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Developing a Taxonomy for Electronic Portfolios

1 Introduction

Ongoing educational discussions on e-portfolios assume that the appropriate use of this relatively new software tool can improve the efficiency and effectiveness of learning. A large and growing body of literature examines the various features of the software and the different kinds of application scenarios that exist for instruction and education.

Given this explosion of interest, it should be helpful to not only discuss the different cases of application and software features, but to also lay some kind of foundation: What exactly are the different characteristics of this type of software, how do they relate to each other and how can they be incorporated into a holistic view of educational scenarios?

The following article suggests and defines a set of specified features. These properties are grouped together according to different prototypes of e-portfolios. The main objective of this article is not only to present these kinds of substantiated characteristics as results, and therefore to account for a more accurate language use and a hopefully better understanding of how to successfully integrate this software tool into (higher) education. It also wants to show the analytic process of this developing enterprise. A better understanding of the different software functionalities and their relation to each other will help all of us, software developers as well as educationalists, to design tools and scenarios that are didactically more appropriate. From a specified pedagogical point of view not every technical property or set of characteristics makes sense, or is useful in every didactical setting; some can even impair the quality of learning. And vice versa: A tidy and consistent classification should be useful in choosing the software which fits best the intended didactical purpose.

2 Some epistemological considerations

Before going into the details of methodological consideration (how to develop a sound taxonomy), I will discuss some even more fundamental epistemological issues than the body of techniques used for developing the taxonomy. From an epistemological point of view, there is no hidden classification scheme of e-portfolios “out there” in the world of software and pedagogy, which has to be discovered. From the level of analysis (the chosen granularity e.g. micro, meso or macro level)

to the point of view that we elect to illuminate the yet unknown object, up to the language that we use to ascribe features to it, a taxonomy is always a construction guided by some basic theoretical principles.

A famous example of this deliberation can be found in the opening of Michel Foucault's book *The Order of Things* (Foucault 2002, p. XVI) where he cites "a certain Chinese encyclopaedia" drawn from a text by Jorge Luis Borges. The quoted encyclopaedia divides animals into the following categories: "a) belonging to the Emperor, b) embalmed, c) tame, d) sucking pigs, e) sirens, f) fabulous, g) stray dogs, h) included in the present classification, i) frenzied, j) innumerable, k) drawn with a very fine camelhair brush, l) *et cetera*, m) having just broken the water pitcher, n) that from a long way off look like flies." Another illustration occurs in the book *Women, Fire, and Dangerous Things* by the linguist George Lakoff (2002) where – from the perspective of our western culture – three seemingly different things in the Australian aboriginal language Dyirbal are included in one category named "balan". The inclusion of such different things in one category is not done at random, but has its own underlying system of thought, its own – but different – rationality. These examples not only show "the exotic charm of another system of thought" (Foucault), but the difficulty in comprehending these other inherently consistent systems with our own incommensurate traditional Western systems.

To understand the constructivist point of view, the old metaphor of the blind men and the elephant may be useful (cf. Fig. 1): Different people – all of them blind – are touching an elephant. They get in contact with different parts of their "epistemological object". From their differing viewpoints, they obtain very dissimilar impressions of the investigated part of the external world. Their diverse interpretations (snake, spear, fan, tree, wall or rope) are construed on the basis of their actual (isolated) experiences and guided by former experiences. In science, there is not a single "god's eye" view, no place for a neutral – and from the reference point of the investigated object – detached observer, but only a specified and therefore limited contact (experience) with certain aspects of the object. We perceive objects not with *the view from nowhere* (Nagel 1989), but always with the help of our bodies and the tools we rely on for getting in touch with given objects.

The segments of reality that we get in contact with arouse sensations (or perceived changes in our measuring instruments), which we are going to be interpreted later on. This is a situation similar to that of the blind men confronting the elephant: we not only have to construct a holistic picture from a limited amount of information, but we have to make clear-cut distinctions in order to differentiate parts of the observed object in order to describe its features. If one designates one part of the elephant with the word "trunk", this is just as much a construction as the concept of "rope" that a blind man might invoke to describe his experience.

These considerations are founded on four different assumptions:

1. We assume that every part of a body satisfies an essential functionality for the life of the observed animal. From our current understanding of the evolution and the workings of an elephant it seems rational, and in this relatively

in a complex scene we call nature and related to each other in manifold ways. To prevent the human bias associated with the concept “actor”, the actors-network theory (ANT) proposes to use the technical term “actant” for all kind of objects – animate and inanimate – which make a difference (Latour 2005). (From an epistemological point of view, only differences can be observed and ascribed to objects.) Under this semantic, the use of action words in sentences like “a jug *holds* water” or “a kettle *boils* water” demonstrates that actors are not only humans. ANT has used this perspective as a maxim for social science research: Instead of reifying reality and taking the “social” for granted, it has to be seen as a network of association which has to be explained itself. Instead of viewing the “social” as a kind of “solid stuff” that can be used to explain certain observed behaviour in the world, it has to be (de)constructed to get a deeper understanding of the interactions forming our reality.

On the other hand, it is wrong to despise consistent (social) constructions and to treat them like illusions. All perceived sensations are normally substantial, authentic and unfeigned. They refer to a yet hidden aspect of an outer world that exists independently from our sense organs. Through our specific interaction with this outer world, we perceive certain facets that are genuine. Our sense organs carve out certain parts of the world that exist independently from us, parts that we get in contact with and call reality.

Taking this reasoning seriously means that classification schema do not reflect the outer world as such, but are only constructions, guided by some central (theoretical) assumptions. The traditional term “Truth” does not capture this more complex relationship and constructivists like Ernst von Glasersfeld (1995) and Heinz von Foerster (2002) have therefore coined the concept of “fitness”. It is derived from a pragmatic epistemological concept. Like a key that has to exactly fit a keyhole to open or close a lock, our constructed theories also have to fit. In actions derived from interpreted observations lies success or failure. If our actions succeed, then we can say that we have grasped certain aspects of the world, but we still do not know if this executed action was the most efficient one or even if alternatives exist. We are like a blind woman in the woods who hears the rushing waters of a nearby river. Guided by her sense of hearing, she will – after some collisions with objects she may call trees – finally arrive at the river. But she will never be able to see the forest and therefore judge if her way was the shortest and best one.

3 Taxonomy as a framework for orientation

I understand taxonomy as a classification schema built by a system of consistent generative principles, procedures and rules guided by a functional logic appropriate for reflecting the (assumed) mechanism of action of the classified object.

Definition 1: Taxonomy

Even though developing this taxonomy is primarily a theoretical enterprise, it does not mean that the result itself is only important to theoreticians and therefore only of academic interest. If, for example, an educational organisation (e.g. school or university) wants to introduce e-portfolios in their curricula, it is vital to reflect in detail all the features that are necessary to obtain the desired functionality. It is therefore crucial not only to look into the functionality of the available software package and to determine if the necessary properties are at hand one by one, but also to investigate if the provided *system* of characteristics is appropriate for the intended pedagogical objectives.

