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TIJDSCHRIFT VOOR ONDERWIJSKUNDE EN OPVOEDKUNDE

The implementation of professional development for lecturers in higher education: From national to local educational innovation with IT

D. Hopster-den Otter, M.E.C. Lubbers, and K. Schildkamp

Abstract Initiation and implementation of nationally developed innovations within local educational institutions is a complex process. Innovations often fail to become part of the organizational routines. Therefore, the aim of this study was to identify how two types of information technology-related educational innovations for lecturer professional development, created by a nationally driven program, were received and implemented in local higher education institutions, and what factors supported or hindered this process. Results from 38 interviews with representatives of the institutions and professional development providers showed that the initiation and implementation of the innovations at the local institutions varied. These differences could be explained by factors related to the (perceptions of) the innovation, the development of the innovation, the characteristics of the individual and the institution; in particular, the last three categories were found to be related to the stages of the innovation-process model used.

Keywords initiation, implementation, nationally developed innovations, higher education, lecturer professional development

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Dorien Hopster-den Otter,
d.denotter@utwente.nl

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1 Introduction

Educational innovation with information technology (IT) has been a priority in higher education for many years (Kirschner et al., 2004; Rienties et al., 2013; Shen & Ho, 2020). As students grow up in an era of digitization and artificial intelligence (Westera, 2015), higher education needs to prepare them adequately for the rapidly changing labor market. Moreover, educational institutions are increasingly integrating IT to enhance both teaching and learning. For example, blended education offers students the opportunity to take part of the education online and part face-to-face, and learning analytics makes it possible for lecturers to monitor study behavior more automatically, allowing for more targeted instruction (Rathenau Instituut, 2022). Designing and implementing innovative education with IT require new competences for lecturers in higher education (Redecker, 2017; Uerz et al., 2021), and therefore also professional development (PD) (Darling-Hammond et al., 2017; Schildkamp et al., 2020).

Different higher education institutions (HEIs) often struggle with the same topics regarding lecturer PD for educational innovation with IT, such as how to implement blended learning, use artificial intelligence in teaching and learning, and how to use digital peer feedback. That is why various countries are investing in collaboration between HEIs and have initiated programs and projects that facilitate and fund the development of (technological) innovations at a national level (e.g., Southwell et al. 2010; Kottman et al., 2020). However, studies have shown that the implementation of these nationally developed innovations in local HEIs is a complex process influenced by many factors (e.g., Hixon et al., 2012; Kottmann et al., 2020; Niederhauser et al., 2018), and often these innovations fail to become part of the routines of the HEI (Wiltsey Stirman et al., 2012).

Commonly mentioned hindrances are that nationally developed innovations do not address the goals and needs of the users, there is a lack of resources to implement these nationally developed innovations, and there is a low level of commitment from management (e.g., Southwell et al., 2010). Working together nationally on educational innovation with IT potentially offers also several affordances. It can save time and resources, can prevent HEIs from "reinventing the wheel", and can enable combining knowledge and working in an evidence-informed manner (Association of Universities, Association of Universities of Applied Sciences, & SURF, 2018) Therefore, it is important to further study which factors can support and enable the implementation of nationally developed innovations in local HEIs.

In this study, we focus on a national program in the Netherlands that has taken several of the aforementioned hindrances into account at the start of the program. This program, called the Acceleration Plan for Educational Innovation with IT (Association of Universities et al., 2018), was a national, four-year project

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(2018-2022) in the Netherlands to work on the opportunities that IT offers for higher education. It was initiated by the Dutch Association of Universities, the Association of Universities of Applied Sciences and SURF (the collaborative organization for ICT in Dutch education and research) and focused on bringing together initiatives, knowledge and experience to support digitalization. The goals of the Acceleration Plan were: (1) improved connection with the labor market, (2) more flexible education and (3) improved and enhanced learning with ICT. Representatives from 39 local HEIs worked together in different thematic groups called zones. One of these zones focused on developing innovations based on the needs of the lecturers in their HEI. HEIs can use these innovations to improve their lecturers' PD. The representatives of the HEIs (zone members) decided on the goals of the program. HEIs could only participate in the national program if they committed time and resources to it, and the boards of the HEIs had to commit to these programs (Association of Universities, Association of Universities of Applied Sciences, and SURF, 2018). .

