Evaluation of E-Portfolio Systems

Klaus Himpsl-Gutermann & Peter Baumgartner

Introduction

E-portfolios are a new type of software and it is still relatively vague to determine, which functions are obligatory – that is which functions constitute characteristic features – and which functions are just optional ("nice to have"). This chapter describes the concept and the results of a research project which was conducted to evaluate e-portfolio systems, and aims at providing decision guidance for implementing e-portfolios – first and foremost from the pedagogical perspective. It consists of two main parts: the first part introduces the method of evaluation and a criteria checklist for e-portfolio systems, which can be used by institutions to carry out evaluations on their own, depending on their individual focal points. The second part summarizes the results of an evaluation carried out in the year 2009 and gives recommendations, primarily aimed at institutions of higher education

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The crucial question: What is an e-portfolio system?

Presently the market of e-portfolio systems has simply become unmanageable (Strivens, 2007). This is due to the fact that the rapid development from the paper portfolio to the electronic portfolio was particularly pushed by various Web2.0 applications, which can be used for certain elements or aspects of an

e-portfolio. The crucial question is: Which system can be called an e-portfolio system?

In his position paper, Serge Ravet – director of the European Institute for E-Learning (EifEL) and initiator of the campaign "e-portfolio for all" – puts the various e-portfolio terms straight and tries to outline the foundation for e-portfolio software-architecture of the future, from a rather organizational point of view (Ravet, 2007, see figure 1). Graham Attwell, an expert on advanced training and e-portfolios from Wales, is of a different opinion. According to him, the future of e-learning lies primarily in the creation of a "personal learning environment (PLE)" (Attwell, 2007). Both experts formulate their ideas for the future of individual learning processes, in which the electronic portfolio plays a major role – even if they do so from two totally different perspectives. At the same time they both agree that at the moment the educational and technological implementation with current software products is still far from these visions.

Figure 1: E-Portfolio according to Ravet

But which recommendations can experts give to an institution in higher education now, if they want to implement a system for the use of e-portfolios within their studies?

In order to profit from the advantages of online communication and cooperation, experts agree that it is recommendable to choose a web-based solution, (Sweat-Guy, R., & Buzzetto-
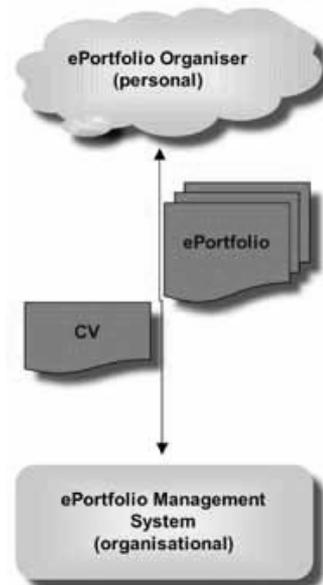
More, N. A., 2007). However, the data, which come into consideration for the use in a personal portfolio, can be stored in completely different systems, as figure 2 shows.
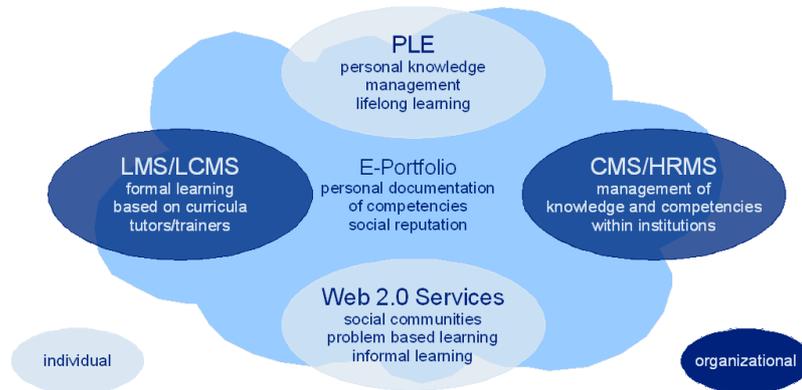
Figure 2: Overview of software-systems with e-portfolio share (own model, based on Erpenbeck & Sauter, 2007)

Which kind of system best suits the intended portfolios? Shall existing learning platforms or content-management-systems be used for portfolio work? Or is it better to fall back on Web2.0 applications? Which aspects are more important: individual or institutional ones? And, which criteria can an institute of higher education utilize to determine which kind of portfolio system is science-based and forward-looking?