As a *product*, a good taxonomy should serve as a convenient and helpful tool for practical purposes to support and facilitate a software selection procedure. On the other hand, the process of developing a systematic classification scheme for an e-portfolio itself is an important step in the construction of a theory on e-portfolios. As Kurt Lewin (1951, p. 169) said: “There is nothing as practical as a good theory.”

There are at least eight tasks a good taxonomy has to meet. (The sequence of the following list does not represent priorities.)

- a. **Integration:** Apparently isolated phenomena (e.g. different experiences in the implementation process of e-portfolios, different practices of utilization) can be grouped together (classified) according to some common attributes (criteria). This process is called classification and the taxonomy is the systematic practice and science of classification. The word has its roots in the Greek τάξις, taxis (meaning ‘order’, ‘arrangement’) and νόμος, nomos (‘law’ or ‘science’).¹
- b. **Orientation:** A consistent framework does not only provide an overview of important concepts and relevant features on an item by item basis, but should also account for their connection and links. A pedagogical driven taxonomy of e-portfolios should therefore not only list the different criteria, but should also explain where, how and why they relate to each other.
- c. **Information:** Precise wording with a limited vocabulary facilitates communication and reduces possible misunderstandings. Different experiences with e-portfolios cannot be compared in a consistent and uniform way, until a common language and theoretical framework exists as the yardstick and benchmark even if they can be related to each other.
- d. **Cost reduction:** Taxonomies can also be seen as a way of standardization. Grouping educational scenarios with certain common characteristics into a didactical taxonomy eases the search for an adequate situation and facilitates the process of the instructional design. Different experiences with e-portfolio practices – and in real life there are always discrepancies – are reduced to their shared pedagogical main characteristics. This simplifies the adaption of different cases of application, practices, situations and organisations.

1 <http://en.wikipedia.org/w/index.php?title=Taxonomy&oldid=308128449>

- e. **Transfer:** Taxonomies are the result of processes executed to reduce complexity. Taxonomies help to identify the similarities that are crucial for every transfer process in two ways: On the one hand, the different exemplars (objects, processes, situations etc.) are grouped together in the same class, to state more precisely, because they share properties to a certain extent. Even if they vary in many other aspects, they are similar from the point of view of the classifying category. On the other hand, the different criteria are often not just based on their nominal distinctions (e.g. ease of use, price, activities etc.), so they cannot be compared to each other on the same scale. Often, however, they can be seen as points on an ordinal scale, sorted or ranked by common criteria (e.g. different prices ranked by the amount of money, different activities sorted by their level of complexity or ranked by the phase they occupy in the learning cycle etc.). As the attention is focused on (family) resemblances (“Familienähnlichkeiten”, Wittgenstein 1984a:§§65-71), this reduction of complexity facilitates transfer processes. Under the guidance of criteria, it should be easier to distinguish the different basic types from their variants. This is very helpful for software development, implementation strategies and education as it increases the chance of recognition of functional configuration, working situations and educational scenarios.
- f. **Innovation:** It is sometimes thought that the reduction of complexity and standardization processes constrains technical and didactical innovation. The opposite, however, is the case if (a) the taxonomy provides a sufficiently large repository of cases and (b) the classification system is well founded and transparent. A huge repository which clusters e-portfolio scenarios under systematic and theoretically sound premises, nurtures didactical diversity for the following reasons: Inexperienced novices will not only discover many instances of what they are looking for, but the dazzling array of exemplars, cases, opportunities, strategies and scenarios they encounter will already be grouped and “tamed” into categories. They will therefore not be overwhelmed by complexity and be encouraged to experiment with as yet unknown situations. Experienced experts, on the other hand, will take the reduced complexity as a starting point for their inquiry. They will modify, amplify, add, and substitute where necessary. Taxonomies are tools that can be adapted and should not be considered holy, sacrosanct and inviolate shrines.
- g. **Heuristic tool:** In the early history of the periodic table of elements, the observed gaps inspired scientists to investigate these inconsistencies and find ways to fill in the blanks, which – as we now know – resulted in a success story. To serve as a heuristic tool, is a very important property of all classification systems. Special attention is drawn to all inconsistencies, as they are a challenge to the whole taxonomy and its underlying principles. Either these discrepancies disappear or the taxonomy itself will be discredited. On the other hand, finding solutions to the inherent problems of the taxonomy help to improve it and demonstrate the usefulness of the constructed classification schema.

- h. **Theory construction:** If discrepancies are observed in taxonomies, their resolution supports the continuing process of “discovery” and the accompanying theory construction. Either solving the puzzle or not, leads to a revision or even replacement of the theory.

4 General methodology

There are three different approaches that can be used to develop a classification system for e-portfolios:

1. We could look into the functionality of software tools and determine “*objectively*” what kind of activities the program allows and supports. Or generally speaking: What kind of educational scenarios will the software enable for the different groups of actors (implementers, administrators and users)? The problem with this line of reasoning lies in the fact that available functions do not necessarily mean that they are really used in everyday practice. We know, for example, that the prodigious capabilities of Microsoft Word or Open Office are utilized by only a fraction of users.
2. We could observe how e-portfolio software is used in everyday practice in order to determine which usage patterns are *subjectively preferred* by the actors in the field. For our problem this research strategy implies an inescapably conservative inclination: although this approach shows favored habits and used routines, one has to notice that if it is not used in conjunction with other means of investigation, the results will not give any hints about which other kinds of innovative uses could also be feasible.
3. We could embed e-portfolio software into an organisational context where certain specified educational scenarios are more encouraged than others. These arrangements shape settings *socially* where – following the actor-network theory – actants associate with each other, e.g. relate to each other interactively (actor-actor, actor-tool, tool-tool) in a dominant way. But this more systemic point of view runs the risk of ignoring the technological and psychological details that are not only part of the situation, but also work as enablers or may even cause the state of affairs to a certain extent.

This reflection demonstrates once more the appropriateness of the theory of communicative action, where Jürgen Habermas (1996, 2006) demonstrated that all validity claims embedded in every action can be challenged any time in exactly three different ways. Every sentence (speech act) or action has incorporated explicitly or implicitly validity claims that represent three different relations to the world (cf. Fig. 2). For instance, asking a student to bring me a glass of beer during a lecture at university could be criticized or attacked in three different ways by the student:

1. **Objective relation to the world:** “There is no shop selling beer at the campus.” This argument challenges my implicit view of the objective reality that is hidden in my speech act.
2. **Subjective relation to the world:** “I can not believe that you really want a glass a beer. Maybe you just want me to leave the auditorium.” This answer assumes that my speech act disguises my real intention. It is challenging the authenticity of my sentence.
3. **Social relation to the world:** “Sorry, but it is not allowed to drink alcohol during classes. And by the way, I am a student and not your butler.” This response is an attack on the legitimacy of my command. It is neither allowed to drink beer at lectures, nor is it appropriate to use students for personal services.