This study aims to identify how innovations from the so-called national Acceleration Plan were received by local HEIs and what factors potentially can further support and/or hinder the initiation and implementation of nationally developed innovations for lecturers PD. Understanding this is important to enhance the effectiveness of national collaborations on complex topics that HEIs struggle with and in order to benefit from the potential that educational innovation with IT can offer (Wiltsey Stirman et al., 2012). Understanding this can also help to explain the long-term success or failure of these innovations and improve the initiation and implementation of them in the future (Cohen & Mehta, 2017). For these reasons, we investigated the initiation and implementation of two types of educational innovations from the Acceleration Plan within local HEIs: (1) field labs for lecturer PD and (2) a toolkit for effective lecturer PD. Both are innovations that need to be implemented by local PD providers. For example, one of the field labs is a course to taught by PD providers to lecturers on how they can use digital peer feedback. The toolkit consist of tools that PD providers can use to design professional development interventions for lecturers. More information on these innovations will follow in section 3.1.

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2 Theoretical background

2.1 The innovation-process model

The initiation and implementation of educational innovations is a complex process. An *innovation* can be defined as the intentional introduction and application of ideas, products or practices new to the relevant unit of adoption, designed to significantly benefit the individual, the group, the institution or

wider society (Rogers, 2003; West & Farr, 1990). Initiation and implementation of innovations are a prerequisite for their wider use and thus, in this case, for potential effects on lecturers' learning and the quality of their teaching. However, initiation and implementation are conceptualized in different ways and used interchangeably with several other concepts in the literature, such as dissemination, diffusion, adoption and spread (McKenney & Reeves, 2012; Rogers, 2003; Southwell et al., 2010). A lack of clear definitions of these two concepts hampers evaluation of the innovation process.

Many theoretical models have been developed to help understand and explain the initiation and implementation of innovations (for overviews, see, e.g., Beausoleil, 2018; Eveleens, 2010; Graham et al., 2013). Although these models originated from several disciplines and reflect different ideologies, they generally consist of similar elements. First of all, a stage-based approach is often used, in which the innovation process is described as a sequence of steps to solve a problem or develop something new over a period of time (Beausoleil, 2018). Such a linear approach often turns out to be clear and useful, even though it is acknowledged that many feedback-loops happen before the process is completed (Eveleens, 2010). Second, the innovation-process models generally include two common phases - the initiation and implementation phases - with each including several sub-stages. The *initiation phase* can be defined as all of the information gathering, conceptualization, and planning for the adoption of an innovation while the *implementation phase* involves all of the events, actions, and decisions involved in putting the innovation into use (Beausoleil, 2018; Rogers, 2003).

For the purpose of this study, which is to investigate the initiation and implementation of innovations in HEIs, we used the innovation-process model described by Rogers (2003), who has been perceived to be the most influential and cited innovation scholar of the 20th century (Beausoleil, 2018). His seminal work has served as a basic framework for many innovation studies, as it draws on in-depth research from thousands of research studies on the innovation process. Rogers (2003) proposed an innovation-process model for institutions consisting of a sequence of five stages, as shown in Figure 1. While the process of change is generally complex and non-linear, this model provides components identifying some of the major points to consider in the process. The process moves from an initiation phase (stage 1 and 2) to an implementation phase (stage 3, 4, 5), as previously described, with a moment of critical decision on whether or not to adopt the innovation in-between. The five stages in Rogers's model are:

Agenda-setting: identifying and prioritizing institutional problems that create a need for innovation. To fulfill these needs or to solve these problems, innovations that are potentially appropriate will be further explored. In this stage, the institution is still working on its vision. In the case of this study, this

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implies that educational innovation with IT has not yet become a need or a focus of the HEI's vision.

