet as a content and communication provider. In a teaching and learning environment students are relying on the internet for their research, teachers are using the technology to prepare and deliver their content and online learning management systems are used to provide an environment that allows content organisation and student administration. In recent times this has been extended to providing social structures where students can blog, post videos (for example, youTube), share images (for example, Flickr) and create a web presence (for example, mySpace, BeBo). Along side this is the advancing integration of mobile technologies with SMS text messaging, sound file sharing and podcasting.

So, how can information technology be capitalised on in a blended (face-to-face and online) teaching and learning environment. The question this paper addresses is "What features are desirable for a web-based teacher focused information and knowledge system?"

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## 1.1 Information and knowledge

In order to provide content, a teacher requires a mechanism to acquire, organise and disseminate information and knowledge. While the definition of information is clear, and can be thought of as "data invested with meaning" or *contextualised* data, there is still debate as to what constitutes knowledge (Davidson and Voss, 2002:52-53).

Central to the definition of knowledge is that it belongs to an individual. For example, Nonaka (1994, p. 15) includes "the commitment and beliefs of its holder". Meisenberger and Seiwald (2002) emphasis the individual and include a social dimension, to quote "Only a small part of individual knowledge is generated through the process of individual experience. Most parts are socially derived."

Therefore, a knowledge acquisition, management and dissemination system should belong to an individual (as it is based on beliefs) and include mechanisms not only to represent information but to allow for the social construction of knowledge.

## 1.2 Virtual teacher

What features are desirable for a web-based teacher focused information and knowledge system? Content delivery is a major component and as such there is a requirement to acquire, organise and disseminate it. In a face-to-face delivery, content is often viewed as a series of overhead projections (commonly in the form of PowerPoint slides). Notes may be provided that support the content of the slides, since the slides are usually created as a means to focus the face-to-face delivery and discussion.

In order to have a context, the slides need to be placed in a structure. The presentation is placed in a learning domain, while the individual slides are placed in a predefined sequence. An identifiable issue arises when content is required in more than one place. For example, the ability to resize a graphic is relevant in all the domains where images are utilised, for example; multimedia, web page development, and word processing.

The content on each slide is composed of a variety of media elements, or digital assets. These can include unstructured media such as text, images, sounds, animations and video or structured elements such as a document (doc or pdf file), a flash animation, or link to web sites. As before these assets may be reused in many places in the knowledge system.

In a face-to-face session students and teacher share their knowledge, possibly by using a data projector to focus on a small fragment of content. As a web-based system may be referred to 24 hours a day seven days a week, a feedback system is important.

## 2 virtualMe Prototype

In order to explore which features would be desirable, an action research approach has been taken and several prototypes developed and trialed. Based on these prototypes a framework has been developed consisting of five dimensions: context; structure; content; media elements; and annotations.

Initial prototypes developed an overall structure, and these have evolved into the current prototype, coined the “virtualMe” (Verhaart & Kinshuk, 2005). This embodies the concept that the environment organised information and knowledge centred on an individual, in this case a teacher, and provides mechanisms for social interaction.

### 2.1 Dimensions

Based on feedback from the prototypes, five dimensions were identified as desirable in a knowledge acquisition, management and dissemination system, and these form the framework of the virtualMe: context; structure; content; media elements; and annotations

As information is “contextualised data” it is important to place content in a structure. The overall structure or framework is the virtualMe itself, that is, the information and knowledge important to the owner. At the second level, the content needs to be organised into logical domains. In a teaching system these would generally be the areas of expertise such as Multimedia, or Web construction, or may include interest areas such as research, hobbies, and so forth. A domain can further be broken down into topics, topics to lessons, lessons to slides, and slides into digital assets.

Therefore, to manage context a structure is desirable. In the case of the virtualMe prototype a backbone taxonomy (Guarino, & Welty, 2002) approach has been used to manage the overall structure. A multimedia taxonomy is illustrated in **Figure 1** (center column).