The Research design and evaluation process

The method of "Qualitative Weight and Sum (QWS)"

In literature, various evaluation methods for software products are offered (Scriven, 1991). The most important ones are:

- Criteria checklists
- Recensions
- Comparison groups
- Opinion of experts

Each of these methods holds a number of advantages and disadvantages, so that in practice a useful combination of various

methods proves to be most suitable. For the evaluation the method of "Qualitative Weight and Sum (QWS)", originally developed by Michael Scriven, was applied, which eliminates the disadvantages of mere numerical operations as much as possible (Scriven, 1991). The QWS-method represents an iterative process of evaluation, which focuses on a weighted list of criteria. The following classification proved to be most suitable:

- Essential (E)
- Extremely important (*)
- Very important (#)
- Important (+)
- Less important (|)
- Not important (0)

In the first step, a panel of experts assesses the importance (weighting) of the criteria of a prepared catalogue. After that all 0-dimensions can be deleted, as these criteria were not regarded as important.

In the second step, the software product evaluands are assessed by means of the essential criteria (E) in regard to the question if the minimum requirements are met. If not, the software products are deleted from the list, which considerably reduces the amount of work for the process that follows. It is important to make sure that the criteria which were regarded as essential are "pass-fail" attributes (e.g. multilingualism of the surface – Yes/No).

Then, in the third step, the actual evaluation is carried out. It assesses the functions of the software products which are still part of the list. It must be taken into consideration that the weighting of the criterion at the same time represents the maximum possible value which an evaluand can reach in a certain category.

As a result of the previous process a hierarchy is developed (ranking), which can be provided with an integrating final assessment (grading), e.g. "will be part of the top 10-list".

A disadvantage of the QWS-method is that it does not contain a definite algorithm for decision making according to a ranking, but has to be reapplied in the form of an iterative procedure several times, in order to receive significant results (e.g. paired comparison of two evaluands). Due to this fact, the method constantly changes between a holistic and an analytical point of view, but always provides meaningful and, above all, comprehensible and revisable results.

The advantages of the method are in particular:

- The evaluands, which remain on the final list, basically meet the minimum requirements of an e-portfolio system.
- The overview in table form (see above) assures a good initial assessment of the list of evaluands.
- The method allows a further comparison of evaluands, which after a first assessment by the institution, are taken into account for implementation.
- A weighted criteria checklist with pedagogically motivated meta categories permits a further evaluation with an individual setting of priorities.

The application of this method on e-portfolio systems will be described in the following section.

The criteria checklist for the evaluation

The development of the criteria checklist was a multi-level, iterative process, which took three major sources into consideration:

1. studies on designing a taxonomy for e-portfolios (Baumgartner, Himpsl & Zauchner 2009),
2. 69 e-portfolio system criteria, which were developed in course of the WCET-study (2006),
3. portfolio features identified by Sweat-Guy and Buzzetto-More (2007).

First, a meta-level layer was introduced with five major categories:

1. Collecting, organizing, selecting

2.   Reflecting, testing, verifying and planning
3.   Representing and publishing
4.   Administrating, implementing, adapting
5.   Usability

The first three categories refer to prototypical portfolio processes as were described in the taxonomy; the other two categories comprise of general criteria, which distinguish between the point of view of the administrator (server-based) and the point of view of the user (client-based).

The 69 criteria of the WCET study were commented on and justifiably classified into these meta-level categories, whereas individual features from the list of Sweat-Guy and Buzzetto-More were taken into consideration.

In course of this process, some criteria (less important, redundant, etc.) were eliminated. As a result a new criteria checklist was created in an iterative process, which was assessed by 25 e-portfolio experts and weighted according to the QWS-method.

In addition to that, especially in the definition of the minimum requirements, the following pedagogically motivated assumptions were taken into consideration:

- Electronic portfolios "belong" to the learners – that means that learners must have the right to use their data; they must be able to individually administer the access to their data themselves. After the portfolio work at a certain institution is finished, their data must still be available to them.
- The e-portfolio system does not serve classroom management, that means that in particular tools for communication and collaboration in the group of learners are not part of the evaluation.
- The individual benefit for the learners represents the most important thing; the software is therefore not really regarded as a competence management system of the institution.

The result of this process was a weighted list of altogether 34 criteria, as illustrated in table 1.