Matching: fitting an appropriate innovation to the institutional problem. In the current study, this implies that a need for educational innovation with IT is present. The estimated feasibility, benefits and risks of the nationally developed innovations have been weighed and the innovations may be identified as potentially useful. Ultimately, this leads to a decision in which an innovation is approved or rejected for further implementation.

Redefining or restructuring: aligning the innovation with the context. On the one hand, the innovation can be adapted to fit the needs and structure of the institution. On the other hand, the structure of the institution may be changed to better fit the innovation. In the case of this study, this means that the nationally developed innovations have been adopted and used, or adapted to the institution and used, or transformed for use within a new context.

Clarifying: putting the innovation into more widespread use in an institution. The meaning of the innovation thus becomes clearer to the institution's members. In this stage, the innovations have been used more than once, and a plan is in place to integrate these innovations in the routines of the institution.

Routinizing: incorporation of core elements of the innovation into the regular activities of the institution, but the innovation itself has lost its own identity. The innovations have developed into routines within the institution.

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Figure 1

The Innovation-Process Model (Rogers, 2003, p. 419)

2.2 Supportive and/or hindering factors

Various factors may support and/or hinder the innovation process. These factors can be divided into four categories: (1) (perceptions of) the innovation; (2) the development of the innovation; (3) the characteristics of the individual; and (4) the institution (Kottmann et al., 2020; Liu et al., 2020; McKenney & Reeves, 2012; Mulder, 2011; Straub, 2009). Factors related to (*perceptions of) the innovation* include, for example, the extent to which the innovation a) is perceived as an added value over current practice; b) is compatible with current values and methods; c) can be tested in a small setting, d) has observable results, or e) is easy to use (Rogers, 2003).

The second category concerns the *development of the innovation*. Factors

related to the development of the innovation in this case are the lecturers' involvement during its development, the development at a national or local level, and the role of knowledge brokers in initiating and implementing the innovation (e.g., Rogers, 2003; Smith, 2012; Southwell et al., 2010). Knowledge brokers are people who play a key role in transferring and translating knowledge from those who have it to those who need it (Jusinski, 2021). During an innovation, they can initiate the innovation process and guide the new idea to approval and implementation, due to a key position and well-developed interpersonal and negotiating skills, among other things.

The third category concerns *individual characteristics* of lecturers and other staff at the HEI that make them more likely to adopt an innovation (Mulder, 2011; Straub, 2009). Examples are the individuals' beliefs, motivation, knowledge and skills (Liu et al., 2020; Mulder, 2011; Straub, 2009).

The fourth category includes factors related to the *institution* in which the innovation is being adopted and implemented, such as the HEI's IT infrastructure, learning culture, and facilitation of implementation of the innovation by providing time and financial resources (Kottmann et al., 2020; Porter et al., 2016; Porter & Graham, 2016; Smith, 2012). Appendix A provides an overview of all factors used in this study, their definitions and associated references.

2.3 Research questions

For the purpose of this study, we defined the following main research question: What factors support and/or hinder the initiation and implementation of the nationally developed innovations and how are these related to the stages of Rogers's (2003) innovation-process model?

This question is addressed by means of two sub-questions:

- In what stage of Rogers's (2003) innovation-process model are the nationally developed innovations within the HEIs?
- What factors support and/or hinder the initiation and implementation of the nationally developed innovations?

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Method

3.1 Research context: the Acceleration Plan

The Acceleration Plan for Educational Innovation with IT was a national four-year program to move the digital transformation of higher education in the Netherlands forward in a significant way (Association of Universities et al., 2018). It was a collaborative venture between the Association of Universities in the Netherlands, the Dutch Association of Universities of Applied Sciences and SURF (the collaborative organization for IT in Dutch education and research), in

which 39 HEIs participated. HEIs could only participate if the board of the HEI committed to the program, and committed time and resources to the program. Moreover, on a yearly basis all the local HEIs had to submit their vision on educational innovation with IT and how they were implementing the nationally developed innovations to the steering group of the national program. Usually the boards of the HEIs distributed this task to policy makers in the organization.