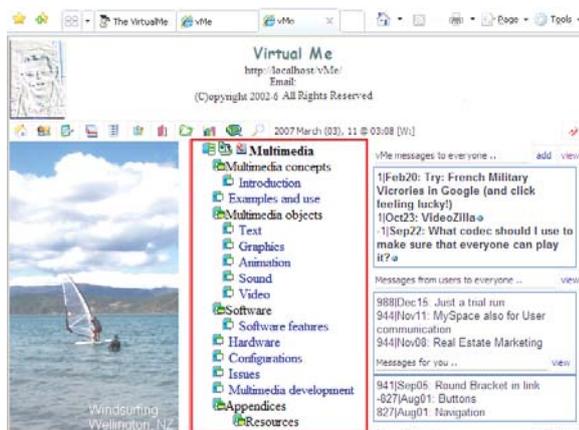


Figure 1: virtualMe structure

The concept of a slide of content is a fundamental building block of the virtualMe, and has proven to be a useful and usable size for managing and organising content. In order to provide a consistent reference the slide of content needed to be defined and in order to simplify discussion the term “sniplet” was coined. It has been defined as “a piece of knowledge or information that could be represented by one overhead transparency”. (Verhaart, 2003).

The sniplet is illustrated in **Figure 2** and shows some of the core dimensions of the virtualMe. The content is represented in a format suitable for projecting on a data-projector. The structure is displayed as the breadcrumb sequence (top left) and as a position in a sequence (ball on top right).

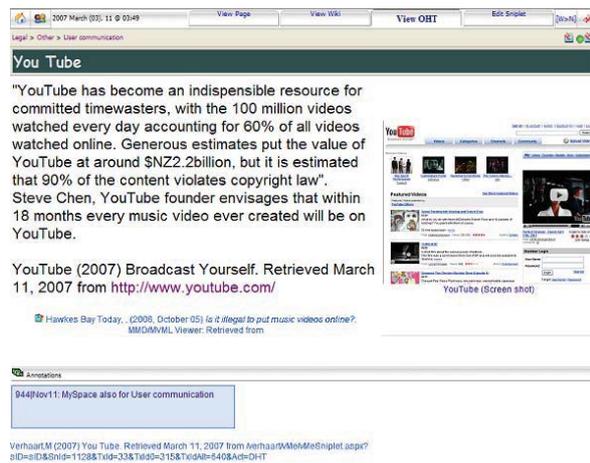


Figure 2: sniplet in OHT view

The sniplet illustrated in **Figure 2** is composed of several digital assets. These include some text, an image, a reference to the source of the information, and a URL link. The ability to be able to manage digital assets is an important part of any knowledge system. A digital asset can be used by multiple sniplets, and this creates an interesting contextualisation issue.

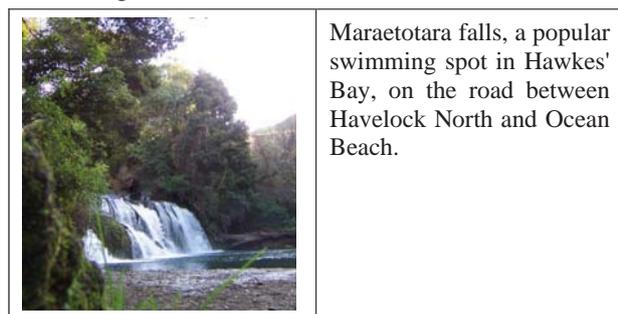
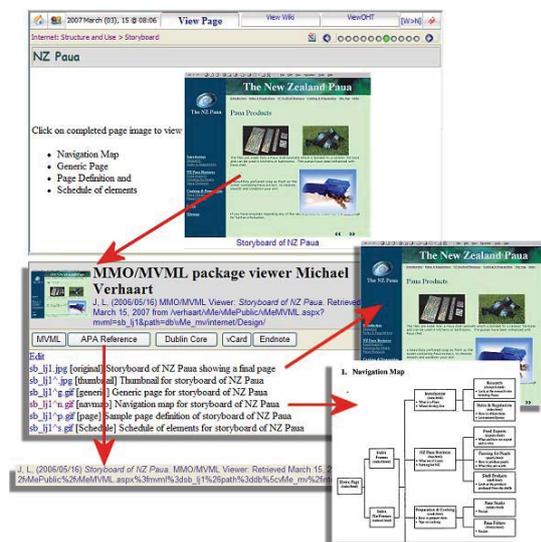