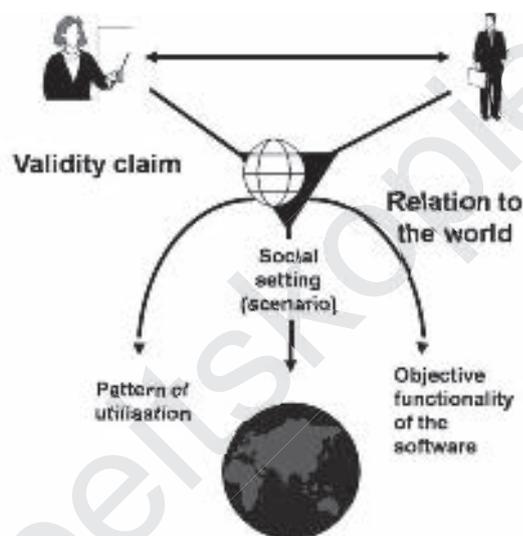


Fig. 2: The three different relations to the world

This principle of the three possible critiques can mentally be applied to *every* action, independent of its actual real life use. It is not necessary to challenge validity claims that are not only obvious but also evidently correct. On the other hand, power relations hinder or even prevent criticism.

For the taxonomy development I have used the Habermasian framework and have provided three different approaches to the world of e-portfolios:

1. **Software evaluation** (objective relation): To get an idea of the set of functionalities of different software packages, we looked into 60 software packages for e-portfolios and evaluated 18 programs more thoroughly. This work was done by Klaus Himpsl (see the article in this volume) and gave us a picture of the common software properties. It also made us aware of some features not available in all packages.

2. **Case applications** (subjective relation): We set up a test server at <http://www.mahara.at> where our software Mahara (<http://www.mahara.org>) could be used non-commercially by teachers and other persons. In return for this free service, we were able to look into many different cases of applications. In addition, we interviewed users and persons in charge at a variety of universities to get an overview of the different use of the e-portfolio software.
3. **Application scenarios** (social relation): Another project funded simultaneously by the Federal Ministry of Science and Research looked into model scenarios of e-portfolio implementation in the Austrian higher education sector (Zwiauer & Kopp). Unfortunately, we did not get as much information from this source as we had hoped. The official reason given by the participating universities was that they were protecting the data of their students, but behind the scenes it was clear that safeguarding their competitive advantage was also a major reason for the lack of cooperation. So we had to derive the application scenarios primarily from the interviews we conducted and from the few occasions when we obtained access to the implementations.

But the primary method and therefore the most important contribution for the taxonomy presented in this paper resulted from the elaborated analysis of the literature on e-portfolios.

5 Methodological approach step by step

In the following section, I will give detailed references about analyzing and using the literature on e-portfolios to construct the taxonomy. Please note that at this point of investigation, there is no need to differentiate between paper-based and electronic portfolios. It is the principal goal of this study to put together a classification system on the basis of *functional* criteria independently of their medial realization. Even if the modus of the realization is essential (e.g. how to access the data: by paper or electronically), it is the higher level of the criteria itself (in this case “mode of access”) that is taken to form the basic categories. The different implementations of this function are subordinate attributes (aspects) of this main category.

So far, I have used several different terms, such as “category”, “criterion”, and “function”. In constructing the taxonomy for e-portfolios, these terms have a special technical meaning. However, let me develop the methodological approach step by step and define these notions at the appropriate place.

5.1 Bibliographic research

In the first months of 2007, we started our search in the scientific literature for detailed descriptions of e-portfolio systems. Based on the assumption that every article on e-portfolios has to mention functional aspects, we analyzed these in-

vestigations. But we couldn't take for granted either the used words (language) or the reported functionality, as from our epistemological point of view, these items are not mirroring the Kantian "thing-in-itself", but are a construction themselves. Some of the infinite varieties or aspects of the external world are artificially cut out and – using language – conceptualized and therefore highlighted. Other – perhaps more important – aspects remain in the dark. The evolving reality is formed by the analytical mind of the researcher whose thought – and therefore theoretical perspective – is the knife that cuts out what seems to be "interesting" slices of the external world.

This epistemological background is the reason for the numerous different concepts in general, and for using diverse notions for similar or even identical functionalities. The concepts themselves are reflections of the used theory and, therefore, cannot be taken at face value for a taxonomy which has to be useful for as many possible theoretical frameworks. Instead, the presented notions and used vocabulary have to be reconstructed by a discussion that compares the different "cutting" strategies. The vocabulary found in the literature is just the raw material we have to work on (to modify, to merge) in order to get a systematic classification which is not only consistent, but also covers as many theoretical approaches as possible. With this background in mind, we can define:

Definition 2: Category

A category is the superordinate term designating the most generic group, genus, type or class where subordinate concepts (so called criteria) can be filed.

Definition 3: Criterion

A criterion is every subordinate concept used to designate attributes, characteristics, features, properties or parameters.

From this perspective, every article or paper describing characteristics of e-portfolios can be considered as a kind of description that explicitly or implicitly is founded on a classification system comprising categories and criteria. As many articles are not formally concerned with categorisation issues, these implicit taxonomies are often imperfect e.g. inconsistent and incomplete, even just fragmentary. But all the same, they represent a hidden background schema, derived from a more or less systematic theory. In order to distinguish this concealed background assumption from our goal of a systematic and theoretically transparent taxonomy, I will call it a description system:

Under a description system, we will understand any kind of characterization of e-portfolios (reports, narration, analytical studies, implementation examples etc.) that do not have expressively the development of a taxonomy as their

goal and therefore do not present epistemological considerations on constructing taxonomies. Unlike the direct approach to develop a systematic classification system, the categories and criteria of description systems are not created under a coherent and clearly defined functional logic of the considered object (in our case: e-portfolios).

Definition 4: Description System

With this consideration in mind, we used the search engine Google to find articles, papers and other material that could be classified as e-portfolio description systems. We looked for different combinations of

- “type” or the German equivalent “Typ”
- “portfolio”, “webportfolio”, “eportfolio”

The best results were found with the combination “type of portfolio”. From the hit list, we selected as a sample the following 11 articles for a more detailed inspection. (Remember: this selection was done early in 2007):

1. Helen Barrett: The Electronic Portfolio Development Process (Barrett 2000)
2. Chang Barker: e-Portfolio for Quality Assurance (Barker 2006)
3. en.wikipedia: [*Career portfolio*; *Electronic portfolio*]
4. ePortConsortium: Electronic Portfolio White Paper V. 1.0 (ePortConsortium 2003)
5. Grant, Jones und Ward: E-portfolio and its relationship to personal development planning: A view from the UK for Europe and beyond (Grant, Jones und Ward 2004)
6. IMS Global Learning Consortium: IMS Portfolio Best Practice and Implementation Guide Version 1.0 (IMS GLC 2005)
7. Paul Gerhard (INSIGHT): e-Portfolio Scenarios [*E-Portfolio Scenarios*]
8. Preteacher.org: Electronic Portfolios (withdrawn from the webpage: [*Preteacher.org*])
9. Regis University: E-portfolio Basics [*Regis University*]
10. Edwin Stiller: Das Lehrerbildungsportfolio als Instrument der professionellen Entwicklung (Stiller 2005)
11. Anne Wade, Philip C. Abrami und Jennifer Sclater: An Electronic Portfolio to Support Learning (Wade, Abrami & Sclater 2005)

5.2 Generation of categories and criteria

The texts listed above were examined in the context of the following two questions:

- **Criteria:** Do the articles mention aspects (characteristics, properties, attributes etc.) of e-portfolios that describe a certain functionality?
- **Categories:** Is it possible to group these functions together to form classes (taxas)?

