3 A Conceptual Framework for Task and Tool Personalisation in IS Education

Abstract

Learner-centred, self-regulated learning approaches such as flipped classrooms or personalised learning environments (PLEs) are popular. This paper analyses personalised learning in collaborative, self-regulated e-learning approaches applying the theory of cognitive fit to explain the personalisation of learning tasks and learning tools. The PLF is presented defining the core constructs of such learning processes as well as a method of personalisation. The feasibility of the framework is demonstrated using a thought experiment describing its possible application to a university course on electronic negotiations as part of an IS curriculum. Current learning methods used in the course and new learning methods matching the PLF are compared and discussed critically, identifying potentials to improve personalised learning as well as avenues for personalised learning research.

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3.1 Introduction

In recent years, the importance of e-learning has increased leading to a convergence of technological and pedagogical innovation aiming for educational goals supported by technology (Garrison 2011). Conforming to Dewey (1997, p.46) who noted that teachers are

> "concerned with providing conditions so adapted to individual needs and powers as to make for the permanent improvement of observation, suggestion, and investigation",

the importance of personalised learning has been recognised in research and practice. Personalisation by a teacher, however, is only possible in small classes mostly relying on face-to-face learning. To enable automatic personalisation, new methods using expert systems or data mining approaches are employed leading to high investments in start-ups developing and applying such technologies (Emerson 2013). According to the learning paradigm of constructivism (Kafai 2006), only learners themselves are truly able to regulate their learning processes. Such learner-centred, self-regulated approaches (such as learning in informal settings directly at the workplace or flipped classrooms) are getting more and more popular shifting responsibilities for organising the learning process from teachers to learners (Tsai et al. 2013). Self-regulated personalisation not only includes time and pace but the definition of learning objectives and even learning tasks to achieve these objectives. Such personalisation, however, requires a certain awareness based on a profound evaluation of one's own skills and learning preferences (Zimmerman 1989).

PLEs strive to support personalisation in self-regulated learning. In contrast to VLEs, PLEs are not single systems but user-configured sets of interchangeable social media (formerly Web 2.0) tools such as blogs, wikis, media sharing services, podcasts, social networks, or social bookmarking services (Attwell 2007). Due to their ubiquitous availability, conjunction to private use, and independence of learning institutions, PLEs are easy to set up and to use for individuals as well as for groups of learners. However, configuration, usage, and evaluation of social media tools in the context of PLEs requires digital literacy and awareness (McLoughlin and Lee 2010):

1) Although there is an increasing expectation that learners as digital natives already possess digital literacy through the permanent engagement with social media, there is also a strong need for explicit scaffolding as learners might not know how to use such technologies for learning or see their relevance for learning (Katz and Macklin 2007);
2) Constant private use of social media might also affect their behaviour adversely leading to impatience or an overly casual approach to learning (CLEX 2009).

Both problems, i.e. the matching of learning preferences to learning tasks as well as to learning tools, can be generalised to the class of matching problems which has been the topic of numerous studies in the IS domain (e.g. Gupta and Anson 2014; Robey and Taggart 1981) and the learning sciences (e.g. Kolb and Kolb 2005; Vermunt 1996). Although different kinds of cognitive styles or learning styles have been analysed with different kinds of learning methods or IS designs, matches have rarely been found. Until today, there is no consistent theory that is able to explain such matching processes (Coffield et al. 2004; Pashler et al. 2009).

The research goal of this work is thus to explain and support self-regulated personalisation, matching learning preferences to learning tasks and PLE tools. In contrast to previous attempts to demonstrate specific matches between learning styles and learning methods or contents, this paper focuses on learning tasks as the construct of personalisation which is defined by the learners themselves providing an alternative method to define such matches. Therefore, this paper aims to provide an overview of the heterogeneous theories of learning and cognitive fit (Vessey 1991) in section 3.2 and integrate them into the PLF showing the main influence factors for collaborative, self-regulated personalised learning in section 3.3. In section 3.4, the feasibility of the PLF will be demonstrated by a thought experiment, applying it to an example university course which is part of an IS curriculum. The paper concludes with a discussion and an outlook to future work.

3.2 Theoretical Foundations

The following section presents a literature review of the theories shaping the PLF, integrating collaborative e-learning, personalised learning and cognitive fit.

3.2.1 Collaborative Electronic Learning

Several learning paradigms existing in the learning sciences are applied to e-learning, defining how learners acquire knowledge (cf. Figure 11). Instructivism focuses on a teacher standing in front of the class transmitting knowledge to the learners. Whilst behaviourism (Skinner 1958) follows a stimuli-response model where the human mind is modelled as a black box, cognitivism (Tennyson 1992) particularly investigates this black box modelling human memory. Cognitivism thereby focuses on the information processing taking place along the transmission of knowledge. In contrast to instructivism, constructivism (Jonassen 1990) defines learning as the construction of knowledge by the learners using observation and reflective thinking. There are two major streams within constructivism, namely situated learning in communities of practice (Lave and Wenger 1991), (aiming to explore authentic problems) and constructionism (Kafai 2006) (which explicitly emphasises social aspects such as learning in groups describing learning as an inseparable relationship between personal meaning making and social influences) (Garrison 2011). Through social interaction between teachers and learners as well as among learners, ideas are communicated, and knowledge is constructed and confirmed. Learners, therefore, have an important responsibility to manage the learning process and achieve their learning goals while teachers merely assist this process.

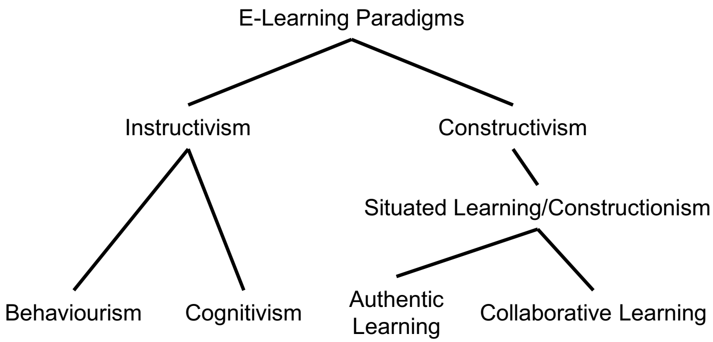

Figure 11 Taxonomy of E-Learning Paradigms (adapted from Melzer and Schoop 2014c, p.780)

To reflect the inherent connection of e-learning and constructionism, this paper follows the definition of Garrison describing e-learning as

> "electronically mediated asynchronous and synchronous communication for the purpose of constructing and confirming knowledge" (Garrison 2011, p.2).