Table 1: The criteria checklist for the evaluation of e-portfolio systems	
Essential criteria	
Input of keywords	E
Internal cross-references	E
External cross-references	E
Publication in the web	E
Pricing and license schemes	E
Simple data export	E
Support of all currently used A-grade browsers (a term coined by yahoo, see http://developer.yahoo.com/yui/articles/gbs)	E
Collecting, organizing, selecting	
Simple data import	*
Comfortable data import	#
Searching, sequencing and filtering	#
Annotations to files	#
Aggregating (integration of external data via feeds)	+
Version control of files	#
Reflecting, testing, verifying and planning	
Guidelines for reflection	#
Guidelines for competences	#
Guidelines for evaluation (self assessment, assessment by others)	#
Guidelines for goals, personal development and career management	#
Guidelines for feedback (advice, tutoring, mentoring)	#

Representing and publishing	
Access control by users (owner, peers, authority, public)	*
Adaptation of the display: layout (flexible placing, boilerplates)	#
Adaptation of the display: colors, fonts, design	#
Publishing of several portfolios, or alternatively, various views	#
Administrating, implementing, adapting	
Development potential of the provider, company profile	#
Enabling technologies (programming language, operating system, ...)	#
Authentification and user administration (backed-up interfaces, ...)	#
E-Learning-standards	#
Migration/storage/export	*
Usability	
User interface	*
Syndicating (choice of feeds for the individual portfolio)	#
Availability, accessibility	*
Navigation/initial training/help	#
External and internal information function	#
Interchangeable, adaptable user-defined boilerplates	#
Personal storage, respectively export function	*

Despite the great number of e-portfolio experts, the dispersion about the weighting of the criteria was low (average always complied with median).

For lack of space, the whole criteria checklist as well as the detailed descriptions of the individual criteria cannot be included here in full length. However, institutions can apply them in course of their own evaluations and can use a different weighting of the criteria, considering the aims and main focal points of their individual institutions.

The results of the evaluation conducted in 2008

The following sections sum up the main findings of an evaluation of e-portfolio systems, carried out in spring 2008 on behalf of the Federal Ministry of Science and Research. The illustration of the findings has two major aims: firstly, it shows how the evaluation method can be applied and how the results can be evaluated. Secondly, useful recommendations are expressed, primarily aimed at institutions of higher education.

The shortlist of recommendable products

Considering the propositions and minimum requirements, a list of roughly around 60 e-portfolio providers was created at the end of January 2008. The evaluation of the software products was carried out in the period of April/May 2008 by the same panel of 25 e-portfolio experts, using the weighted criteria list. After the last evaluation period in June/July 2008 a shortlist of 12 products was created that can be recommended for e-portfolio implementations in higher education (see table 2).

Table 2: The shortlist of recommendable products		
Product	**Provider**	**License**
Drupal ED	funnymonkey	open source
Elgg	curverider	open source
Epsilen	BehNeem LLC	commercial
Exabis	Exabis Internet Solutions	open source
Factline	factline Webservices GmbH	commercial
Fronter	Fronter International	commercial
Mahara	eCDF New Zealand	open source
Movable Type	Six Apart	open source
PebblePad	Pebble Learning Ltd	commercial

Sakai	The Sakai Foundation	open source
Taskstream	Taskstream Inc.	commercial
Wordpress	automattic	open source

The products in the list can be categorized according to four different software systems:

- E-portfolio-Management-Systems: Products deliberately offered to institutions as e-portfolio systems like Epsilen, Mahara, PebblePad and Taskstream
- Learning Management Systems (LMS) or Learning Content Management Systems (LCMS) with integrated e-portfolio functions like Exabis, Fronter and Sakai
- Integrated systems respectively software families (various CMS with rather "indirectly" possible Portfolio functions) like Drupal ED, Factline and Movable Type
- Other systems respectively kinds of software like Elgg and Wordpress

The commercial products offer different forms of licenses: an all-inclusive offer like Factline, licenses per user like Fronter, or a combination of both like Epsilen, PebblePad and Taskstream.

Assessment of evaluands

The evaluands were assessed in the 27 weighted criteria. Due to the weighting of the criteria checklist the assessment * could be reached six times, the assessment # 19 times and the assessment + two times as a maximum score.

A first ranking results from arranging the list according to the three "positive" evaluations, which means first of all according to *, and, in the event of a points draw, subsequently according to # and finally according to +.