These questions need to be embedded in an iterative procedure that fluctuates between inductive and deductive approaches:

Induction: The aspects found in the papers can not be seen as a systematic and complete inventory of criteria. With every new article, new bits and pieces can show up. There is no guarantee that this process will ever come to an end. The concepts found in the literature are more or less an accidental list of items that can be seen as describing some facet of the investigated object. Taken together, the data gives us some impressions, ideas and hints of how to construct a coherent structure or system of criteria.

Deduction: Putting these facets systematically together into distinctive groups, in order to form categories, is our own invention, although this process is grounded and guided by the found data. The theoretical construction, on the other hand, permits another point of view regarding the notions and concepts found in the investigated articles. In this light, the original list can be altered by modifying the found notions or adding new terms. From the “higher” perspective of a system, one can reflect upon what kind of differentiation or generation of aspects would better fit the constructed framework.

The following examples will illustrate this back and forth process. Most papers mentioned different actions in relation with e-portfolio work, like collecting data, planning, presenting data etc., so it was natural to create a general class for these goings-on and give it a name. In light of the newly-formed category “activity”, the planning operation gained a slightly new meaning: Even if they are not overt behaviours that necessarily involve body movement and therefore cannot be observed as easily as other human actions, we nonetheless have to put these mental operations on the same level as other – more visible – actions. The following table (cf. Table 1) is an excerpt of notes taken during the research process and will illustrate this approach in more detail. One can find, for instance, under the category “material”, a list of data content respectively subject matter, like artefacts, feedback, reflections etc., but also their relation to each other (related, unrelated). During a thorough in-process inspection, it turned out to be more appropriate to generate distinctive categories: “type of artefact” and “relation”. On the other hand, creating a new category “relation” draws attention to the term “relation” itself and its possible items (subcategories). What kinds of relations are feasible, only connected and unconnected? Would it not be better in that case to call the category “connected” with the parameters “yes” and “no”? Or are there other types of relationship (e.g. serial, network etc.) as well?

Table 1: Excerpt from research notes

C A T E G O R I E S							
Action Goals	Access	Material	Selection	Views	Feedback	Reflection	Activity
collecting artefacts	proprietary	artefacts	no	retrospective	self	product	collecting
reflecting the learning process	all	feedback	yes	prospective	peer	process	choosing
C R I T E R I A	evaluating the learning product	reflection			authority		adding
	planning the development	linked					reflecting
	presenting the development	unlinked					planning
							presenting

This table should be read by columns, e.g. what criterion belongs to a specified category. There exists no horizontal data relationship between the fields of the rows.

5.3 Formation of portfolio types

5.3.1 General considerations

In a third step, all criteria were applied and tested in their configuration with real world examples. The goal of this research step was to find inconsistencies (detecting overlaps and gaps) and to create reasonable clusters of criteria that were practicable and would reduce complexity. The intention was to obtain a coherent set of different types of e-portfolios which would be useful not only from a theoretical perspective, but also for practical purposes, such as further improving the functionality of the e-portfolio software, selecting the most appropriate software for the intended implementation strategy or determining the most suitable software for the proposed educational scenario.

This process turned out to be critical, as it demanded that we make a decision about the level of granularity of our classification system. The different types should be able to characterize as many distinctive types of portfolio in their everyday usage. Neither a too coarse-grained system, which lumps together important characteristics, nor a too detailed differentiation, which cannot be manipulated in practice, should be the final result. Underlying this process of type-creation is the delicate question: What can be interpreted just as some variation and what has to be defined as a fundamentally different type?

The answer to this question is by no means easy to determine and it may even be the case that no consistent solution exists at all (Baumgartner 1993, pp. 261–271, Lakoff 2002). Clearly enough, there are circumstances, where a distinction seems to be obvious. For instance, it is not difficult to decide between artefacts like chairs, tables and cupboards. All of them could also be classified without many discussions as members of the category “furniture”. But even in this seemingly straightforward example we could add examples that cannot be classified so easily: Do carpets, for instance, also fall into the category of “furniture”?

The general approach to this difficulty is the assumption of gradual differences, where we have to decide (supported by rational arguments) where the limits between two categories have to be drawn. As a simple example, let us take the categories “rich” and “poor”. We could say that a person with a certain amount of money, expressed in a certain currency, could be defined as “rich”. Even if we have to contextualize this proposition for different countries (e.g. different benchmarks for different countries, such as the USA and Mozambique), this distinction should not be problematic, and even possible critiques about the concrete figure of the boundary can be easily addressed because of the relative transparency of the argument.

But unfortunately, these simple metric scales cannot cover all aspects of the world.

Psychologist Eleanor Rosch conducted many experiments in which humans were asked to put different kind of birds (chickens, penguins, ostriches, redbreasts etc.) into a ranking order of typical birds. All tested persons generally agreed in their classification of “good” and “bad” examples of birds, but even all the “bad” examples, like penguins and ostriches, are full-fledged birds. In this example, there is no graduated distribution made.

The problem of (cultural) context is addressed by the example of “bachelor”. It seems easy to define one as an adult man who is not married. But does this description make sense every time and within every culture? What about adults living together with partners of the opposite sex? What about gays or lesbians? Is the category “bachelor” applicable to the Pope as well? What about the relatively new term “single”?

It seems that for every such category, there are some prototypes that are defined under an implicit cultural frame. There are many different and conflicting definitions which cover different point of views. The assumption of a clear-cut unproblematic categorisation, where all exemplars of the same category are alike, is not valid. This is the bad news. The good news, however, is that generalized cognitive models (Lakoff) constructed by humans are essentially congruent with each other. They are formed by our common practice and generally similar experiences. Even if we have very different daily experiences, from a more abstract point of view they are all alike: We all principally have (a) the same kinds of senses organs, (b) we all experience the outer world through and by means of our body and (c) we compensate for different individual experiences by means of repeated actions and cultural communication. “Children do not learn that books exist, that armchairs exist etc. etc. – they learn to fetch books, sit in armchairs etc. etc.” (Witgenstein 1984b:§476).

5.3.2 Considerations applied to e-portfolios

According to the theory of idealized cognitive models, we had to find a separation criterion that was not only embedded, but also omnipresent in the “e-portfolio culture”. After revising our list of literature several times, we could distil two basic factors present in almost all the investigated papers:

1. The assumptions that learning processes – even if they are viewed from a holistic point of view – can at least be analytically divided into different phases or stages.
2. The intended objectives, such as the programmed functionality, the implementation strategy pursued or the educational scenario employed, are always present in the article – be they mentioned explicitly or only supposed implicitly.