This is performed in Communities of Inquiry (COIs). The COI framework (cf. Figure 12) defines cognitive presence, social presence, and teaching presence as key dimensions providing guidelines for implementing and evaluating constructionist e-learning courses. *Cognitive presence* describes the individual perception and acquisition of new knowledge, skills and abilities through critical discourse and application to a problem domain. *Social presence* represents the transfer of these individual efforts to a group of learners. COIs focus on asynchronous exchange of text messages to enable collaboration. This type of electronically mediated communication is described to be particularly effective in facilitating critical discourse providing users with more time to think through their utterances systematically and to document all statements making them public to the COI. Sustainable and cohesive groups of learners are particularly important to facilitate discourse providing each individual with the opportunity to discuss and confirm individual knowledge as well as to help other learners. *Teaching presence* represents the influence of the teacher moderating discourse ensuring an open climate assisting the learning process. At the same time, the teacher is responsible for selecting and preparing the learning contents according to the course goals to facilitate information processing adhering to the learners' preferences. Thereby learners need to be enabled to regulate and personalise their learning experience themselves. Overall, these three heavily intertwined dimensions represent the core of constructionist e-learning.

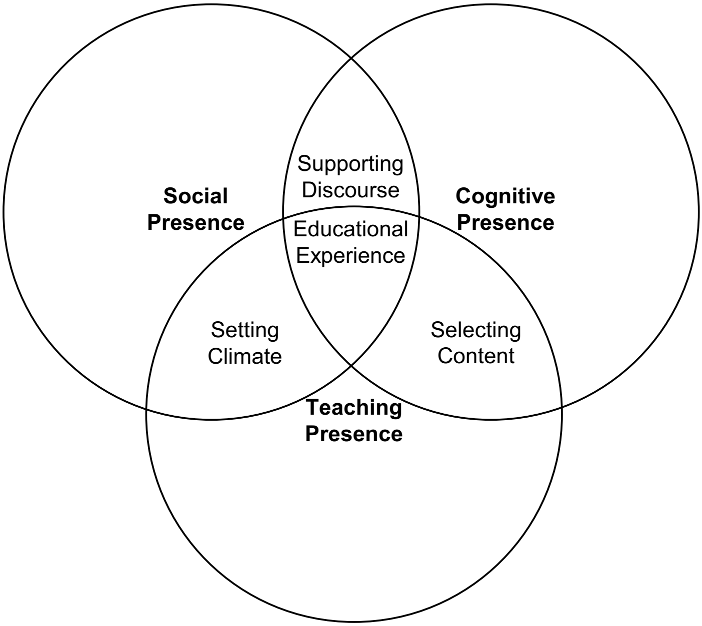

Figure 12 Community of inquiry Theoretical Research Framework (Garrison 2011, p.23)

3.2.2 Personalised Learning

Personalised learning can be structured into two dimensions:

1) Who is responsible for the personalisation – a teacher or learning system on the one hand or the learners themselves on the other hand;
2) What is going to be personalised – learning methods or learning content.

Following constructionism, a learner-centred approach to personalisation is pursued. Thereby, the paper focuses on personalisation of the learning method in a self-regulated fashion, keeping the learning contents constant.

Personalised learning is usually related to individual characteristics and abilities of the learners. The work of Jung on personality types (Jung 1923) has led to numerous theories and instruments on learning styles

(Coffield et al. 2004). They can be structured from largely constitutionally-based factors to concrete learning approaches, strategies, orientations, and conceptions. Each learning style is supposed to fit certain learning environments, methods, or scenarios. Personality-based factors have been a topic in IS research, analysing cognitive styles in IS usage patterns (e.g. Robey and Taggart 1981; Taggart et al. 1982) or learning styles in EUTs (e.g. Davis and Bostrom 199; Melzer and Schoop 2014b). Several matches between learning styles and learning methods have been proposed. However, many learning style instruments lack validation and findings are seldom reproduced due to small effect sizes and numerous confounding variables. Thus, the value of using personality traits in the design and usage of IS has been questioned (e.g. Gupta and Anson 2014; Huber 1983).

3.2.3 Cognitive Fit

The theory of cognitive fit (Vessey 1991) emerged from the debate whether graphical or tabular problem-solving tasks fit specific mental representations of how to solve these tasks. Emphasising information processing theory, it created the theoretical foundations to match *mental representations for a task-solution* to *problem-solving tasks,* proposing a consistent mental representation in human memory to decrease complexity leading to a better *problem-solving performance*. Over the years, the model of cognitive fit has been extended (cf. Figure 13) to grasp more detail including an *internal representation of the problem domain* as well as an *external problem representation* (Shaft and Vessey 2006). While the internal representation refers to knowledge about the meaning of symbols or mathematical procedures which has to be retrieved from memory, the external representation refers to shapes and positions of symbols on paper or other media which can be retrieved from the environment. Both the internal and external representation influence each other leading to a mental representation for task-solution. Cognitive fit has already been applied to interdependent tasks in the domain of software engineering (Shaft and Vessey 2006). An analysis of the interwoven software maintenance tasks of code comprehension and code modification showed how cognitive fit can be used to explain and integrate effects on the overall problem.