*Table 3: Ranking according to the three "positive" evaluations (first *, then #, finally +)*

Product	*	#	+	|	0
Drupal ED	3	10	7	6	1
Elgg	3	10	6	4	4
PebblePad	3	6	15	2	1
Sakai	3	6	9	6	3
Mahara	2	9	9	3	4
Movable Type	2	9	7	7	2
Exabis	2	7	5	5	8
Factline	2	6	7	7	5
Taskstream	1	11	6	4	5
Wordpress	1	11	5	4	6
Fronter	1	5	14	6	1
Epsilen	0	5	9	6	7
max. score	6	19	2	0	0

This overview (see table 3) already outlines the following points:

1. All software products are far away from the maximum score possible (at most 3 out of 6 *, at most 11 out of 19 #).
2. No software is convincing in all 27 categories, as can be seen in the evaluations of the columns | and 0.

For a more detailed analysis and as decision guidance for the choice of the most suitable software product for a given institution, the list has to be examined from different perspectives. Within the framework of the QWS-method, the following points have to be taken into consideration:

1. The table is not supposed to be interpreted as a definite ranking from place 1 to place 12.

2. It would be a mistake to assign an overall achieved score to each product on the basis of a numerical scale.
3. The list serves as first evidence for a more detailed analysis, in the course of which the products should be compared by pairs in an iterative process.

According to the first automatic grading as shown in the table , Drupal ED and Elgg would emerge as the two top-quality products, after that a group from PebblePad via Sakai and Mahara to Movable Type with a similarly distributed positive assessment and finally all other products.

However, the examination of e.g. the assessment of PebblePad shows that the automatically generated lists can only serve as a starting point for a more detailed qualitative analysis. In contrast to Drupal ED and Elgg, PebblePad reached the assessment # only six times. On the other hand, it reached the assessment + 15 times, so that it has an overall score of 24 "positive evaluations", in comparison to 20 "positive evaluations" of Drupal ED and 19 of Elgg.

In addition to carrying out an analysis of „strengths", one can also examine the weaknesses of a software product, that means the results in the columns | and 0. The assessment 0 means that a certain feature does not exist at all or is not sufficiently pronounced, | means weakly pronounced.

According to this ranking, PebblePad would be the sole market leader with only three "negative" evaluations, after that Drupal ED and Fronter, which takes a huge step forward in comparison to the first ranking. Movable Type to Taskstream could be regarded as the center span, followed by the rest.

The example of Fronter shows very well that a differentiated examination is inevitable. Fronter could reach the best assessment * only twice; at the same time it also reached the lowest assessment 0 only once and can therefore be regarded as a very balanced product.

To bring these considerations in line, a new ranking has to be designed, resulting from a pairwise comparison of the assess-

ment of individual evaluands. In this new ranking, many prod-
ucts could be regarded "neck and neck", which would make the
list look a bit different. However, there is clear evidence for
three groups:

1.   a top trio with PebblePad, Drupal ED and Elgg
2.   an upper center span with Mahara, Movable Type
     and Sakai
3.   a second half with Fronter, Taskstream, Factline,
     Exabis, Wordpress and Epsilen, whereupon Epsilen
     falls a bit off

An important advantage of the QWS-method is that on the ba-
sis of the assessment results, an analysis of the products can be
carried out with an individual setting of priorities. What such
an analysis might look like will exemplarily be described in the
following section.

Assessment of evaluands in regard to portfolio processes

For the criteria checklist several meta-level categories were
introduced, the first three of which are pedagogically motivated
and correspond to portfolio processes. The five meta-level cat-
egories are:

1.   Collecting, organizing, selecting
2.   Reflecting, testing, verifying, planning
3.   Representing and publishing
4.   Administrating, implementing, adapting
5.   Usability

What would the assessment look like if the categories 4 and 5
were initially disregarded? That means which products support
typical portfolio processes particularly well? To answer this
question, the evaluations of the first three meta-levels were
summed up, assorted first according to their strengths, after
that according to their weaknesses and finally compared pair-
wise (see table 4).

Product	*	#	+	|	0
PebblePad	2	3	8	1	1
Mahara	1	5	6	2	1
Taskstream	1	6	4	2	2
Factline	2	4	3	5	1
Fronter	1	2	8	3	1
Drupal ED	1	4	4	6	0
Elgg	1	4	4	3	3
Sakai	2	2	4	5	2
Movable Type	1	4	3	6	1
Wordpress	1	3	3	3	5
Epsilen	0	3	4	3	5
Exabis	0	3	1	5	6
max. score	2	12	1	0	0

Table 4: Table combining different rankings according to evaluation scores in meta-level categories 1, 2 and 3

In the opinion of the authors, there turn out to be three groups in regard to the criteria of supporting portfolio processes. PebblePad, Mahara and Taskstream represent a top-quality trio with a high assessment; they show weaknesses in only very few categories. These three products have especially been developed as e-portfolio software and, according to this evaluation, they really meet the requirements.