Representatives of the local HEIs, zone members, worked together in eight thematic Acceleration 'zones'. These zone members formed an important link between the Acceleration Plan and their own HEI to ensure the dissemination of the innovations developed. The zone members were selected and facilitated by the HEIs. No criteria were provided by the Acceleration plan, so it was up to the boards of the HEIs to decide whom to facilitate to participate in one or more of the zones of the Acceleration plan. The 17 representatives from 16 HEIs that participated in the zone that is the focus of this study were all working in the field of PD, although in different positions (e.g., researchers, educational consultants and support staff, IT specialists, policy makers). Moreover, 13 of the 17 representatives also provided PD themselves. The goals that the zones worked on were not decided upon beforehand. Zone members decided on the goals and accompanying working packages together, based on the goals and needs of their local HEIs. These goals and needs were investigated through analyzing the aforementioned vision documents of the local HEIs, and by conversations the representatives had with their colleagues (e.g., with management, educational support staff, lecturers).

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One of the larger zones of the Acceleration Plan was the zone called 'Facilitating Professional Development for Lecturers', which was involved on the third ambition. They aimed to assist all HEIs in facilitating the use of IT by lecturers to teach in a way that will accelerate educational innovation to improve the quality of teaching and learning. This focus was explicitly chosen by this zone to emphasize that the implementation of educational innovation with IT is always considered to be a tool and not a goal. The goal was improving teaching and learning in the HEIs. The zone consisted of 16 local HEIs with 17 representatives. Together these zone members worked as a team and developed several innovations to support lecturers in the use of educational innovation with IT, based on common needs identified in the local HEIs. As the zone members all worked in the area of PD, they were in close contact with the lectures and often checked in with the lectures of the local HEIs to establish their needs, albeit this was done in a more informal and not systematic manner. In this study, we focus on two of these innovations developed by the zone: 1. field labs for lecturer PD; 2. the toolkit of building blocks for effective lecturer PD (see Table 1). These innovations are open educational materials, meaning that the innovations have open licenses that permit users to adapt the innovations to their specific needs (Baas et al., 2019). The innovations were developed in

collaboration with various PD providers from the HEIs. Educational design research (EDR; McKenney & Reeves, 2012) and a literature review about building blocks for effective lecturer professional development (Schildkamp et al., 2021) formed the basis for the content of these two innovations.

Field labs for lecturer PD

With regard to the field labs, topics for these field labs were identified from the vision documents from the local HEIs and by zone members based on conversations they had with lecturers in their HEI (stage 1 of Rogers's (2003) model: agenda setting). Based on the vision documents, policy documents and conversations between zone members and lecturers of their local HEIs, six themes for field labs were established: (1) digital peer feedback; (2) digital formative assessment; (3) learning analytics; (4) blended education; (5) artificial intelligence; (6) open educational resources. These were all themes that the HEIs were working on. Furthermore, the needs assessment conducted according to the aforementioned EDR approach (McKenney & Reeves, 2012) indicated that lecturers needed support in the implementation of these educational innovations with IT (stage 2: matching). Every field lab consist of different materials (e.g., videoclips, lecture slides, manuals), which local HEIs can adjust to their context and needs (stage 3: redefining or restructuring). For more information on the field labs: https://www.versnellingsplan.nl/en/Kennisbank/field-lab-for-professionalization/. During the design of the field labs, lecturers in the local HEIS were informally used as a sounding board by the representatives of the local HEIs. For example, they provided feedback on (parts of) the field labs. After the initial development of these field labs, zone members had to decide with their colleagues in their local HEI which field lab(s) to implement and how.