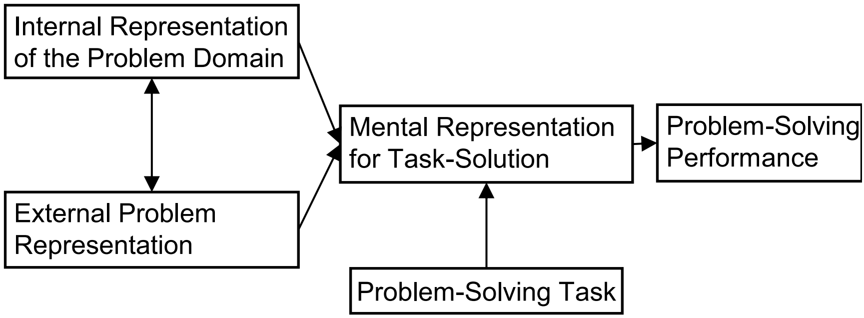

Figure 13 Extended Cognitive Fit Model (Shaft and Vessey 2006, p.32)

Vessey and Galletta emphasise the importance of tasks as the unit of analysis referring to the debate on cognitive styles:

> "Rather than seeking measures of cognitive style in an attempt to explain the incremental effects of individual differences on performance, we suggest seeking *information processing skills that support a particular task* […]" (Vessey and Galletta 1991, p.69)

We, therefore, use cognitive fit as a new approach to personalised learning arguing that the self-regulated personalisation of learning tasks and PLE tools are two parallel but interdependent processes of cognitive fit, where the learners have to match their representations of the respective learning problem to specific learning tasks and learning tools. Achieving such a fit in one or both matching processes should increase learning performance. Following the idea of cognitive fit, personalised learning can be analysed focusing on the configuration, management, and evaluation of learning tasks as well as learning tools to infer preferences and predict learning performance. However, a clear-cut taxonomy of learning tasks and learning tools is necessary to define possible matches.

3.2.4 *Taxonomy of Learning Tasks*

Bloom's taxonomy of learning objectives (Bloom et al. 1984), one of the most prominent taxonomies in the learning sciences, defines learning tasks together with specific levels of knowledge as a two-dimensional allocation of learning objectives in its revised version (Anderson and Krathwohl 2001). The knowledge dimension differentiates knowledge on facts, concepts, or procedures from metacognitive knowledge (i.e. knowing about one's own knowledge). In self-regulated learning through web-based systems, such metacognitive knowledge is particularly important because it is used to organise and personalise the learning experience (Narciss et al. 2007). Knowledge can be acquired performing different cognitive processes grouped in ascending order of complexity from lower order thinking skills (i.e. remembering, understanding, and applying) to higher order thinking skills (i.e. analysing, evaluating, and creating). Courses typically encompass several learning objectives combining cognitive processes and knowledge levels. The taxonomy, furthermore, defines specific learning tasks, which can be used to achieve these learning objectives for every cognitive process (cf. Table 8). Bloom's taxonomy shows its cognitivist roots as a tool for teachers to structure their classes only describing knowledge acquisition omitting constructionist learning tasks focusing on situated learning or collaboration.

Table 8 Cognitive Process and Learning Tasks (based on Krathwohl 2002, pp.214-215; Churches 2009)

Cognitive Processes	Complexity	Learning Tasks	Digital Learning Tasks
Remember	Lower Order Thinking Skills	Recognising, Recalling	Bullet pointing, Highlighting, Bookmarking, Social networking, Social bookmarking, Favouriting/Local bookmarking, Searching,
Understand		Interpreting, Exemplifying, Classifying, Summarising, Inferring, Comparing, Explaining,	Advanced Searches, Boolean searches, Blog journaling, Twittering, Categorising, Tagging, Commenting, Annotating, Subscribing
Apply		Executing, Implementing	Running, Loading, Playing, Operating, Hacking, Uploading, Sharing, Editing
Analyse	Higher Order Thinking Skills	Differentiating, Organising, Attributing	Mashing, Linking, Validating, Reverse engineering, Cracking, Media Clipping
Evaluate		Checking, Critiquing	Blog commenting, Reviewing, Posting, Moderating, Collaborating, Networking, Refactoring, Testing
Create		Generating, Planning, Producing	Programming, Filming, Animating, Blogging, Video blogging, Mixing, Wikiing, Publishing, Videocasting, Podcasting, Directing

Churches (2009) applies Bloom's taxonomy to digital learning extending it by learning tasks performed in digital environments using social media tools as well as including the notion of collaboration inherent to social media. Remembering can, therefore, be supported digitally by highlighting words in a text, building a social network to ask experts, or searching and bookmarking resources on the web, while understanding is facilitated by advanced searches using complex expressions, journaling contents in (micro)-blogs, categorising or tagging it. Application tasks represent lower as well as higher order thinking skills including running a software and especially sharing content over media sharing services. Higher order thinking skills such as analysis and evaluation include the mashing up, reverse engineering, commenting, or refactoring of content in blogs focusing, for example, on reports and their assessment. Finally, the creation of content, as a main goal of social media, includes the complete generation and publishing of programs, videos, wikis, podcasts etc. on the web (cf. Table 8).

3.2.5 Taxonomy of Learning Tools

Promoting openness, interoperability, and user control (Siemens 2007), PLEs reflect the idea of social media. In contrast to VLEs, they represent an approach rather than a specific application where learners can create, share, mash-up, and discuss content using the tools they prefer (Downes 2005). Since PLEs by no means restrict the social media tools which can be used, and technological evolution still produces numerous new kinds of tools, the definition of an exhaustive taxonomy of tools is impossible. Thus, we focus on the most prominent types of tools which are used within PLEs, namely microblogging services, social bookmarking services, podcasts, blogs, wikis, mind maps, video sharing platforms, and image creation services (Attwell 2007; Siemens 2007).

Such tools are configured and used within PLEs for two reasons:

1) customisation of the learning environment providing ownership, control, and literacy and
2) social support through collaboration with a learning group or across boundaries with practitioners facilitating the learning process (Buchem et al. 2011).