Figure 3: A waterfall

For example, if we look at an image of a waterfall (**Figure 3**), and separate it from the text attached it will lose context. In order to manage the digital assets a significant amount of research has been carried out by the author into how this can be managed. In order to retain context, metadata needs to be attached. Attaching metadata to digital assets has been available for many years, but unfortunately unless it is perceived to be

useful, in many instances is not created (Philips, 2000; Goldfarb & Prescod, 2002). The virtualMe uses meta-data attached to each digital asset to manage the context, for example: to create captioning information; a descriptive tool-tip; and provide referencing information.

Another desirable feature that has emerged from the prototypes is the ability of the digital asset to contain multiple representations. For example, if an image is a photo of a person, it would be useful to additionally have a business card, a curriculum vitae, an audio clip with the correct pronunciation, and so forth. This has required the design and implementation of a multimedia object (MMO) package containing a meta-data file that describes the object, and the multiple files. In the virtualMe each media element is represented by an MMO, and when clicked on will hyperlink to the MMO package. This is illustrated in **Figure 4** where an image of a web page links to storyboard design elements including a navigation map, page description, element schedule as well as produces an APA style reference.



**Figure 4: Multimedia Object**

To allow for the acquisition of the knowledge of users (or site visitors) the virtualMe includes an annotation dimension (Verhaart and Kinshuk, 2006). This is becoming common on many web sites where user input and comment is requested. For example: Adobe (originally Macromedia) LiveDocs (Adobe, 2007), where the help system is replicated online and allows users to enter comments; Microsoft's support network (Microsoft, 2007) solicits responses in both likert scale and formative styles.

Displayed on the left of **Figure 1** are a series of panels that allow for annotations in the system to be displayed. An annotation attached to a snippet is displayed in a panel at the bottom of **Figure 2**. The prototypes identified two annotation types: out of context (or global) annotations, and in context annotations. Out of context annotations are those that are not directed at a specific piece of content and may be general comments to all users. For example, a comment that gave a url to information about comet McNaught that was overhead in January 2007. In context

annotations are those attached to content, such as a snippet.

## 2.2 Survey

In order to assess the efficacy of the virtualMe framework, a survey was developed that would investigate four areas: the overall framework; the annotation framework; Resource acquisition, management and sharing; and teaching and learning.

### 2.2.1 Methodology

A well respected method used to evaluate information technology based system is the Technology Acceptance Model (TAM), as conceived by Davis (1989). The Institute for Scientific Information Social Science Citation Index listed 335 journal citations between 1999 and 2004 (Money & Turner, 2004). It has proven to be a reasonably accurate predictor of both users' intentions and the system usage and is centred on two primary belief constructs; ease of use and perceived usefulness.

Based on this model a survey was constructed with questions using ordinal values on a Likert scale with an opportunity for respondents to provide free-form responses. Ethical approval was obtained. Requests to complete the survey have been circulated to a wide audience of people involved in teaching and learning. As this is a technology related project a certain level of computer expertise is necessary, and since the system uses web technologies, this automatically limits responses.

Once these elements were identified, a survey into the perceived usefulness and easy of use has, and is, in the process of being carried out.

### 2.2.2 Data collection

To be able to complete the survey a respondent must first have used the system. For those unfamiliar, a walkthrough was provided as a PowerPoint presentation, a Word document with written instructions and a video. Respondents were then encouraged to "play" on the system, and once they felt concepts were understood, were asked to complete the survey.

Limitations were identified and questions to determine bias were included. A confounding variable is the ease of use of the system, that is, whether the system itself influenced the responses. Hence, the second part of the TAM model solicits feedback on ease of use.

The survey instrument was then pre-tested using colleagues and existing students, and from feedback modified accordingly.

