

A Framework for the Adoption and Diffusion of Personal Learning Environments in Commercial Organisations: An exploratory study

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Abstract

This study presents an exploratory approach to identify the main factors of Personal Learning Environment (PLE) adoption and diffusion within commercial organisations. Utilising an inductive investigative approach via the use of Grounded Theory methodology, relevant adoption factors were identified and their resulting influence during various stages of the innovation diffusion process were proposed. Data was collected using semi-structured interviews followed by systematic analysis using a three-staged coding process. The results revealed 10 factors affecting the adoption of PLEs influencing the innovation diffusion process at various stages. Informed by the Technology Acceptance Model and Innovation Diffusion Theory, the proposed model could have important implications for key decision makers within commercial organisations, while adopting, rejecting and assimilating new technological innovations (e.g. PLE) for learning delivery.

1. Introduction

With the advent of Web 2.0 technologies, learners are exposed to, if not overwhelmed by, a plethora of social software tools and services. These emergent technologies enable learners to generate contents as well as consume other-created ones. This, together with the recognition of the need for lifelong learning, has contributed to a shift from a centralised institutional teaching approach to a more learner-centred decentralised learning approach (Wilson, 2008). To address the issue of increasingly diverse backgrounds of learners and contexts where learning activities occur, new generation learning environments should thus be more responsive and open than prevailing ones. Specifically, it is deemed useful to create an individual world for learning with personalization intelligence on the learner's side, thereby enabling learners to easily construct and maintain their own Personal Learning Environment (PLE). Roughly speaking, a PLE consists of a mix of preferred learning tools, learning services and learning resources.

Furthermore, the existing literature (e.g. Roger, 1995; Davis, 1989; DeLone & McLean, 2003; Venkatesh et al., 2003;) indicates that different types of institution involve different sets of facilitating as well as hindering factors that result in the acceptance (or rejection) of a technological innovation. It is intriguing to identify such factors and subsequently develop appropriate strategies to deal with them. Interestingly, the number of research studies investigating this particular issue in academic organisations is dwarfed by that in their commercial counterparts, which have become increasingly important players in the arena of new educational technologies. To bridge this observed gap, we have conducted a study where semi-structured interviews with some lifelong learners from commercial organisations. Of

particular interest is how they view the emerging notion of PLE (Section 2). Qualitative data so collected have systematically been analysed with the grounded theory approach (Section 3). Based on the findings, we have constructed a conceptual model on the PLE adoption by commercial organisations (Section 4), which entails further refinement and validation. Nevertheless, we have achieved an initial but significant step towards an integrated view on the adoption of new learning technologies in non-academic settings.

2. Theoretical background

2.1 Personal Learning Environments

The increased use of Web 2.0 has enabled an individual learner to build a unique and personal learning space (environment) and this experience is labelled under the umbrella term, Personal Learning Environment (PLE). There is no consensus or single description of a PLE (Fiedler & Våljataga, 2010). We commonly understand it to have a primary objective, that being to enable learners to manage their own learning within a flexible and versatile environment. The PLE therefore follows a learner-centric approach, allowing the use of lightweight services and tools that belong to and are controlled by individual learners. Rather than integrating different services into a centralised system, the PLE provides the learner with a variety of services and hands over control to her to select and use these services the way she deems fit (Chatti et al., 2007). Learners are able to combine formal and informal learning, collaborate with others and receive and create content that they may choose to share. For the purpose of this study, based on the various interpretations across the technology enhanced learning (TEL) community, we define PLE as “*a pedagogy-driven environment that facilitates learners to integrate distributed contents, services, tools and contacts based on personal goals and preferences, thereby enabling them to control their own learning and connect different contexts with the support of communities*”.