Toolkit of building blocks for effective lecturer PD

As representatives of the HEIs mentioned more possible topics for field labs based on the needs of the lecturers in their HEIs (stages 1 and 2: agenda setting and matching), it was decided to also develop a toolkit with which local HEIs can develop their own field labs on the topics that they are interested in. The toolkit consists of a literature review explaining what important building blocks are for effective professional development (e.g., active learning, focused on lecturers own practice, collaboration between lecturers) (Schildkamp et al., 2021). The toolkit further consists of a manual, cards with the building blocks and a mural for designing the field lab. For more information on the toolkit: https://www.versnellingsplan.nl/en/Kennisbank/toolkit-building-blocks-effective-lecturer-professional-development/. Based on this toolkit, PD developers in the local HEIs can use (aspects of) the toolkit to develop field labs for their own HEIs.

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Table 1

Innovations from the Facilitating Professional Development for Lecturers Zone

Innovation	Goal	Content	References
Field labs for lecturer PD	Implementation of ready-made PD trajectories that could be adapted to the local HEI	A manual and all necessary materials, such as slides and assignments. Available with six different themes: - Digital peer feedback - Digital formative assessment - Learning analytics - Blended education - Artificial intelligence - Open educational resources	Facilitating Professional Development for Lecturers Zone, 2020, 2021a, 2021b, 2021c, 2021d, 2021e
Toolkit building blocks for effective lecturer PD	Practical support in (re)designing PD activities for lecturers	- Literature review about building blocks for effective PD for lecturers - Handbook with guidelines for designing PD activities based on the EDR method - Questions and examples per building block to support selection of effective building blocks - Online environment (murals) for practical implementation of guidelines as described in the handbook - Poster of the building blocks model - Card set suitable for various working methods to support the discussion about and the design of PD activities	Ritmeester & Boulogne, 2021

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Within the zone of the acceleration plan, the focus was on the first three stages of Rogers's model: identifying and prioritizing institutional problems that create a need for innovation (stage 1), designing innovations that could solve the identified problems and would meet the needs (stage 2), and trying to aligning the innovation with the context, and making sure that the developed innovations could be adapted to fit the needs and structure of the local HEIs (stage 3). However, we have to acknowledge here that although the local HEIs representatives worked in this manner, the question that needs to be answered is how the actual implementation of these nationally developed innovations went in each local HEIs and in what stage of Rogers's (2003) innovation-process model the nationally developed innovations could be categorized.

3.2 Participants

Purposeful sampling was used to select interview participants. From each HEI participating in the Facilitating Professional Development for Lecturers Zone, we selected at least two types of participants. Firstly, we selected the HEI representatives who were the team members for the zone (n = 17). Secondly, we asked for the PD providers who were ultimately responsible for lecturers' PD in their HEI, as they occupy an important position in the initiation and implementation of the innovations. This often turned out to be the head of a Center for Teaching and Learning (n = 17). In two HEIs, the head was replaced by another person in charge, because of illness or starting too recently. In one HEI, the roles of HEI representative and PD provider were fulfilled by the same participant. Finally, we asked the selected participants about initiatives from others in the organization regarding the use of the innovations. If there had been any initiatives, we asked whom we could question about this to generate a complete picture. This resulted into two additional participants. Although by using this purposeful sampling strategy to identify the respondents was most suitable for this study, we do need to acknowledge that there is a chance that we missed certain respondents, as HEIs are large organizations and people are not always fully aware of what happens in the different faculties and departments. In total, we had 38 participants from the 16 HEIs in this study. We coded the HEIs into HEI-A for the first HEI, HEI-B for the second HEI, et cetera, and show which respondent numbers belong to these HEIs in Appendix B. Half of the participants started their current position before 2019, i.e. before the start of the Acceleration Plan (n = 19), nine participants started during the first half and 10 participants during the second half. Of those in the last two groups, 13 participants were working in another function at the same HEI before the Acceleration Plan started.