Supporting the individual dimensions ownership and control, learners will be enabled to design and manage their learning processes breaking down learning objectives into learning tasks based on individual learning preferences. Personalisation of tools thus is guided by the learning tasks required to achieve the learning objectives (Bower et al. 2010; Churches 2009). Bower et al. (2010), consequently, propose a framework of social media learning designs assigning social media learning tasks to Bloom's taxonomy of learning objectives defining how specific social media tools can be used to achieve certain learning objectives following a constructionist perspective (cf. Table 9). It must be noted that Table 9 only shows a reduced version of social media tools for the sake of clarity, omitting the concrete learning tasks that have to be defined w.r.t. a specific learning content. The allocation of tools shows that social media facilitates the idea of constructionism by numerous possibilities to create contents collaboratively. Regarding the knowledge dimension, microblogging and social bookmarking services match the acquisition of factual knowledge while wikis provide conceptual knowledge. Video-related tools such as recording software, podcasts, and media sharing are especially suitable to acquire procedural knowledge. Finally, mind maps and blogs focus on metacognitive knowledge. The more constructive a tool is, the better it facilitates higher order thinking skills (Bower et al. 2010).

Table 9 Framework of Social Media Learning Designs (adapted from Bower et al. 2010, pp. 190-191)

	The Cognitive Process					
The Knowledge Dimension	**Remember**	**Understand**	**Apply**	**Analyse**	**Evaluate**	**Create**
Factual Knowledge	Microblog	Social Bookmarking, Podcast	Image Creation	Wiki	Social Bookmarking, Blog	Image Creation
Conceptual Knowledge	Wiki, Podcast	Blog, Wiki, Mind map	Video	Wiki, Podcast	Wiki, Blog	Mind map
Procedural Knowledge	Video, Podcast	Podcast	Blog, Video	Video	Blog, Video	Image Creation
Metacognitive Knowledge	Mind map	Mind map	Blog	Blog	Blog	Mind map

3.3 The Personalised Learning Framework

This section aims to integrate the heterogeneous theories described in the previous sections into the PLF to explain the process of personalised learning. Reflecting constructionism inherently involving collaborative learning, the source of the PLF is not an individual learner, but a community of inquiry (COI). Although an inherent property of personalisation is its focus on individuality, personalisation of tasks and tools in constructionist learning occurs in groups considering the process of learning equally important than the learning outcomes. Therefore, individuals have to negotiate their preferred tasks and tools with their peers and teachers to find a consensus. The core framework (cf. Figure 14) thus contains the COI personalising learning tasks and learning tools. Matching learning preferences of the learners to respective tasks and tools are modelled as cognitive fit processes.

The analysis of personality traits as learning styles typically treats such styles as fairly stable. Literature on personality-based learning styles, however, shows that there are numerous contextual variables that often outshine personality traits and thus have to be considered in the framework (Pashler et al. 2009). Classroom contextual factors such as learning styles, for example, are criticised for their often normative nature. Defined and assessed by a teacher, a non-preferred style might lead to disadvantages for the learner (Pintrich et al. 1993). Looking at informal learning scenarios, learning motivation differs greatly. Learning goals need to be balanced between personal life, work life, and other interests. A part-time learner's motivation is often non-comparable to that of a full-time learner (Haggis 2003).

Most of the time, PLEs are taken to be completely learner-driven environments, exceeding the learning goals of a single course being available for further learning. However, the PLF adheres to the narrow definition of PLEs adhering to a learning institution to

> "enable self-direction, knowledge building, and autonomy by providing options and choice while still supplying the necessary structure and scaffolding." (McLoughlin and Lee 2010, p.33).

If applied to a real university course, the learning institution's strategy and culture as well as its infrastructure will affect learning. A university's strategy is transferred to the staff and eventually to the students reflecting the country's culture as well as a learning culture.

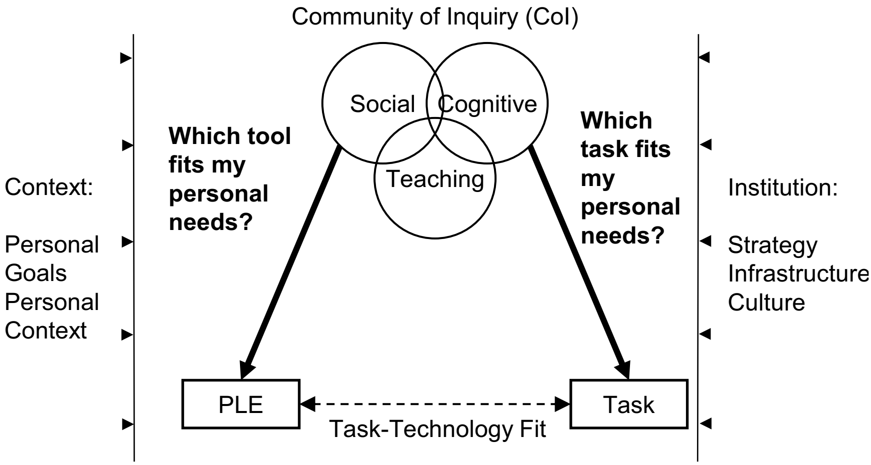

Figure 14 Conceptual Framework of Requirements for Personalised Learning

3.3.1 Cognitive Fit and Personalised Learning

The PLF shows that the personalisation of learning tasks and learning tools are two interdependent processes of cognitive fit. Learners personalise their learning experience throughout the learning process configuring, managing, and evaluating tasks and tools to achieve their desired learning objectives, at the same time acquiring awareness and digital literacy for further learning processes (Narciss et al. 2007).

Learning awareness is an important prerequisite to personalisation in self-regulated learning. In the model of cognitive fit, learning awareness is represented as *internal representation of the learning domain* as well as *external representation of the learning domain*. The internal representation contains experiences, feelings, and thoughts (i.e. which tools do I like to use; how do I want to break down a learning objective into learning tasks?). The internal representation can be guided by personality traits or learning preferences. The problem here is to retrieve and explicate such information to make it accessible and understandable, which requires experience. The external representation encompasses material such as written text or guidance by peers that present information increasing the learning awareness (i.e. what tasks are available; which tools provide which features). Complexity lies in finding such information e.g. on the Internet. Both internal and external representation together form the *mental representation of the task/tool-solution*, defining how learners want to achieve learning objectives.