2.2 Acceptance of technology and innovation diffusion

There exists a considerable amount of literature explaining user acceptance of new technology (e.g. Venkatesh & Davis, 2000). Among them, the *Technology Acceptance Model (TAM)* has widespread credibility due to its success in bringing together previously disjointed behavioural research disciplines concerning the adoption of technological innovations (Wetzels, 2003). Davis (1986) conceived TAM by extending the *Theory of Reasoned Action (TRA)* formulated by Fishbein & Ajzen (1975). At its core TAM posits that the intention to use a technology depends fundamentally on its Perceived Usefulness (PU) and Perceived Ease Of Use (PEOU). Subsequently TAM was extended by a number of authors (e.g. Segars & Grover, 1993; Chau, 1996) to include additional constructs and forms. Incorporating all these suggestions Venkatesh and Davis (2000) proposed TAM2, which has recently been extended to TAM3 by Venkatesh & Bala (2008). Venkatesh et al. (2003) proposed the Unified Theory of Acceptance and Use of Technology (UTAUT) model by combining eight dominant models in the technology acceptance field. Even though a huge number of studies (e.g. Chiu & Wang, 2008; Wang, Wu, & Wang, 2009) have been used to confirm the robustness of the TAM models, several studies have highlighted key limitations of those models (e.g. Carlsson et al., 2006; Li & Kishore, 2006; Bagozzi, 2007;) and a need for revising or extending them.

The PLE literature (Atwell, 2007; Fiedler & Våljataga, 2010) also presents the key argument that PLEs are a new approach to learning; they are not solely technical solutions/systems but rather pedagogically driven, technically facilitated conceptual solutions. As PLEs mark a radical innovation in comparison to the way existing learning environments (LMS/VLE) are configured and used, we look into the Innovation Diffusion Theory (IDT) to complement the TAM as the underlying conceptual framework for our study.

“An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption” (Rogers, 1995). The decision to adopt an innovation is a function of several factors but previous studies found that only *relative advantage*, *compatibility* and *complexity* are consistently related to innovation adoption where the ‘relative advantage’ construct is similar to the perceived usefulness and the ‘complexity’ construct is similar to perceived ease of use (Moore & Benbasat, 1991). Rogers (1995) states that the ‘innovation decision process’ progresses over time through five stages: *knowledge* (when adopters learn about the innovation), *persuasion* (when they are persuaded of the value of the innovation), *decision* (when they decide to adopt it), *implementation* (when the innovation is put into operation), and *confirmation* (when the decision is reaffirmed or rejected).

3. Research Design

3.1 Grounded Theory

Due to the lack of prior studies looking at adoption and diffusion of PLEs within commercial organizations, a research method enabling the researchers to be open to concepts and relationships from raw data was required. The rationale was not to get distracted by the assumptions of what ought to be found in the data, instead let the theory emerge from the data itself. Grounded theory (Glaser & Strauss, 1967) provided such a methodological framework.

Grounded Theory is primarily an inductive investigative process in which the researcher formulates a theory about a phenomenon by systematically gathering and analysing relevant data (Glaser & Strauss, 1967, p. 1; Glaser, 1992, p. 16).

According to Strauss and Corbin (1998, p. 12), “*Theory derived from data is more likely to resemble the ‘reality’ than is theory derived by putting together a series of concepts based on experience or solely through speculation (how one thinks things ought to work).*” Grounded theory examines the “six Cs” of social processes (causes, contexts, contingencies, consequences, covariances, and conditions) to understand the patterns and relationships among these elements (Strauss & Corbin, 1998).

In order to generate theory from data without any preconception, Grounded Theory progresses through a number of stages. The first stage usually involves carrying out semi or un-structured interviews followed by a multi-part analytical process (involving several coding strategies) giving rise to the emergent theory.

3.2 Data Collection

Semi-structured interviews were chosen as the instrument for data collection. Unlike structured interviews, semi-structured interviews enabled flexible and dynamic style of questioning and discussion directed toward understanding the significance of human experiences from the informant’s perspective. Once the participants agreed for an interview, a document outlining the objectives of the study and some prior information about PLEs was emailed to them. Additionally, a link to a video (PLE

Conference, 2010 media-cast winner)¹ demonstrating a PLE scenario was also included. Three sets of questions were prepared, targeting different levels of the participant's experience on using learning technology.