3.3 Instrument and procedure

A semi-structured interview was prepared using Rogers's (2003) innovation-process model. Along with three background questions, the interview guide consisted of two main parts (Table 2). The first part relates to the first subquestion and consisted of 18 questions about the stages of Rogers's model. The aim of these questions was to determine the stage to which the initiation and implementation of the innovation within the HEI could be linked. Please note that these stages only concern the innovation process specifically for the field labs and the toolkit. The second part of the interview with three questions relates to the second subquestion, focused on potential supportive and hindering factors that contributed to the initiation and implementation (i.e., the innovation process) of these two innovations. In this part, participants were first asked to mention supportive and hindering factors themselves in order to allow them the possibility of identifying factors they considered most supportive or hindering. After that, factors based on the literature were shown on a

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screen, and participants were asked to indicate whether and how these factors contributed (Appendix A, Tables A.1 to A.4). Finally, the 17 zone representatives were shown some additional factors about their role as a knowledge broker (Appendix A, Table A.5) in order to investigate which characteristics of the representatives contribute to the innovation process. All 38 interviews were conducted in Dutch, online using Microsoft teams and audio-recorded. After the interviews were transcribed verbatim, the transcripts were returned to the participants for verification and to give them the opportunity to clarify their input. Most participants agreed with the results; four participants agreed after providing minor textual changes.

Table 2

Sections and Sample Questions from the Interview Guide

Section	Sample questions
Background	Can you briefly describe how lecturer PD is organized at your educational institution?
Innovation-process model	
Agenda-setting	To what extent is educational innovation with IT an important element in the vision and policy of your HEI?
Matching	What do you think of the innovations [field labs, toolkit]?
Restructuring	To what extent do the innovations [field labs, toolkit] fit in with your working method or/and to what extent has it been necessary to adapt the innovations?
Clarifying	How have the innovations been received by PD providers? Why is that?
Routinizing	To what extent have the innovations become part of the regular activities within [HEI x]?
Factors	What factors have facilitated and supported the use of the innovations at your educational institution? What worked well?

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3.4 Analysis

The first subquestion, about in which innovation stage the innovations within the HEIs are, was addressed by comparing the responses from participants at the same HEI and determining the stage of innovation for each HEI using the criteria as defined in Figure 2 (e.g. there is no need (yet) for educational innovation with IT, et cetera). The interview questions asked for factual information, so the responses were considered to be complementary. That means that in case a respondent did not know (much) about the (stage of) the innovation, the most complete response was taken as the guide. In doing so, we took into account that the other participant probably was not well-informed, which is especially relevant from stage 3 onward. Furthermore, when classifying the stage, instead of plotting each innovation individually we focused on the innovation that was further along in implementation, since implementing one innovation sustainably

implies a more extensive process compared to trying all innovations once. This also enables a more in-depth study of the factors involved in the entire process. The three researchers discussed and agreed on the classification of the HEIs. The results were fed back to the respondents for a member check.

For the second subquestion, about what factors are supportive or hindering, we applied directed content analysis (Hsieh & Shannon, 2005) to the transcripts. This means that we used the factors from the literature as initial codes (see Appendix A, Table A.1 to A.5). Any text that could not be categorized with the initial coding scheme was given a new code based on the data. This resulted in four new codes, which were *design* of the innovation, *experience*, *time and priority*, and *involvement of the knowledge broker.* Overlapping codes were merged; for example, the code *position in the HEI* was merged with the code *leadership*. A text fragment was only coded with a factor when it became clear that the factor supported and/or hindered the implementation of the innovations, but not when this remained unclear or when the factor was mentioned as important but not as playing a role in the HEI. The final coding scheme was used to double-code 10% of the transcripts. Inter-rater reliability analysis found that the agreement rate between the two coders was 80.7% (Fleiss $\kappa = .66$), which is substantial (Landis & Koch, 1977). Disagreements between the coders were discussed to ensure validity in further coding.

In addition, we quantified the qualitative data at the level of the factors and factor categories. Every factor was evaluated on an ordinal scale: -1 when mentioned as hindering, 0 when mentioned as both hindering and supporting, and 1 when mentioned as supporting (not mentioned = missing). This enabled us to perform descriptive analyses, such as calculating frequencies and percentages. For example, the factor *added value* was mentioned as a supportive factor (score of 1) by 6 of the 38 participants, which is 15.8% (see Table 3). The values of the factors that belong to a category (see Appendix A, Table A.1 to A.5) were added up into the corresponding factor category (e.g. the values of motivation + beliefs + IT literacy + self-efficacy + perceived autonomy = category at the level of the individual). A factor category is thus the sum of the ordinal values of its factors. We used Spearman's rank correlation coefficients to investigate the relationship between Rogers's (2003) innovation stages and the factor categories. Furthermore, we used the qualitative data in ATLAS.ti to illustrate the quantitative data in SPSS, with quotations translated from Dutch.