3.3.2 Cognitive Fit and the Personalisation of Learning Tasks

Regarding the personalisation between the learners' *mental representation of a learning task-solution* and the respective *learning task*, there are three important factors reflecting the three presences of the COI framework, namely

1) task complexity,
2) individual experience, both reflecting cognitive presence, and
3) external support reflecting social and teaching presence.

The concrete learning tasks complexity must match the complexity of the learner's problem representation (i.e. the *mental representation of a learning task-solution*). Cognitive fit demonstrated that achieving a fit between a task and a mental representation of a problem reduces mental complexity and thus increases problem-solving performance. The presented taxonomy of learning tasks distinguishes learning task complexity into lower order and higher order thinking skills. Performing overly complex tasks leads to overburdened learners who are unable to execute the learning task, while performing overly easy tasks leads to ineffective learning. To break down learning objectives into matching learning tasks regarding their complexity, individual experience is an important factor. In the domain of cognitive fit, higher information processing skills (e.g. through experience) for a specific decision-making task as well as task and problem combination have been demonstrated to increase decision-making performance (Vessey and Galletta 1991). Such metacognitive knowledge about previously performed learning tasks, contents, or individual preferences demonstrates the internal representation. The social constructionist notion of PLEs can also help to create such knowledge by engaging in discussions with peers or teachers to confirm or dismiss knowledge collaboratively fostering the exchange between internal and external knowledge of the learning domain. Achieving a cognitive fit between this *mental representation of the task-solution* and the *learning task* represents an optimally personalised learning task.

3.3.3 Cognitive Fit and the Personalisation of Learning Tools

A similar process takes place regarding the PLE tools used to achieve learning objectives. However, these tools cannot achieve learning objectives alone, but support specific learning tasks. Therefore, the learners have to match their *mental representation of learning tool-solution* to a specific *learning task supported by a learning tool*. There are several matches of tasks (e.g. discussion) to tools (e.g. social networks) leading to a task-technology fit while other combinations do not match. Predictors of task-technology either reside within the tasks' or technologies' characteristics (Goodhue and Thompson 1995). Task-related predictors facilitating fit are performing routine tasks, few task interdependences, and power to define and orchestrate the tasks themselves. While the PLF fosters the hand-over of responsibilities to the learners to create such openness, learning is seldom focusing on easy routine tasks. Technology-related predictors are the experience of the user with a specific software and the departmental background, both pointing out the necessity of digital literacy. However, it is assumed that achieving a cognitive fit in the personalisation of learning tools implicitly leads to a task-technology fit, since the learning tasks influence both processes. Investigating cognitive fit, analyses have been conducted w.r.t. tools supporting the decision process (e.g. structured English, decision tables or decision trees) in programming tasks. Cognitive fit could show specific matching conditions that increased performance (Vessey and Weber 1986).

We will complement these findings from a learning perspective, analysing the PLE-tool-selection-process, which depends on the

1) overarching learning objectives and outcomes,
2) respective dimensions of knowledge and cognitive processes expected,
3) type of pedagogy applied, and
4) preferred modalities of representation (Bower et al. 2010).

This confirms the importance of a clear communication of learning objectives and the freedom and awareness to deconstruct them to concrete learning tasks to achieve learning outcomes. Digital literacy is also important, referring to the internal representation, to know which PLE tools enable which learning outcomes. Regarding the type of pedagogy, however, social media tools particularly support higher order thinking skills such as the creation of contents in blogs or wikis. Finally, learners can influence the preferred mode of presentation choosing for example blogs over image creation. Achieving a cognitive fit between this *mental representation of the learning tool-solution* and the *learning task supported by a learning tool* represents an optimally personalised learning tool.

3.3.4 Synthesis of the Personalisation of Tasks and Tools

The analysis of cognitive fit in interdependent processes proposes that both personalisation of learning tasks and personalisation of learning tools run in parallel for each sub-task (Shaft and Vessey 2006). The resulting *mental representations of the learning task-solution* and *mental representation of the learning tool-solution* are then integrated into one *mental representation for personalised learning* again requiring a fit, consequently leading to improved *learning performance*. Increasing learning awareness via the facilitation of constant (re-)evaluation of the *internal representation* as well as *external representation* enables the learners to achieve cognitive fit regarding their *mental representation of the learning task-solution*, *mental representation of the learning tool-solution*, and, consequently, the *mental representation of personalised learning* increasing *learning performance* (cf. Figure 15). Learning performance is thus defined as the degree to which the learning outcomes fulfil the learning objectives. In a constructionist learning experience, learning outcomes can be divided into cognitive, affective, and psychomotor outcomes (Bloom et al. 1984). However, this paper focuses primarily on the cognitive outcomes.

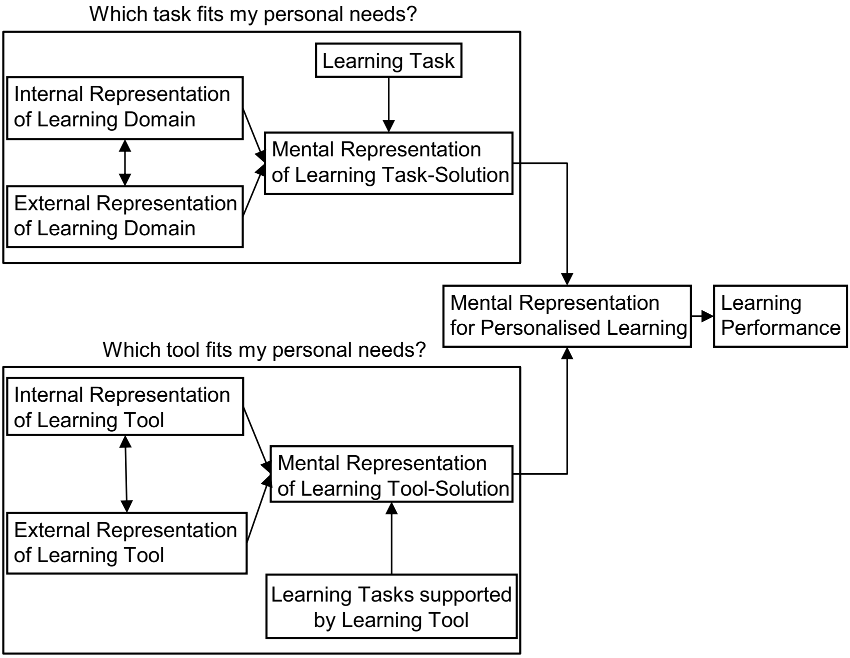

Figure 15 Cognitive Fit in Personalised Learning (adapted from Shaft and Vessey 2006, p.33)