Theoretical sampling is the preferred Grounded Theory sampling method. The choice of the participants is driven by the research context under which the construct or theory operates, not by the generalization of the findings to other settings (Miles and Huberman, 1994, p. 29). Depending on the outcome of initial interviews and emergent ideas, additional participants can be invited and questions can be reformulated accordingly. For the purpose of this study, the participants were selected from the learning and development sector in the UK, involving learning and development managers (SMEs as well as large enterprises) and consultants. A total of 10 participants were invited for the interviews out of which 9 agreed and participated. The interviews took place between 25th March 2011 and 20th May 2011 and were digitally recorded. While 1 of the interviews was conducted face to face, the other 8 were mediated with a videoconferencing tool.

3.3 Data Analysis

The data analysis was carried out in three coding stages, namely, open coding, theoretical coding and selective coding. Open coding involved the dissection, examination, comparison, contrasting, and categorising of data with the view to identifying concepts and categories within the data (Strauss & Corbin, 1998). The data reduction process in this phase was based on a qualitative evaluation of each sentence of each interview. The second stage of the analysis involved theoretical/axial coding (ibid, pp. 144-145) where groupings based on relationships and patterns were identified within and among the categories. These groupings and relationships gave rise to preliminary propositions. For this study the Six Cs theoretical coding family (mentioned in section 4.2) was used among the 18 coding families described by Glaser (1978). The final stage of the analysis involved selective coding where the analysis focused and crystallized around the main theme of the study pertaining to PLE adoption and diffusion. In this phase a smaller set of higher-level categories and factors was identified around the core theme (ibid, pp. 146-148).

In order to establish reliability during the *open coding process*, double-coding was used to establish inter-coder reliability as proposed by Miles and Huberman (1994, p. 64). The related formula is:

$$Reliability = \frac{Number\ of\ agreements}{Total\ number\ of\ agreements + Total\ number\ of\ disagreements}$$

They argued that at least 70% agreement was required to ascertain reliability during the analysis process. For this study a set of three interviews was independently coded by a co-author who was not involved in the interviewing and analysis process. The results for the three interviews were 86%, 87% and 89% agreements, which were above the acceptable levels mentioned earlier.

¹ http://youtu.be/Vyk_m0FrRG4

4. Results

4.1 Analysis findings

4.1.1 Perceived cost-effectiveness

All of the 9 the participants during the interviews highlighted the importance of associated cost-benefit analysis for adopting PLEs or any other technological innovation. Some of the illustrative comments are:

“When we look at things like the ICT a lot of it will really depends on the amount of money that is being requested”

“It is more or less preparing a business plan and its justification to spend I suppose”

“..cost obviously is always a big factor..”

“This could really enhance their offering from their financial perspective ...”

This is also consistent with the innovation literature where many studies have looked into the benefits and costs associated with the organizational adoption of technology innovation (Bunduchi & Smart, 2010). One of the key notions here was the need to demonstrate the cost-effectiveness (direct or indirect benefits, efficiency savings, etc) of PLEs as an innovation in comparison to existing solutions. If the innovation is emergent, then decision makers must be made aware of the direct benefits which will have capital cost implications. Alternatively, if a more mature innovation is to be adopted, then the decision makers must be aware of indirect costs having implication on indirect implementation costs (Waarts et al., 2002).

4.1.2 Perceived effort-expectancy

The participants were uncertain about the amount of time that might be spent to learn about an innovation like a PLE. They thought it might be helpful for them to adopt a PLE if the effort required to learn something not directly impacting their jobs is minimal. Illustrative comment:

“I think it might be, may be some managers have concerns about how much time they may be using..... with so much information at fingertips how they are going to manage the time”

This aspect is also consistent with the literature and can also be compared to perceived ease-of-use. Davis (1989) believed that given the fixed effort spent in completing a task, easy to use technology can help people achieve more in the same period of time, thus improving their working efficiency and in turn will facilitate its adoption.