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Results

4.1 Stage of Rogers's (2003) innovation-process model

Results of the qualitative analyses showed that the innovations within the 16 HEIs were in different stages of Rogers's (2003) innovation-process model (Figure 2 and Appendix B). Only the innovations within HEI-A were placed in

stage 1 (agenda-setting), because educational innovation with IT was not (yet) a focus, and there was no need (yet) for these innovations (Figure 2). This was due to the fact that HEI-A was still identifying and prioritizing institutional problems because of changes of the board during the innovation process that withdrew previous commitments and prioritized other institutional issues. Participant 6, PD provider in HEI-A (Appendix B.1), explained:

> "We were dealing with a change in management, which resulted in an unclear vision on educational innovation with IT. The previous executive board had agreed to participate and the new board actually did not. (…). Moreover, we were in a trajectory to improve the quality of our educational programs (…), so then it is just hard to come up with the other things."

The innovations within the three HEIs placed in stage 2 (HEI-B, HEI-C, and HEI-D) were identified as potentially useful for their needs, but were not (yet) used. This aligns with the criteria for stage 2: matching (Figure 2). HEI-B and HEI-C had the intention to use the innovations in the near future. For example, participant 27 from HEI-B said:

> "We are now considering how the Acceleration Plan could help with our needs. More concretely, I discussed with my colleague how we can embed the toolkit in our basic qualification for didactic competence." Future use of the toolkit was also planned for HEI-D, but no match for the field labs was found: "It did not seem that we would benefit much from the field labs, as we felt that we were already further ahead in that area".

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The innovations within the seven HEIs in stage 3 (HEI-E up to and including HEI-K) were used at least once, but the PD provider was not well-informed (Figure 2). For example, the digital peer feedback field lab in its original form was implemented in HEI-K with eight lecturers from five different programs. In addition, the blended education field lab in its original form was deployed in HEI-J. Some other HEIs adapted the innovations to fit their own context. Participant 30 from HEI-E modified the toolkit and explained:

> "We structured the building blocks differently. We wanted to have fewer of them, so we now use some of the building blocks in intake interviews to design PD processes."

It is noteworthy that the implementation of the field labs at HEI-J and at HEI-K was initiated by one person, and not supported by (the vision of) the entire HEI. For example, participant 11 from HEI-K said:

> "This person had been working on digital peer feedback himself and also

knew colleagues who were working on it and wanted to do something with it. So, it depends on one person (…). Our HEI is still looking for exactly what we want with digitization."

Three HEIs used at least one innovation more than once and expressed an intention to integrate the innovation(s) in HEI routines, so the innovations within these three HEIs were placed in stage 4 (Figure 2). For example, the blended education field lab was adapted into a blended bootcamp at HEI-M and the intention was to do this annually during the summer period. Participant 21 from HEI-M said:

"We made a blended bootcamp where lecturer teams could redesign their education. I also used the toolkit for the bootcamp design. For example, we chose to participate as a lecturer team instead of as an individual lecturer. We also did it on location and online to let lecturers experience what blended education entails."

The PD providers from the HEIs in which the innovations were placed in stage 4 were well informed about the innovations, indicating that the innovation was also put into more widespread use.

The innovations within HEI-O and HEI-P were placed in stage 5, meaning that at least one innovation has been integrated in the organizational routines (Figure 2). For example, the blended education field lab and the toolkit had been integrated in the routines of HEI-O. In more detail, the blended education field lab had become a formalized part of the basic qualification for didactic competence in HEI-O. Both innovations were also integrated in routines at HEI-P, resulting in a change of thinking. Participant 16 of HEI-P said:

"The movement that has started is very large and has had a real effect at all levels in the HEI, from students and lecturers to administrators."