3.4 An Example Application of the Personalised Learning Framework

The feasibility of the PLF is demonstrated by applying it to an actual university course ANM in a thought experiment. First, the status quo of teaching in ANM is described leading to a detailed description of learning methods used and contents taught. We will then present the application of the PLF to ANM, resulting in a new course with the identical content and learning objectives but with different learning methods facilitating collaborative learning and self-regulated personalisation.

3.4.1 Teaching Electronic Negotiations in Information Systems

Negotiations represent complex management tasks comprising of interdependent communication and decision-making processes (Bichler et al.

2003). As such, they are often included in IS or business administration curricula in higher education preparing students for their jobs. Electronic communication media such as e-mail are increasingly used for negotiations, although they possess certain obstacles which inhibit optimal negotiation performance (Schoop et al. 2008). For example, communication is unstructured; archiving of messages is left to the negotiators; and decision-making in multi-attributive negotiations is challenging. Electronic negotiations are defined as negotiations supported by electronic means providing additional support features (Ströbel and Weinhardt 2003). NSSs, as archetypes of ISs, aim to support human negotiators providing communication support, decision support, document management, and further support functionalities (Schoop et al. 2003; Schoop 2010).

Negotiation pedagogy in management education largely focuses on instructivist face-to-face courses (Lewicki 1997). E-learning courses on negotiations are scarce, providing web-based trainings that mainly follow instructivism sometimes including simulations (Eliashberg et al. 1992; Kaufman 1998). Nevertheless, the necessity of combining conceptual and procedural knowledge is acknowledged by employing explicit examples, case studies, negotiation experts, or negotiation simulations (Loewenstein and Thompson 2006). Practicing the use of NSSs additionally requires e-negotiation-related content such as electronic communication media, specific support features, and experience in using NSSs. In electronic negotiation courses, learner motivation is usually very high facilitating self-regulated learning approaches (Köszegi and Kersten 2003). Because of the collaborative nature of negotiations, the process of negotiation itself is often seen as a collaborative learning task (Andriessen 2006).

3.4.2 Advanced Negotiation Management: Status Quo

The current ANM represents a typical half-year university course involving around 100 full-time graduate students from management-related subjects such as ISs, Management, or International Business and Economics. The course consists of weekly lectures and a negotiation journal. The journal is graded and provides half of the final grade. The other half comes from the end-of-course exam. ANM is designed to afford a total of 180 hours of work per student and semester. Teaching is supported using the VLE ILIAS (Graf and List 2005) to share learning material, upload and evaluate assignments, and facilitate communication between students as well as with teachers. Learning tools are completely pre-defined, requiring assignments to be turned in as Microsoft Office documents prescribing a minimum word count. Besides the official bulletin board and e-mail for questions and answers, other communication channels are not actively supported.

The ANM lecture covers face-to-face and electronic negotiations in a holistic manner, beginning with basic definitions and characteristics, then outlining the negotiation process. Preparation, execution, and evaluation of negotiations are taught applying them to electronic negotiations focusing on communication, decision-making and mediation aspects. Finally, selected topics from negotiation research (e.g. intercultural aspects) are discussed. The lecture involves numerous interactive individual and group tasks to enable students to experience negotiation aspects first-hand. For example, to illustrate negotiator profiling, students have to judge their fellow learners without talking to each other and report about their interests. To experience different negotiation styles (Kilmann and Thomas 1992), students engage in negotiation role plays with each other portraying specific styles, eventually evaluating each other's performance. Besides these interactive elements performed during lectures, the negotiation journal complements teaching providing several assignments to be completed outside the lecture to facilitate practical experience and reflection. All of these assignments have to be handed in in textual form or as a presentation for grading as well as feedback. The first assignment is a summary of individual expectations regarding the course and previous negotiation experience. Later on, students have to make requests in real-life contexts to experience and analyse when a person is not willing to fulfil a request and thus not willing to enter into a negotiation. The major assignment is to engage in an electronic negotiation simulation with fellow students or practitioners conforming to a predefined case study lasting from one to two weeks. This includes preparation, execution, and evaluation of this negotiation and of the negotiation partner, thereby applying the knowledge learned. Specific aspects of ex-post negotiation analysis are also practiced analysing negotiation scenes in movies (Kunkel et al. 2006).

Table 10 assigns the learning methods described above to their respective learning objectives according to Bloom's taxonomy. Although there is no real separation between passive lecture and interactive lecture as both are intertwined, they represent different methods leading to different objectives. While the passive part of the lecture focuses on lower order thinking skills regarding negotiation knowledge using slides and readings presented by the teacher for explanations, the interactive parts, including discussions, role plays, and case studies focus on higher order thinking skills e.g. by portraying specific negotiation styles in role plays. The assignments of the negotiation journal especially focus on higher order thinking skills and conceptual negotiation knowledge (e.g. evaluating methods for negotiation analysis applying them to movie scenes) as well as procedural negotiation knowledge (e.g. adoption of a negotiation process model in the negotiation simulation) being intertwined with the interactive lecture. Metacognitive knowledge is not explicitly addressed in the course, as it is very much prescribed by the teacher.