4.1.3 Compatibility with existing systems

Within innovation literature compatibility is defined as the degree to which an innovation is perceived as consistent with the existing values and past experiences of potential adopters (Moore & Benbasat, 1991). The participants of this study did point towards compatibility issues but leaned more on technological and process compatibility issues. Some of the illustrative comments are:

“..I would be keen to see how that could or parts of that could be put onto a learning management system and work”

“..how would you integrate and implement something similar to that within our own environment it's that challenge”

Several studies (e.g. Tan & Teo, 2000), supporting the above arguments indicate that the perceived compatibility of an innovation has a positive influence on the

adoption of that innovation. Hence, compatibility of PLEs (primarily technological) with existing solutions and offerings must be demonstrated to potential adopters.

4.1.4 Leadership's attitude towards change

Another common theme across all the interviews was related to the decision making process within commercial organisations. The decision to adopt or reject an innovation lied completely in the hands of the top management exhibiting a top-down approach. This essentially means, the decision to adopt will also depend on the personal characteristics of the key decision makers, specifically their attitude towards change.

Some of the illustrative comments are:

"..Let's just say it's just I think safety and a little bit of resistance to change from the immediate superiors."

"It would probably be managers and senior managers and business leaders."

This is again consistent with the innovation literature where the decision makers' attitude towards innovation influences the adoption and diffusion process within an organization (Rogers, 1995). Empirical studies have also highlighted the important role of top management in the adoption of innovation (Huang et al., 2009). Hence, the key decision makers within an organization will most likely influence adoption of PLEs.

4.1.5 Strategic alignment

Among the participants, all the consultants and a couple of managers, expressed that a lack of alignment of the organizational goals to individual outcomes will hinder PLE adoption rates.

Illustrative comments:

"At the moment there is not sort of training strategy for our internal staff... So what we need to be really clear about is what is the strategy for training generally before you looked at PLEs."

"Those are reporting more acceptance and results are actually more likely to be looking at demonstrating results and aligning, learning with business objectives upfront"

Schaper and Mervan (2007) observed this effect in their study and report that alignment of organizational and individual goals will ensure the continued use of the adopted innovation.

4.1.6 IT Support

Through the comments of the participants, it was evident that the majority of the organisations had access to limited or basic IT support. Some organisations relied on external support for their vendor specific systems.

Illustrative comment:

"...we have an ICT service desk for first line support for logging calls and things that they could do basic things via e-learning like reset passwords."

PLEs fundamentally should allow learners to assemble their own learning environment using available technology. This, in our view, may require considerable IT support (post implementation as per IDT), specifically to cope with rapid technological changes. Technical support (Hofmann, 2002) has been identified as an important factor for the adoption of new technology and its resulting impact on user

satisfaction (Mirani & King, 1994). It has also been argued that high level of technical support positively impacts the adoption and specifically the continued use of a novel technology (Igbaria, 1990).

4.1.7 Line Managers

Once an innovation is adopted and implemented organisation wide, the continued adoption across the organisation seems to be hugely influenced by line managers. An illustrative comment is

“If they using it for their own jobs and they encourage usage in other roles, certainly the statistics we found in the 3000 learners is the person whose opinion matters the most to them, it would influence them to get learning in a new way. It isn't the HR, it isn't the learning department, it isn't the supplier, it is the line manager and it is 55% that actually say that the line manager will actually influence whether or not they get involved with the e-learning”

This supervisory and communicative influence has also been noted in the literature via the decomposed theory of planned behavior, which decomposes “subjective norm” into two variables: supervisor influence and peer influence (Taylor & Todd, 1995). Lewis et al. (2003) confirm this empirically and state, if supervisor sees a technology as useful, through a process of shared cognition, so will the target individuals. This might be crucial for the sustained adoption of PLEs after it has been adopted by the organisations and could impact the overall adoption rate in the long run.