After that, there is a wide center span with Factline, Fronter, Drupal ED, Elgg, Sakai and Movable Type. These products show restrictions concerning certain portfolio features; the main reason for that lies in the fact that none of these products was developed as an e-portfolio system; they represent differ-

ent software types but were examined with reference to their capability as e-portfolio systems.

Wordpress, Epsilen and Exabis show weaknesses in certain features, which can be traced back to various reasons: Being Weblog software, Wordpress just partly covers portfolio processes. Epsilen, which was already developed as an e-portfolio product by Ali Jafari several years ago, offers a newcomer numerous supporting boilerplates. But, on the other hand, it is very inflexible, offers hardly any scope for design and, from the technological point of view, it is not at all comparable to more recent Web 2.0 developments. Finally, Exabis, as a plugin for the learning management system Moodle, primarily holds weaknesses in regard to representing and publishing. There is no individual scope for design and the processes for publishing and giving feedback are rather laborious.

Conclusion and recommendations

As a conclusion, the products were examined separately and compared in all five meta-level categories. On the one hand, all individual evaluations were accounted for in regard to the corresponding criteria. On the other hand, the comments and qualitative analysis, which can be seen in more detail in the individual reviews, were taken into consideration as well. For a clear illustration, a simple scale from one to three ticks was chosen, whereas three ticks represent an explicit recommendation in the respective meta-level category (see table 5).

Table 5: Overview: Results of the evlauation of e-portfolio systems in alphabetical order.

Evaluation of E-Portfolio Systems Overview (May 2008)		Effort for first time installation	Collecting, Organizing, Selecting	Reflecting, Testing, Verifying, Planning	Representing, Publishing	Administration	Usability
Product	Licence						
Drupal ED	open source	high	✔✔✔	✔	✔✔	✔✔✔	✔✔✔
Elgg	open source	medium	✔✔✔	✔	✔✔	✔✔✔	✔✔✔
Epsilen	commercial	low	✔	✔✔	✔	✔	✔
Exabis	open source	low	✔	✔	✔	✔✔✔	✔✔
Factline	commercial	medium	✔✔✔	✔	✔✔✔	✔	✔
Fronter	commercial	medium	✔✔✔	✔✔	✔	✔✔	✔
Mahara	open source	low	✔✔✔	✔✔	✔✔✔	✔✔	✔✔
Movable Type	open source	high	✔✔✔	✔	✔✔	✔✔✔	✔✔
PebblePad	commercial	low	✔✔✔	✔✔	✔✔✔	✔✔	✔✔
Sakai	open source	medium	✔✔	✔	✔✔✔	✔✔✔	✔✔
Taskstream	commercial	medium	✔✔	✔✔✔	✔✔✔	✔	✔✔
Wordpress	open source	medium	✔✔✔	✔	✔✔	✔✔	✔✔✔

The additional category "effort for first time installation" describes the time expenditure the institution has to count on if it prepares its platform and the users for portfolio work. Epsilen, Exabis, Mahara and PebblePad are "out of the box" systems, which can be used right after the first time installation. Factline, Fronter, Sakai and Taskstream are systems with a modular design principle and hold the advantage that they are very flexible. But, on the other hand, they also require basic adaptations in cooperation with the provider. A similar situation applies to the Blogging software Wordpress. Drupal ED and Movable Type as Content Management Systems, as well as the social networking software Elgg are, after the first time installation, just conditionally suitable for portfolio work and require cer-

tain adaptations and additional installations, in order to provide users with the full comfort of an e-portfolio system.

The section "collecting, organizing, selecting" shows a very pleasant result: most of the products are recommendable in this category. A result which is by far worse was achieved concerning the boilerplates for "reflecting, testing, verifying and planning"; just Taskstream is thoroughly convincing in this category. For the composition of a presentation portfolio Factline, Mahara, PebblePad, Sakai and Taskstream can be highly recommended. But it has to be mentioned that Drupal ED, Elgg, Movable Type and Wordpress did not achieve the best assessment in this category because an individual access policy and keeping more portfolios at once are not possible or just possible in a very laborious way. In regard to the category "administrating", five products are highly recommendable; in the "usability" section this holds true for only three products, namely the three "big" open-source projects Drupal, Elgg and Wordpress.