E-portfolios do not merely consist of different unrelated web pages produced on the spur of the moment. The production, implementation and application of e-portfolios should normally support a specified software plan of organisational or individual development. If we can analytically distinguish different phases in the learning process, then we should be able to turn these distinct stages into a crucial difference for the functionality, implementation and usage of the e-portfolio. In the case of concrete goals being mentioned, we can use this information critically for our own formation of e-portfolio types.

But there is a catch: We need to distinguish between the e-portfolio’s proclaimed goals and the “presupposed actions” goals which have been envisaged to accomplish these objectives. The announced and declared purpose of a given e-portfolio software does not necessarily mean that all of its functionality is appropriate for this goal. On the other hand, is it necessary to critically evaluate whether or not the described actions or intended behaviours are actually relevant and efficient (appropriate) for realizing the e-portfolio objectives. One can drive nails with shoes, but this does not necessarily mean that shoes are the appropriate tools for this purpose. The proclaimed objectives of e-portfolios is a question of “fitness” in the previously mentioned constructivist sense of the three validity claims: objective claim: software/programming; subjective claim: individual/learning; and social claim: organisation/implementing or the social arrangement of the educational scenario.

5.3.3 Generative questions

To support the analysis of the different description systems hidden in our literature list, we documented relevant phrases in tabular form. For every generated type of portfolio, we used a separate column. These quotations were the basis for the identification of criteria belonging to the different types of portfolio. As a guideline for the construction of the criteria we have worked out the following seven generative questions:

1. **Owner:** Who owns the e-portfolio? To whom does the data belong? (Note: The user of the portfolio or the person who generates the data is not necessarily the owner.)
2. **Access:** Who has what kind of access to the e-portfolio?
3. **Item:** What kind of items, that is to say, what types of artefacts (material) can be included in the e-portfolio?
4. **Activities:** What kinds of activities are necessary for the comprehensive work on respective e-portfolios?
5. **Process:** Should the e-portfolio support development processes? If yes: What kind of processes are they?
6. **Period:** Is the e-portfolio work orientated to a specific point or period of time?
7. **View:** Which perspective is typical for the used e-portfolio? Is it a perspective geared towards the past (retrospective) or to the future (prospective)?

5.3.4 Example of the constitution of classes and their attributes

In order to illustrate the impact of these generative questions for the construction of categories and their criteria, I will present some reflections on the question, “Who owns the e-portfolio?” This question generated thoughts that later turned out crucial for clustering the e-portfolios into different main types.

After the first cycle of data analysis from our literature list, we got the following different notions of ownership:

- Learner
- Student
- Faculty
- Staff
- A group of different people comprising a mixture of the above differentiations (“multiple owner”)

Cleaning up these incoherent and non-systematic occurrences of aspects in the investigated literature leads to the following considerations:

- a. The terms “learner” and “student” are very similar in meaning, but the term “student” denotes a more formal learning relationship, so we merged these two concepts into the more general term “learner”.
- b. The terms “faculty” and “staff” are similar. Here the notion generally refers to the teaching staff, e.g. a group of people serving in possibly different roles, such as instructors, mentors, moderators etc. At the time of the investigation, we did not know if these different teaching roles were of any importance or could be neglected, so we used the general German term “Lehrperson” (teaching person). This term should include all different teaching roles.

- c. The next question arose: Are we done with just these two attributes: learner/teaching person? What about a career portfolio in a business context? Would not supervisor/subordinate be more appropriate? But these terms refer to power relations and do not necessarily have an educational dimension. On the other hand, we have certain power relations in educational settings as well. But if we construct a new category “power relation” with the pair of attributes “domination” and “subordination”, then for systematic reasons, we have to provide a relation that functions on equal terms as well, such as “co-workers” or “peers”.
- d. Are we now done? Our inductive approach with our sample of 11 papers did not disclose the token owner “Institution”. But we knew from our project that this is a very common and important characteristic. It is mentioned in the literature as well, e.g. in the paper by Lorenzo & Ittelson 2005), an article that we had not included in our data sample for analysis.
- e. There is still some inconsistency related to the category “multiple owner”. We could construct the contrasting terms “single owner” or “person” (individual portfolio) and “group” (group portfolio). But this does not include the possible mixing of the different owner roles. So I added to the generic term “group” the more specified term “mixed group”. However, in order to point out the differentiation and contrast more clearly, I finally came up with the terms “homogenous” and “heterogeneous” group.

The example should demonstrate how the generative questions under system aspects facilitate the creation of classes and criteria. In combination with the fluctuation between inductive and deductive approaches, one should get a coherent system of classification. In our illustration of the category “owner”, it turned out that at least three different layers of ownership had to be taken into account:

- 1. Differentiation by the number of owners:
 - a. Person
 - b. Group
 - i. Homogenous group
 - ii. Heterogeneous group
- 2. Differentiation by the role of the owner during the learning process:
 - a. Learner
 - b. Teacher/Instruction/Moderator (teaching person)
 - c. Institution
- 3. Differentiation by power relation:
 - a. Domination
 - b. Subordination
 - c. Equal footing = Peer

6 Presentation and discussion of the results

6.1 Constructing a coherent structure from the data

After this comprehensive demonstration of the used methodology, we are finally in the position to portray and discuss the results:

We have elaborated for every of the 11 mentioned articles a list of criteria². The process cannot be repeated here in detail, but is documented in our German report to the Austrian ministry (Baumgartner et al. 2009). After the initial analysis of these articles we integrated the intermediate results into a table with all the respectively constructed categories and criteria that we had detected. I compiled a manageable list of 11 categories, but I had found at least three inconsistencies on the level of criteria (cf. Table 2):

1. Two categories were not peopled by concrete instances (*context, intention*), as they seemed to be too general.
2. On the other hand, categories like *activity* and *portfolio* included a comprehensive list of incoherent criteria. These items had to be revised and merged into a handy and straightforward list of criteria.
3. In contrast to all the other categories, the class “ownership” not only contained one level of aspects (criteria), but also subordinate items.

Table 2: Result of data analysis (not cleaned up yet)

Activity	to appreciate, to approve, to assess, to confirm, to collect, to decide, to discuss, to document, to elaborate, to evaluate, to examine, to identify, to illustrate, to inspect, to judge, to link, to network, to organize, to plan, to present, to produce, to reflect, to select	
Artefact	biography, competence balance, document, evaluation, (working) example, experience, feedback, SWOT-Analysis	
View	yes, no	
Property	Role	learner, teacher, institution
	Position	superior, subordinate, peer
	Structure	individual, homogenous group, heterogenous group
Target Group	learner, teacher, institution	
Intention		
Context		
Portfolio	assessment portfolio, career portfolio, evaluation portfolio, development portfolio, development planning portfolio, faculty portfolio, formative portfolio, group portfolio, learning (product / process) portfolio, linked portfolio, network portfolio, personal development portfolio, personal portfolio, presentation portfolio, professional career portfolio, qualification portfolio, reflection portfolio, representation portfolio, self-assessment portfolio, showcase portfolio, summative portfolio, working portfolio	
Reflection	product, process	
Relation	isolated, linked	
Time Frame	retrospective, current, prospective	

2 Silke Kleindienst supported this preliminary work.

In order to clean up these irregularities, I had to decide whether I should reduce the complexity or enrich it in such a way that I would get a more coherent classification system. I opted for decreasing the complexity to obtain a handier and more practical taxonomy. The essential idea was to cancel the “context” and “intention” categories in such a way that the semantic of these terms was instantiated by the type of portfolio and the structure of the ownership. The extraction of the class “ownership”, which was merged with the basic antagonism person/institution and set on a higher level than all the other classes, turned out to be especially crucial in cutting the Gordian knot. I used the contrast person/institution as a prior decision to structure the types of portfolios.