4.1.8 Social Networks

Almost half (4/9) of the respondents were not aware of PLEs prior to the interview. A key aspect of innovation diffusion is about raising the awareness level of the innovation and its benefits. 8 out of 9 participants were engaged in some form of social network or expressed the importance of social media.

Some illustrative comments are:

“I use a lot of social media be it Facebook, LinkedIn and sometimes Twitter”

“So there is a peer to peer ... also a very strong influence when it comes down to learners”

In order to raise the awareness of the innovation (PLEs) social networks/media can be actively used to exert peer influence as per the decomposed theory of planned behaviour mentioned earlier in section 5.1.8. Interpersonal influence appears to be extremely important in influencing potential adopters (Karahanna et al., 1999).

4.1.9 Perceived factuality

During the interviews, the respondents, who were aware of PLEs, attempted to define it in various ways. It was evident some of them were not entirely sure how best to differentiate it from LMS/VLE.

Some illustrative comments are:

“I suppose it depends on what you actually mean as a personal learning environment that would have different meanings for different people in terms of your experience...”

“Its not a technology but different working rather than the current way of working”

If the innovation itself is not described in an objective, structured and concise manner, then potential adopters may not be entirely certain what they are committing themselves to. It may be detrimental to the adoption process. One of the

respondents seeks a clear description and rationale for the innovation along with possible evidence to support the claims of resultant benefits.

“You need to be able to say that this what it is, in an educational market this is what it can potentially do for you and that needs to be backed up really strongly by other people who have done it themselves and that case study evidence is very very essential of what it can do.”

4.1.10 Learning culture

All of the participants except one expressed that the learning culture within their organisations is very prescriptive or didactic.

An illustrative comment is:

“...a lot of the learning is prescriptive whereby student signs up for a particular qualification and factually it’s a test..”

Reardon (2010) reports that learning culture has a large, statistically significant relationship with disgruntlement. PLEs encourage learners to take control of their own learning rather than relying on a prescribed way to learn. An unplanned transition from a prescriptive learning culture to a learner-centered one could have a negative impact on user satisfaction and hence adoption rates.

4.2 Proposed Model

Based on the analysis results presented in the earlier section, 10 factors were identified which were categorized in 4 high-level categories. These adopter categories and the respective factors are depicted in Figure 4.1.