Mahara and PebblePad represent the most balanced products, which can be used for portfolio work without huge time expenditure for installation. Both systems require some acclimatization effort but – once their logic is clear – they are easy to handle. However, it has to be said that by abstaining from traditional structures of homepages (e.g. menu navigation, data management), PebblePad cuts its own idiosyncratic path. As "learning suites" Sakai, Taskstream and Fronter offer, in addition to an e-portfolio tool, various other tools to support teaching and learning processes; that is why they might under certain circumstances be interesting for institutions which want to install a learning platform as well.

Wordpress, Drupal ED, Elgg and Movable Type are completely different software types, but they can definitely be used for the purpose of portfolio work. Although they all require a relatively high adaptation effort at first time installation, they have the advantage, that they represent successful open-source projects with a huge and active community. They are the best

available technology and offer individually configurable solutions through various plugins. The Factline Community Server also offers the user individual solutions. But by employing a very particular concept, the software is not easy to handle for newcomers and certainly requires a much more intensive study. Exabis provides Moodle users with an easily operated and structured data pool with an export function, which is hardly offered by any other tool. On the other hand, Exabis shows serious weaknesses concerning the support of portfolio processes, especially in regard to the design of a presentation portfolio. Epsilen is a simple and clearly arranged system, which offers support for designing an e-portfolio as a personal homepage. But at the same time it is also highly inflexible; the scope for design is very limited and the technology is partly antiquated, which calls for the further development of the software.

In addition to the qualitative descriptions of the 12 software products, the detailed criteria checklists are available on request for a more detailed analysis.

References

Attwell, G. (2007). *Personal Learning Environments - the future of eLearning?* eLearning Papers, (vol. 2 no. 1), p. 1 - 8.

Baumgartner, P. (2006). *Unterrichtsmethoden als Handlungsmuster - Vorarbeiten zu einer didaktischen Taxonomie für E-Learning.* In: DeLFI 2006: 4. e-Learning Fachtagung Informatik - Proceedings. Publ.: M. Mühlhäuser, G. Rößling und R. Steinmetz, Gesellschaft für Informatik. Lecture Notes in Informatics: P-87: 51-62.

Baumgartner, P., Häfele, H., & Maier-Häfele, K. (2004). *Content Management Systeme in e-Education. Auswahl, Potenziale und Einsatzmöglichkeiten.* Innsbruck: Studien Verlag.

Baumgartner, P., Himpsl, K. & Zauchner, S. (2009). *Einsatz von E-portfolios an (österreichischen) Hochschulen:*

Zusammenfassung - Teil I des BMWF-Abschlussberichts "e-portfolio an Hochschulen": GZ 51.700/0064-VII/10/2006. Forschungsbericht. Krems: Department für Interaktive Medien und Bildungstechnologien, Donau Universität Krems.

Erpenbeck, J., & Sauter, W. (2007). *Kompetenzentwicklung im Netz: New Blended Learning mit Web 2.0* (1. Aufl., S. 316). Köln: Luchterhand (Hermann).

Häcker, T. (2007). *Portfolio: ein Entwicklungsinstrument für selbstbestimmtes Lernen: Eine explorative Studie zur Arbeit mit Portfolios in der Sekundarstufe I.* Hohengehren: Schneider Verlag.

Jafari, A. & Kaufman, C. (2006). *Handbook of Research on E-portfolios.* Hershey: Idea Group Publishing.

Ravet, S. (2007). *E-portfolio Position Paper.* Retrieved July 21, 2007 from http://www.eifel.org/publications/e-portfolio/documentation/positionpaper.

Scriven, M. (1991). *Evaluation Thesaurus.* 4th edition. Newbury Park: Sage Publications, Inc.

Strivens, J. (2007). *A survey of e-pdp and ePortfolio practice in UK Higher Education.* Retrieved April 11, 2008 from http://www.heacademy.ac.uk/assets/York/documents/ourwork/tla/personal_development_plan/survey_of_epdp_and_eportfolio_practice_in_uk_higher_education.pdf.

Sweat-Guy, R., & Buzzetto-More, N. A. (2007). *A Comparative Analysis of Common e-portfolio Features and Available Platforms.* In Issues in Informing Science and Information Technology Education (vol. 5, p. 327-342). Retrieved December 29, 2008 from http://proceedings.informingscience.org/InSITE2007/IISITv4p327-342Guy255.pdf.

WCET (2006). *EduTools E-portfolio Review.* Retrieved April 11, 2008 from http://e-portfolio.edutools.info.