Type A of portfolios (Person): This basic case assumes the identity of the owner, producer and user of e-portfolios. Its prototype is a person who uses the portfolio software self-contained. But we can also visualize the example of a peer group owning the portfolio. Under this heading, I also include those kinds of server installations where the (paying) client has all rights to the allocated instances of the software installation (including property rights on all the generated data).

Type B of portfolios (Institution): In this contrasting case, there is no complete ownership of the software instance. The institution provides (owns) the e-portfolio and only transfers the right to use it in a certain way. The users are not the owners of the produced content and their activity is also limited by the designated use, regulated by the terms of the condition of usage – even if the software allows for much more functionality.

Another essential move was the accentuation of the reflection class. Every usage of the e-portfolio can be prioritized into two main intentions: Either to evaluate the resulting product or to draw attention to the process. The chosen major perspective is fundamental and modifies the use of the available functionality of the software tool, the appropriate implementation strategy and the everyday use (type of activities) of the e-portfolio.

The selection and decision of these two preferences eliminated not only the empty categories “context” and “intention” but helped to organize and structure the huge list of different terms for portfolio. These two preferences work as a kind of switch: They multiply the possible types of portfolio by 4 ($2 \times 2 = \text{Type A/B; Product/Process}$). Under this angle of consideration, the different notions of e-portfolio can be cleaned up with two additional steps:

1. Merging notions with the same or similar meaning under one general heading (cf. Table 3)
2. Considering the resulting differentiation and reconsidering every type if it includes a reference to the ownership and/or reflection distinction. If so, it is not a basic type of portfolio (central example or prototype) but rather a more specific one.

Table 3: Type of Portfolio (cleaned up)

Portfolio	
Assessment portfolio	assessment portfolio, evaluation portfolio, formative portfolio, network portfolio, summative portfolio
Development portfolio	development portfolio, development planning portfolio, professional career portfolio, qualification portfolio
Learning portfolio	learning (product / process) portfolio, personal development portfolio, reflection portfolio, self-assessment portfolio, personal portfolio
Presentation portfolio	career portfolio, presentation portfolio, representation portfolio, showcase portfolio
No mapping	working portfolio, faculty portfolio, group portfolio, linked portfolio: ambiguous notions or not well-defined, cannot be mapped unequivocally

With this strategy, I was able to considerably simplify matters. In a first step, the original 37 different terms for e-portfolio were boiled down to only 4 types and a miscellaneous category with notions which could not be classified unambiguously under my system. In a second step, I merged the assessment- and learning-portfolios into the reflection portfolio, as they simply represent the institutional/personal distinction in education and I modified the “reflection” category to the more aptly fitting notion of (product/process) “orientation”. When these structural differentiations are applied to the 3 prototypes of e-portfolios, we get a system of 12 fundamentally different types (2 categories of ownership x 2 categories of orientation x 3 basic types of e-portfolios). This final structure with the 4 basic combinations is shown in the graph on the following page.

6.2 Reflection Portfolio (Educational Portfolio)

6.2.1 Type A (personal): Learning Portfolio

This portfolio type supports the acquisition of knowledge or competencies. It is essentially subjective as the experiences of another person cannot be substituted for my own learning experiences. But this does not mean that it has to be used only by a single person. Social learning and reflecting together as a group, either on the learning product or learning process, is also possible, though it is not seen very often at this time (end of 2009).

1. Learning Product Portfolio

This portfolio is owned by an individual learner or a group of learners. Self-determined and essentially self-motivated learners exploit the functionality of the portfolio. The basic goal of this kind of portfolio is to support the learner’s own acquisition of knowledge via reflection (review, discussion) of the learning outcomes after the independent creation of individual (learning) products.

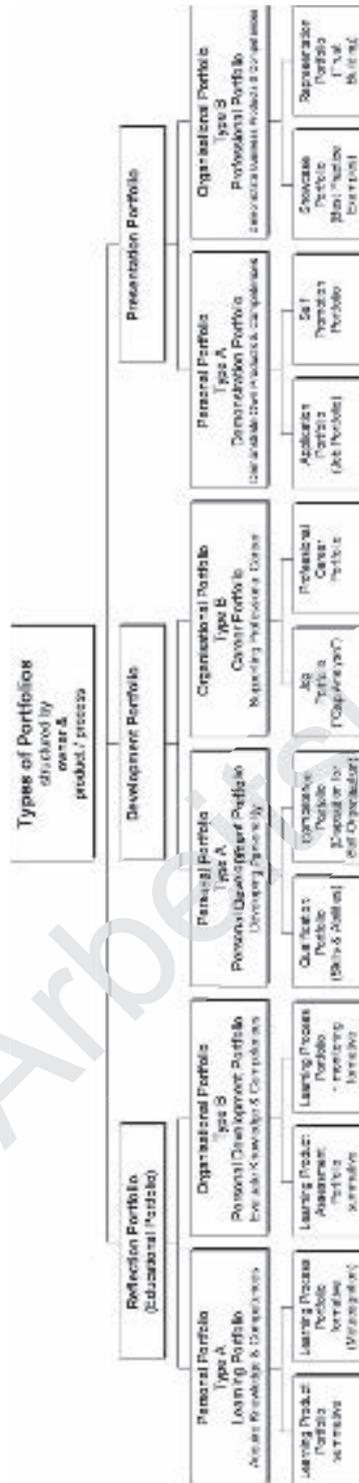


Fig. 3: Types of portfolios structured by owner & product/process

2. Learning Process Portfolio

This type of portfolio is also concerned with learning. In contrast to the above mentioned product type, it is not mainly engaged with individual (learning) products, but with the process (history) of learning. Although it uses the same method (review and discussion), the reflection is not orientated towards a single product, but compares different working examples to get a picture of the development of the learning process. It therefore does not foster learning directly, but on a higher level: learn to learn (Baumgartner & Welte 2001).

6.2.2 Type B (organisational): Assessment Portfolio

To evaluate the knowledge and competencies of learners, an institution provides these kinds of portfolios. This type allows people, who have not been involved in the creation of the material, access to the stored data and has special functionalities to facilitate reviewing and sometimes grading as well.

3. Examination Portfolio

Learners prepare their assignments and store them in the portfolio, so they will be at the disposal of the responsible teaching staff for assessment and grading purposes.