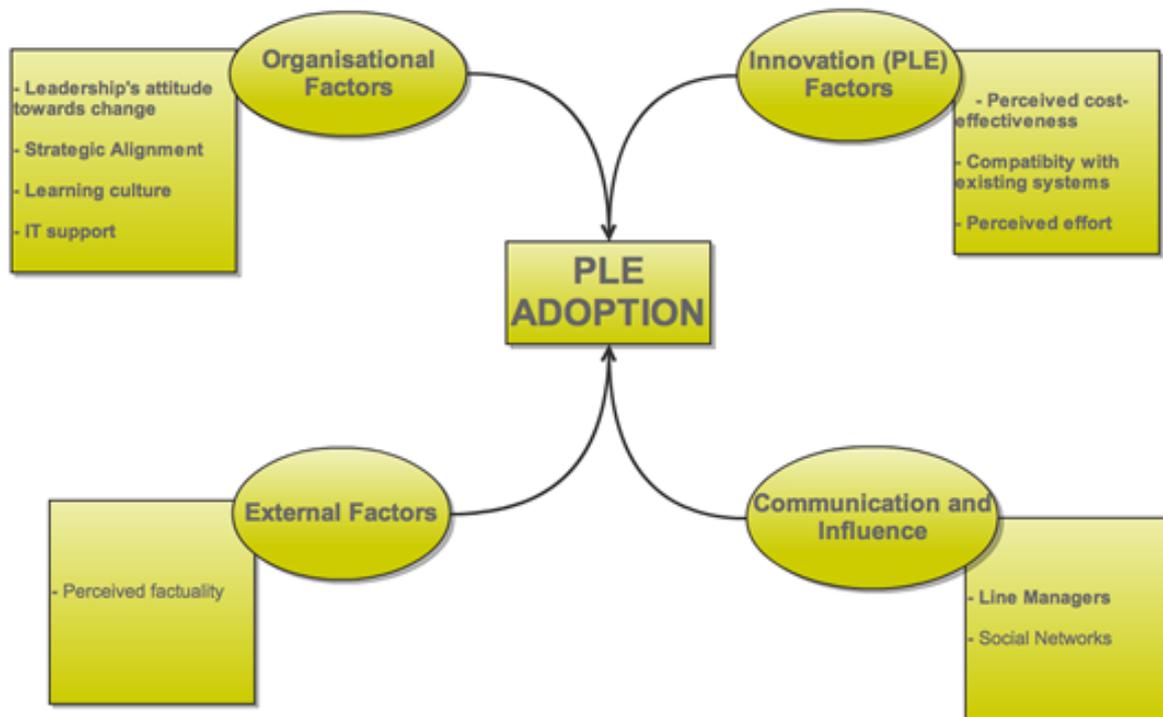


Figure 4.1 Identified Categories and factors for PLE Adoption by Commercial Organisation

In Table 4.1, we propose a set of hypotheses derived from the relationships between the central category and other identified categories based on the analysis presented in the earlier section.

Categories	Factors	Tentative Hypothesis
Organisational factors	Leaderships attitude towards change	H1a: PLE adoption within commercial organisations will be influenced by the top management's attitude towards change.
	Strategic alignment	H1b: The absence of a learning/training strategy, linking organizational goals with individual performance outcomes, will negatively impact on the adoption of PLEs.
	Learning culture	H1c: The more prescriptive the nature of learning is within an organisation, the more likely it will have a negative impact on PLE adoption.
	IT support	H1d: The amount of IT support within a organisation will have an impact on the adoption of PLEs
Innovation (PLE) Factors	Perceived cost-effectiveness	H2a: Demonstrating cost-effectiveness of PLEs over existing solutions will have a strong positive impact on its adoption.
	Compatibility with existing system	H2b: Demonstrable compatibility with existing solutions will positively effect PLE adoption.
	Perceived effort expectancy	H2c: The more difficult and time consuming PLEs are perceived to be, the less likelihood of their adoption
External factors	Perceived factuality	H3a: An agreed/unanimous interpretation of PLE will positively influence its adoption
Communication channels and Influence	Line Manager	H4a: Line managers as PLE champions will have a positive impact on sustained PLE adoption.
	Social networks	H4b: Using social media to communicate PLE benefits is likely to influence PLE adoption.