Apart from past students that had used the system, the requirement to learn then play with the system required a significant time commitment from survey respondents. Hence, responses from a large number of people were solicited, and as at 11<sup>th</sup> March 2007, 56 responses had been received.

### 2.2.3 Results and discussion

The following analysis is based on results retrieved from the database as at the 11<sup>th</sup> March 2007. The on-line survey form continues to collect data and it is the author's intention to complete the analysis towards the middle of this year.

The survey respondents were made up of a wide cross section of the teaching and learning community. With 40 students, 12 educators and 5 visitors (6 indicated other). Males made up 52% of the respondents with females 45% (3% left this question blank).

In order to ascertain the efficacy of the virtualMe, perceived usefulness was measured. An ordinal Likert scale ranged from useless, not useful, useful, very useful and don't know. It was possible for respondents to leave the response blank.

"Don't know" and blank responses are excluded from the following analysis since they do not provide a measurable response either for or against the question posed.

The option "useless" was almost never selected and in order to facilitate analysis has been combined with Not useful.

**Table 1** summarises some of the main findings regarding the overall framework (as percentages);

**Table 1: Overall framework**

	Not useful (%)	Useful (%)	Very useful (%)
The ability to combine content in a continuous view	0	33	67
The ability to view content in a page layout is ...	2	35	63
The ability to include content in many places	0	43	57
To have referencing information available on each page is ...	4	31	65
The "feeling" that I am interacting with a person rather than content is ...	16	44	40

It can be observed from the results that the way in which content is presented is perceived as important. Providing referencing information was generally perceived as being important and this probably reflect the teaching and learning focus of the respondents. 16% of the respondents felt it was not useful feeling that they were interacting with a person.

**Table 2** displays some of the results from the annotation framework questions.

**Table 2: Annotation framework**

	Not useful (%)	Useful (%)	Very useful (%)
The ability to have content changed over time due to adding annotations is ...	2	28	70
Annotations generally are ...	6	49	45

Annotations were perceived as being useful and significantly as very useful with their ability to influence a change in content over time. One of the respondents commented "cannot say whether and how often I would really use it also. But it's nice to have the option!" Reviewing the actual annotations entered into the prototype, 62 annotations were added to the system over a 12 month period by users, and 42 by the owner of the virtualMe site. With approximately 120 users registered in the system, and excluding the owner of the virtualMe this equates to about 1 annotation for every 3 users.

**Table 3** summarises responses from a teaching and learning perspective.

**Table 3: Teaching and Learning responses**

	Not useful (%)	Useful (%)	Very useful (%)
Using virtualMe for my teaching/study would be ...	2	39	59

Only 2% of respondents felt that using the virtualMe for teaching and study would not be useful.

Questions relating to ease of use were divided up into the same areas as Perceived usefulness. The ordinal Likert scale used was "Difficult, No easy, Easy, Very Easy" and included Don't know and the ability to leave the question blank. Analysing the feedback showed that over 83% of the respondents consistently rated the system as easy or very easy.

Respondents were asked to comment on whether there were any issues that could have affected their responses. Apart from a problem with the system running slowly there were no other major issues identified.

### 3 Conclusion

This research question considered in this paper was "What features are desirable for a web-based teacher focused information and knowledge system?" and a framework that can be used in a teaching and learning environment was described. Five dimensions were outlined: context; structure; content; media elements; and annotations, and on-line prototypes that explored the viability and feasibility of such a framework have been developed. The current iteration coined the virtualMe, as it is centred on the educator.

A survey was (and is being) conducted to ascertain the perceived usefulness of the framework and the features. Results to date indicate that the proposed virtualMe framework and the five dimensions are perceived to be useful or very useful by a significant number of the respondents, in most cases in the order of 90%.

Should you wish to provide feedback and participate in the survey, it can be accessed at <http://www.virtualMV.com>. Instructions are provided in the sticky note pane in the lower part of the page.

#### 4 Acknowledgements

The author would like to thank K Hagen-Hall for her initial feedback when preparing this paper, and the conference reviewers for their comments.

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