4. Curriculum Portfolio

In contrast to the examination portfolio, this portfolio type does not only present individual assignments separately, but is embedding them in the course of the curriculum. It documents the learning progress of the student in relation to the curriculum and monitors acquired knowledge and competencies and can also present typical examples of learning products to demonstrate knowledge and achieved levels of competencies. It can be further focused on the curriculum progress (summative portfolio) and on the learning process (formative portfolio) as well.

The curriculum portfolio mirrors not only the modular study structure, but it also contains assignments, comments, reflections and evaluations. It can not only be used for students, but also for staff development as a professional career portfolio.

6.3 Development Portfolio

6.3.1 Type A (personal): Personal Development Portfolio

Owned by users, this portfolio type supports personal development.

5. Qualification Portfolio

Like the learning portfolios (learning product and learning process portfolio), this type also facilitates knowledge and competence acquisition. But here the learning goals are not set up completely freely or voluntarily by the learning individual himself, but are orientated around a bundle of operationalized goals comprising a “complex of knowledge, competencies and abilities which have to be mastered in the specified profession” (Erpenbeck & Sauter 2007, p. 68, own translation). Although the breakdown of these goals is self-determined and self-organized, the general objectives are predetermined externally.

6. Competence Portfolio

Competence portfolios are not only orientated to achieve preset specified goals, but should, above all, foster the development of personal identity and growth, respectively, the maturing of one's personality. The crucial point is the self-organizing ability to improve personal, social and professional (functional, methodical) competencies and once again we can find the three world references (subjective, social and objective).

6.3.2 Type B (organisation) Career Portfolio

This portfolio type also supports the development process of persons, but it is restricted by the interests of the organisations providing the portfolio.

7. Job Portfolio

This type focuses on qualification gaps to overcome problems in the actual job position and/or to advance to the next higher hierarchical position. The planning process generally targets deficits and is limited to finding remedies and improvements for the current situation/positions.

8. Professional (Career) Portfolio

In contrast to the job portfolio, the planning process with this type of portfolio is more holistic and its set of goals is derived from a general career perspective in the particular organisation. The professional portfolio is not only aligned to objective technical knowledge, but also advocates, with some restrictions, the general development of personal growth. An (extraordinary) example is paid educational leave, but with the obligation to portfolio work (reporting experiences and advances).

6.4 Presentation Portfolio

Under this heading one can find all portfolios that are classified with the aim to demonstrate something (knowledge, competencies, products etc.).

6.4.1 Type A (personal): Demonstration Portfolio

9. Application Portfolio

People use this type of portfolio to support their job applications. Instead of modifying standard curriculum vitae every time for a specified job requirement, the applicant generates a view where all the necessary requirements can be seen. The job aspirant sends the URL with the access information (e.g. password) to the organisation where the post was advertised.

10. Self-Promotion Portfolio

The name of this portfolio type may sound a little strange, but I could not find a notion that characterizes this kind of portfolio in the literature. It follows the systematic structure of the presented taxonomy and demonstrates the theoretical power of coherent classification systems. It refers to personal portfolios that are not developed for the search of specific jobs or careers, but to promote oneself, the “brand I (ME)” (Marke Ich: Seidl & Beutelmeyer 2006). This portfolio type is especially suited for freelancers.

6.4.2 Type B (organisational): Business Portfolio

11. Showcase Portfolio

The showcase portfolio demonstrates certain “best practice” examples from the range of products or services sold by the enterprise. It promotes goods and services in order to convince potential consumers to buy them.

12. Representation Portfolio

This class of portfolios does not focus on selling individual products and services directly, but on endorsing the image of the enterprise in general. The task of the portfolio is to create trust within the firm and the quality of its production and/or service processes and to attract new customers or strengthen ties with old customers.

6.5 Activities and artefacts revised

6.5.1 Revisiting the category “activity”

I took the data from table 2 and looked into their semantic. To get a better understanding, I have looked for other synonyms not included in the data drawn from the literature. My goal was to inspect the meaning of the notions in order to (a) identify concepts with identical or similar meanings and (b) to find a more general heading where similar activities could be subordinated. With this strategy, I could condense the unstructured data of more than 20 verbs to 7 different main activities.

For instance, the verbs “to demonstrate” and “to illustrate” have more or less the same meaning and can be regarded as synonyms, while verbs as “to show” and “to exemplify” could also be integrated. But these notions already designate the results of *previous* processes like collecting suitable artefacts in order to demonstrate some attribute. In this example, “to collect” would be the resulting main activity. But collecting artefacts is an activity done for every portfolio! It therefore has no separation capacity and does not fulfil the selective criteria in the classifying process. For this reason I have excluded this notion from the taxonomy altogether.

The same result (ignoring altogether) happened with the activity “to produce” (generate, construct etc.). It is a preparatory activity that is not directly linked with the portfolio. For instance, it is often the case that material especially produced for the portfolio is finally not included (e.g. because it did not turn out as a successful example for demonstration purposes). Selection (to choose, to handpick, to single out etc.) is the important activity itself, grounded on other activities like decision, identification, inspection etc.

6.5.2 Revisiting the category “artefact”

The same process of reduction took place with the different notions for artefacts. In my general view, artefacts are crucial as they are very selective. What kinds of artefacts are included in the portfolio determines to a great extent the purpose and therefore the type of portfolio. But as it is the case with “activities”, there is no clear-cut unambiguous definition possible, but only a typical pattern or mixture which is typical for a specified type of portfolio. Note that the empirical data is also constrained by the relation between intended usages and the (potential) functionality of the software.

Example: Learning outcomes are demonstrated to provide evidence that shows which kind and what amount of knowledge, respectively, competencies, has been acquired. Again, we need to apply the aforementioned general principle of the threefold relation to the world: A working example should substantiate cognitive abilities, psychomotor skills and social competencies that are not directly visible. Photos taken by an artist, a software engineer’s programming code, the podcast of a talk given in a foreign language, or a video of an artistic performance are some instances of the artefact type “example”.

Evaluation: For this category, I intend a very specific form of feedback. Evaluation can be the result of a self-determined reflective process (see also category “reflection”), but it can also be produced by peers or seniors, respectively, supervisors.

Biography: I define biography for the purpose of my taxonomy as a self-produced, special kind of framework or document supporting and integrating the other different kinds of artefacts found in the portfolio.

Document: This category includes all kinds of original documents provided as evidence for the different claims (acquired competencies, achieved requirements, passed examinations etc.) in the portfolio.

Experience: Under this heading are all statements grounded in experiences reported by themselves or – more credibly – by other persons.

Reflection: In this class belong self-developed or externally produced considerations, remarks, thoughts or hints that – in contrast to the criterion of evaluation – do not include a final value judgement.

6.5.3 *Cleaning up of the residual categories*

Context: I have already mentioned that the category of “context” is too general, e.g. not discriminate and was therefore deleted from the taxonomy.

Target group: Here I have taken up the idea from Stiller (2005) to categorize the type of portfolio according to different target groups. The class “target group” is therefore integrated in the developed classification system of e-portfolio types. I have distinguished between personal and institutional (type A and type B portfolios) portfolios and the different target groups they are aiming for (e.g. learning portfolios for learners, self-promotion portfolios for freelancers etc.).