Table 4.1 Tentative hypotheses

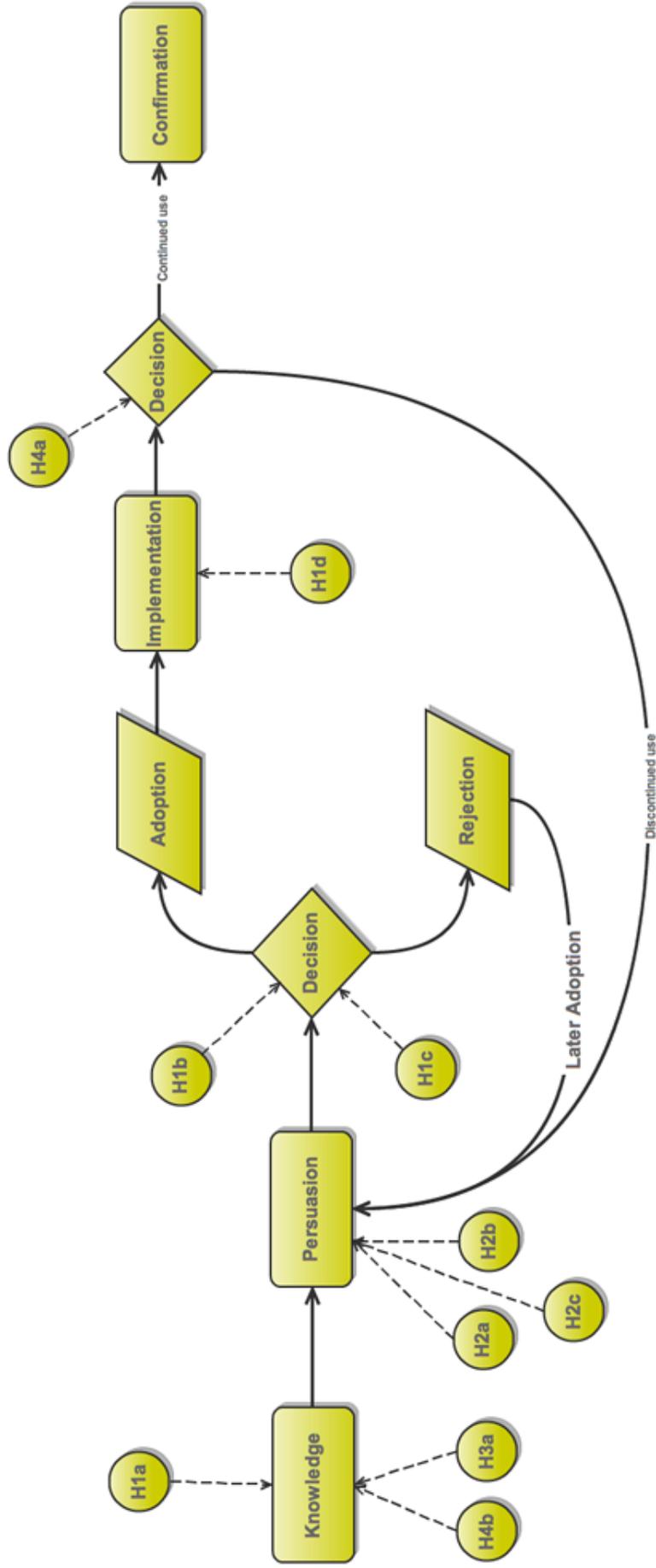


Figure 4.2 PLE Diffusion model

5. Conclusion

The key business decision factors, identified through initial interviews, offer a recognizable set of workplace conditions and considerations that may strongly influence or mitigate against the adoption of PLEs in a wide range of organisational contexts. The initial grounded theory approach, informed by TAM and IDT, supports a study model that aims to capture and describe the journeys that organisations take in adopting, rejecting and assimilating new technological innovations in learning delivery. The model proposed in this study is a tentative one. The propositions and the model will be subjected to further scrutiny and review. The feedback from these reviews (by peers and interview participants) will be used for the development of a complete and integrated model with a corresponding set of testable hypotheses via a large-scale confirmatory study. Potential implications of this study will be targeted towards decision makers within commercial organizations, who can be seen as gatekeepers for the adoption and diffusion PLEs within their organisations. The British Institute for Learning and Development (the BILD) organisation offers the potential to further explore the proposed PLE Adoption Model in real working contexts. The BILD members represent a wide range of business sectors and organisation sizes.

A key limitation of this study pertains to the video used to describe a PLE to the interview participants. The video may be considered rudimentary, as it demonstrates one particular scenario only. As a result it may be liable to bias and misinterpretation. In order to avoid this, it might be better to present a wider variety of scenarios to the target audience. While revising the model, prior to interviewing participants, a hands-on experience will also be important for acquiring a better understanding of what the PLE offers.

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