Table 10 Status Quo of Learning Methods According to Learning Objectives

	The Cognitive Process					
The Knowledge Dimension	**Remember**	**Understand**	**Apply**	**Analyse**	**Evaluate**	**Create**
Factual Knowledge	Passive Lecture (Explanations)		Interactive Lecture (Q&A)			
Conceptual Knowledge	Passive Lecture (Explanations)		Interactive Lecture (Role Plays, Case Studies)		Journal (Expectations, Requests)	
Procedural Knowledge	Passive Lecture (Explanations)		Journal (Movie Analysis, Simulation)			
Metacognitive Knowledge	Not Addressed					

3.4.3 Advanced Negotiation Management: Introducing the Personalised Learning Framework

Implementing the PLF to ANM means:

1) facilitating the construction of COI to enable learning in groups, providing an open climate (cf. components of Figure 14), and
2) supporting self-regulated personalisation following cognitive fit regarding learning tasks and tools (cf. relationships in Figure 14).

The learning method of the flipped classrooms neither facilitates personalisation per se, nor is it the only learning method being able to support self-regulated personalisation, however, it matches the learning objectives of ANM as well as provides enough openness for the PLF combining passive and interactive parts (Bishop and Verleger 2013). Therefore, we decided to follow the four-step cyclic model of the flipped classroom by Oeste et al. (2014) which is iteratively processed. One example iteration of this process will be described in the following to show how the PLF can be implemented. The negotiation journal runs in parallel to the online and co-presence sessions, providing more complex assignments following a self-regulated approach at the same time fostering diversity of tasks and tools compared to the status quo. Thus, PLEs can be introduced to a large scale, providing benefits such as collaborative self-regulated exploration and easy access to authentic tasks facilitating higher order thinking skills, consequently transforming journal entries to public blogs or wikis combining videos, images, or podcasts commented and assessed by peers and teachers.

In the first step (Objectives), an outline of the course is provided defining learning objectives and constraints regarding learning tasks, tools and collaboration. In the online learning phase, access to a course-related knowledge base is provided, containing learning units, videos, and readings to acquire basic factual and conceptual knowledge about negotiation basics, definitions, and seminal theories e.g. regarding negotiation process models and underlying phases (Adair and Brett 2005). The negotiation journal complements the iterations of the flipped classroom providing practical assignments. Similar to the status quo of ANM, a negotiation simulation can be used to illustrate the negotiation process, however, being executed in groups in a larger context requiring exploration of important concepts beforehand and evaluation afterwards. The focus of step one is to organise the learning process negotiating deconstruction of learning objectives into tasks and tools. Therefore, the learning groups have to gather knowledge regarding the relevant topics (i.e. negotiation basics) as well as regarding the learning process (i.e. learning tools in the domain of negotiations) referring to experiences and the knowledge base (i.e. internal and external representation of the learning domain/tool in Figure 15) to achieve a cognitive fit.

In step two (Exploration), students engage in learning gathering knowledge in a self-regulated, authentic way. For example, to achieve the learning objective of being able to conduct electronic negotiations, students gather information (e.g. on characteristics of electronic communication media relevant for negotiations) on the Internet, in papers, or in books. Conforming to the PLF, students are free to choose learning tools (e.g. mind maps or wikis) to paraphrase and rearrange relevant concepts. Training materials and access to NSSs is provided, including it in the PLE, to get the students familiar with such a system and prepare possible negotiation scenarios. As part of the negotiation journal, the simulation is conducted during this step. Conducting an electronic negotiation conforming to a case study, the students can apply, analyse and evaluate their knowledge acquired in the previous steps. A first form of re-evaluation and assessment is conducted within the learning groups aiming to achieve a satisfying result for all members. Further reflection will be encouraged as the student groups have to keep an electronic diary about the negotiation facilitating evaluation and creation of knowledge. Such a blog entry could link video clips to textual explanations of the negotiation process. Again, the students are able to choose for example the mode of representation using different social media tools increasing ownership and control, which consequently benefits satisfaction and learning outcomes. The focus of step two however, is on the management of these tools during execution of the learning tasks.

Step three (Evaluation) represents the first face-to-face session focusing on the interactive discussion of the previous steps to clarify and consolidate knowledge acquisition. Student groups present their negotiation diaries to each other and discuss their negotiation with their partnering groups. Students thus can present their expert knowledge regarding their individual learning objectives and their fulfilment, spreading this knowledge and thereby educating their peers, while the teacher moderates this process. Additionally, the learning process should be evaluated, providing assessments of the tool selection, management and achievement of learning outcomes to the peers.

Finally, step four (Immersion) focuses on the immersion of the knowledge acquired, employing further interactive presence learning by working with peer instruction, role plays, case studies, and readings exercised and discussed in class. Peer instruction (Mazur 1997) aims to deepen knowledge acquisition by posing realistic questions to the students integrating several of the learnt concepts. These questions can be answered anonymously via electronic voting systems or traditional methods requiring students to persuade their peers of their answer. Thus, peer instruction supports the integration of knowledge learnt in the self-regulated parts of the flipped classroom avoiding to embarrass students who opted for a wrong answer.

The concept of the flipped classroom presents a learning method, which fits the requirements of the PLF. Table 10 shows how the learning objectives of ANM can be addressed with implementing these methods as described above making them comparable to the current approach (cf. Table 11). The online parts of the flipped classroom (Objectives and Exploration) improve the passive lecture focusing on lower order thinking skills, the co-presence parts replace the interactive lecture focusing on higher order thinking skills, they are much more intertwined with the negotiation journal integrating higher order thinking skills in early phases. In total, the focus on the negotiation journal is increased fostering its self-regulated and collaborative character. In contrast to the current approach, metacognitive knowledge is now explicitly addressed communicating objectives in the beginning to scaffold the students choosing tasks and tools and facilitating peer assessment during the evaluation.