Intention: I have replaced this notion with the more differentiated concept of the threefold relation to the world. The reflection portfolio focuses in both differentiations (learning and assessment portfolio) on the development of inner personal traits or characteristics (personality = subjective relation to the world). The presentation portfolio mainly establishes the objective relation to the world and the development portfolio is a mixture of subjective and social relation to the world.

6.6 Integration of the results

Now we are finally in the position to integrate all the results in one schema: The following table 4 merges and consolidates the 12 different types of portfolios with the 7 main criteria: property, orientation, view, relation, time frame, feedback and relation to the world.

What follows are some comments done after the inspection of the 7 main criteria in relation to the different types of portfolios:

Table 4: Taxonomy (Part 1)

Type of Portfolio	Property		Orientation		View		Relation		Time Frame			Feedback			Relation to the World		
	Person	Organisation	Product	Process	Yes	No	Isolated	Linked	Retrospective	Current	Prospective	Self	Peers	Authority	Subjective	Social	Objective
Learning Product Portfolio	X		X			X	X		X	x	x	X	x		X		
Learning Process Portfolio	X			X	X			X	X	x	x	X	X	x	X		
Examination Portfolio		X	X			X	X		X	x	x	x	x	X			X
Curriculum Portfolio		X		X	X			X	X	x	x	x	X	X			X
Qualification Portfolio	X		X		X			X	x	X	X	X	x	x			X
Competence Portfolio	X			X	X			X		x	X	X	X	x	X	X	
Job Portfolio		X	X		X			X	X	X	x	x	x	X			X
Professional (Career) Portfolio				X	X			X		x	X	x	X	X		X	X
Application Portfolio	X		X		X			X		X	x			X			X
Self Promotion Portfolio	X			X	X			X		X	X		X	X		X	
Showcase Portfolio		X	X		X			X		X				X			X
Representation Portfolio		X		X	X			X		X	X		X	X		X	X

Property: Who is the owner of the portfolio, a person or an organisation? This criterion was used as a defining category, and that is why no further remarks are applicable here. The ownership divides all portfolios into personal and organisational types (Type A and type B) by definition.

Orientation: Does the portfolio focus on products or processes? As this is also a defining category, no additional remarks are required.

View: It is not surprising that almost every kind of portfolio provides access to a diverse specified selection of the data (view). This is the essential idea of e-portfolios and their main advantage. Exceptions are perhaps the learning product and assessment portfolios. But even in this case, the construction of different views for organizing purposes is helpful (especially if there is already lots of integrated material). As a matter of fact, the criterion of “view” does not discriminate very well and is therefore of only limited value for the taxonomy.

Relation: A similar argument applies to “relation”. The linking of the material is one of the main assets of e-portfolios. It strongly discriminates between paper-based and electronic versions of the portfolio. However, it is not exceedingly useful for a special classification system of e-portfolios.

Time frame: On the other hand, this criterion turned out to be not only useful, but also theoretically interesting.

Reflection portfolio: We have declared reflection portfolios to be “retrospective” e.g. orientated towards the past, although learning has effects on the future as well. But the reflection on a product is a view into the past: The artefact is already produced and reifies accomplished work and objectified experience. Due to the possibility of drawing conclusions for the analysis of the current situation and for the next learning product, I have filled in small signs (cruces).

Development portfolio: Here we get an analogue but inverted pattern: These types of portfolios are essentially orientated towards the future (e.g. in order to overcome qualification gaps), but they include some past moments as well (e.g. in the analysis of the current situation).

Presentation portfolio: This type is primarily concerned with the presentation of actual products, services, and performances and is therefore oriented by the present.

The process variants especially focus on future goals (e.g. to sell more products) and can be seen to have forward looking, prospective motivations.

Feedback: For this category a mapping is not easy as almost all e-portfolio software has this function built-in. It is the decision of the owner – realized in the concrete implementation – if feedback is allowed. A detailed inspection of this feature results in some regularities:

Reflection portfolio: The structure of the provided feedback in this type of portfolio is a function of the property structure. It is dependent upon the

owner and the goal pursued with the portfolio. In portfolios owned by a person, we mostly see feedback in the form of self-assessments; assessments by third parties, on the other hand, are the predominant form in organisation portfolios.

Development portfolio: In this basic type, the personal and organisational variants of the portfolio have an inverted relationship as well. In this case it is not the property structure that is important, but the dependency to the product/process character of the portfolio: The product types are generally orientated in their feedback towards their owners or producers; the process types have a tendency to integrate feedback from their peers as well.

Presentation portfolio: In this type of portfolio we have a prevalent trend to feedback from third parties. Note that the response (by clients for instance) does not necessarily come through written comments, but also by actions such as their buying behaviour.

Relation to the world: As I have already shown, all three types of relations to the world (objective, subjective and social) are invariably present at the same time and that is why I will concentrate on the relation to the world that is the most important for each type of portfolio under consideration.

Reflection portfolio: From its definition, we already get the major relation to the world: Personal portfolios demonstrate primarily subjective relations to the world, whereas organisational portfolios predominantly reveal objective relations to the world.

Development portfolio: Here we can see an interesting correlation caused by the development of the portfolio's product/process orientation: First and foremost, product portfolios show objective relations, while process portfolios reveal subjective and social validity claims to the world.

Presentation portfolio: Concerning the type of relations to the world, we see here a remarkable irregularity: The product types (application and showcase portfolio) show their expected objective relation to the world. But the types of validity claims in process portfolios are a bit more complex: The self-promotion portfolio is intended to improve one's reputation (subjective validity claims). As this is essentially a kind of social construction, it always requires a certain degree of social networking as well. The representation portfolio, which is based on long-term considerations, also demonstrates, in addition to its objective claims, a strong tendency to social relations.

Activities and artefacts: A detailed analysis reveals differences mainly concentrated around the three different basic types of portfolios. In my opinion this finding (cf. Table 5) is some kind of reassurance that the suggested taxonomy

grounded on three prototypes of portfolios makes sense. Now we can safely say that exactly for this reason it is correct to distinguish only three different basic types of e-portfolios. As important as all the other and finer differentiations are, they do not vary in the activities of their producers and the structure of the artefacts they use.

Table 5: Taxonomy (Part 2)

Type of Portfolio	Activity							Artefact					
	selecting	assessing	organising	planning	presenting	networking	reflecting	Example	Assessment	Biography	Document	Experience	Reflection
Learning Product Portfolio		X		X			X	X	X			X	X
Development Portfolio	X	X	X	X		x	X	X	X	X	X	X	X
Presentation Portfolio	X	X	X		X			X		x	x		

7 Recapitulation

This article proposes a systematic taxonomy for e-portfolios. After examining relevant theoretical and methodological issues, it presents the concepts that were extracted from a study of the e-portfolio literature and develops and discusses the classification system.

The importance of the taxonomy depends on its usage in everyday practice. It is not intended to function as a rigid prescription, but as a heuristic tool (a) for the selection of adequate software (b) for a planned implementation strategy and (c) for everyday usage at a personal or organisational level.

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