Table 11 Learning Methods according to Learning Objectives applying the PLF

The Knowledge Dimension	**The Cognitive Process**					
	Remember	**Understand**	**Apply**	**Analyse**	**Evaluate**	**Create**
Factual Knowledge	Flipped Classroom (Objectives & Exploration & Evaluation)					
Conceptual Knowledge	Flipped Classroom (Exploration & Immersion)				Self-Regulated Journal (Exploration)	
Procedural Knowledge	Flipped Classroom (Exploration & Immersion)		Self-Regulated Journal (Exploration/Simulation)			
Metacognitive Knowledge	Self-Regulated Journal (Objectives, Evaluation)					

3.5 Discussion

The following section compares the status quo of ANM with its modified version applying the PLF. Advantages and disadvantages of the framework are discussed from a learner's perspective as well as from a teacher's perspective also integrating external influence factors guiding the implementation of self-regulated personalisation in university courses.

The main advantage of the PLF is that it enables the learners themselves to personalise their learning experience in a self-regulated way. By handing over the responsibility for personalisation to the learner (who is then able to deconstruct learning objectives into tasks and tools), teacher-driven personalisation using learning styles becomes obsolete. Results of previous studies on learning styles and personalisation show its relevance; however, individual learning styles are too coarse a measure to define reliable matches between learning styles and learning methods (Gupta and Anson 2014; Melzer and Schoop 2014b). Personalisation is thus not imposed by the teacher anymore, but by the learners being scaffolded by the teacher. Furthermore, the PLF can be used as an alternative way to enable personalised learning and to explain its underlying relationships, deriving possible support capabilities regarding the personalisation of learning tasks and learning tools.

Self-regulated personalisation also improves the alignment of tasks within a course towards a central theme, which plays a pivotal role for learner satisfaction (Chan et al. 2014). However, the self-regulated alignment requires additional effort in negotiating tasks and tools in the learning group before engaging in the learning itself. In these negotiations, network effects (Shapiro and Varian 1999) play a vital role reducing the number of possible tools considerably, often inhibiting cognitive fit. Such a negotiation, however, is part of the learning process itself enforcing digital literacy and facilitating personal development (Hirshon 2005).

Collaborative, self-regulated learning heavily shifts responsibilities from the teacher to the learners providing ownership and control (Buchem et al. 2011) requiring extensive scaffolding (Tsai et al. 2013). Pedagogy in self-regulated courses must enable learners to make informed educational decisions providing metacognitive knowledge such as learning awareness and digital literacy. At the same time, open learning environments must be created encouraging application of diverse skills and knowledge with learner-centred forms of feedback and assessment (Green et al. 2005). As a consequence, self-regulated courses shift the focus towards learning processes instead of learning outcomes (Azevedo et al. 2008). Clear instructions, timely feedback, and competent staff – being relevant factors for learners' satisfaction according to Chan et al. (2014) – are thus particularly important in such personalised learning scenarios. Personalised learning is usually only implemented in rather small courses. ANM exhibits a considerable number of participants usually leading to anonymity and limited pedagogical opportunities for collaboration and interaction, which might decrease learning outcomes and satisfaction (Lehmann and Söllner 2014). However, personalised learning has been shown to counter these effects (Alonso et al. 2009), albeit requiring a suitable pedagogical integration, which is provided by the PLF. An integration as described in the previous section enables large numbers of learners to engage in real and practical exercises exploring the topic of negotiations in contemporary examples making the future value of the course easily recognisable for the learners (Chan et al. 2014).

There are also detrimental factors which must be considered planning and conducting self-regulated personalised learning. Besides the alignment of learning objectives within a course, the alignment of learning objectives and effort within a study programme is also important to the learners. Attending traditional courses and collaborative courses at the same time can be problematic as the latter require more effort distributed over the semester, while the former are mainly laborious at the end of the semester preparing for the exams. Increasing the number of collaborative and self-regulated courses in curricula may lead to a large-scale shift in the distribution of work. Seen from a staff perspective, the change in learning methods means a huge one-off effort developing and implementing a new course. At the same time, teaching becomes more efficient with the teacher being able to reuse learning units and videos for several classes and also using lecture time more efficiently focusing on interactive learning (Garrison and Vaughan 2011). However, teachers need to be comfortable handing over responsibilities to the learners. From a technological perspective, the teachers also need to be open and proficient to work together with learners using different software. Also, successful online learning material exhibits high quality, which requires a large amount of time to create and support. Matters of data security and copyright regarding such media on public platforms also have to be dealt with.

3.6 Conclusion

The evaluation by thought experiment to demonstrate feasibility presents the main limitation of this work. Regarding the literature, numerous concepts used in the PLF such as e-learning (Andersson et al. 2009), blended learning (Garrison and Vaughan 2011), flipped classrooms (Strayer 2012), and self-regulated learning (Azevedo et al. 2008) have proven their beneficial effects. However, the combination of all of these heterogeneous ideas has to be evaluated again analysing their interplay. Thus, our next steps will be to extend and implement ANM applying the PLF based on the thought experiment above. This instantiation of the course will then be evaluated combining design science research in ISs (Hevner et al. 2004) with DBR in the learning sciences (Brown 1992) aiming for a naturalistic ex-post evaluation focusing on quality, utility, and efficacy. Both methodologies require building and evaluating artefacts aiming to emphasise the connection between research rigour and practical relevance (Collins et al. 2004; Gregor and Hevner 2013).

From a theoretical point of view, the PLF is aimed to be generalisable to a broad range of courses and contents in IS education. However, it is very much nested into the constructivist learning theories. Thus, besides pursuing a practical evaluation, the framework should be applied to other courses varying content, learning methods or method of evaluation to improve its generalisability.

Finally, the definition of the PLF implies several directions for future research. Firstly, the PLF proposes a cognitive fit between learning preferences and tasks or tools as well as a task-technology fit between tasks and tools. The relationship between those processes needs further investigation. Also, such a cognitive fit is not always possible in learning groups with different preferences making analyses on group level necessary analysing the detrimental effects of missing fit. Secondly, the framework proposes two interdependent processes of cognitive fit, namely personalisation of tasks and personalisation of tools. Both processes are interdependent and are thus integrated into an overall cognitive fit for personalised learning. Whilst achieving cognitive fit reduces complexity and thus increases learning performance, the process of integrating both separate processes of personalisation might lead to interferences that increase complexity and thus decrease learning outcomes (Shaft and Vessey 2006).