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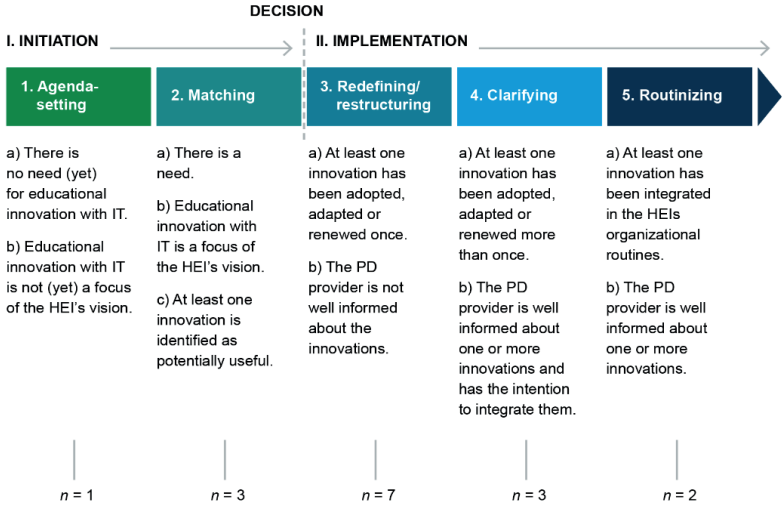
Figure 2

Number of HEIs whose Innovations are at a Stage of Rogers's (2003) Innovation-Process Model



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4.2 Supportive and/or hindering factors

We used four factor categories of possible supporting and hindering factors: (1) (perceptions of) the innovation; (2) the development of the innovation; (3) the characteristics of the individual; and (4) the institution. These factor categories are the sums of ordinals values of corresponding factors (please, see figure 3). On the other hand, there were five innovation stages: (1) agenda-setting; (2), matching; (3) redefining/restructuring; (4) clarifying; and (5) routinizing (see figure 1 and 2). We calculated the Spearman's rank correlation coefficients between the four factor categories on one hand and the stages of Rogers's (2003) innovation-process model on the other hand. Results showed moderate positive relationships (Gravetter & Wallnau, 2017) between the stage and the innovation development category score (= .418, p = .009, 95% CI [.104, .656]), the stage and the individual characteristics category score (= .418, p = .014, 95% CI [.083, .668]) and the stage and the institution category score (= .505, p = .001, 95% CI [.212, .715]). These three significant relationships indicate that the further the HEI had progressed in the innovation stages, the more often factors relating to these categories were mentioned as supportive. No significant relation was found between the stage and the (perceptions of) the innovation category score (= .212, p = .196, 95% CI [-.126, .519]).

Factors related to the innovation

When looking more closely at the factors within each category, various factors appear to have supported or hindered the initiation and implementation of the innovations from the Acceleration Plan according to the participants. Table 3 presents the percentages of participants who mentioned factors related to the innovation. It shows that 81.6% of all participants mentioned *added value.* It was considered a supportive factor by 15.4% of the participants, a hindering factor by 31.6% and both supportive and hindering by 34.2%. This means that innovations that were relevant to the needs and problems of the HEI appeared to be easier to initiate and implement, while it turned out to be more difficult for an innovation that was not perceived as relevant (for descriptions of factors related to the innovation, see Table A.1 in Appendix A). Participant 2 (PD provider in HEI-I, see Appendix B.1) illustrated how the degree to which an innovation is perceived as having added value affects its initiation and implementation:

> "When I bring an innovation very enthusiastically to the attention of two different groups, in one group they say: "Great we can get started on that right away!", while in the other group they say: "Yeah, right…" So it depends a lot on who I am dealing with at any given moment whether something catches on or not. "

In addition to added value, *compatibility* was a frequently mentioned factor. In total, 21.1% of the participants indicated that having innovations be consistent with current values and methods within their organization supported their use of the innovation. Participant 20 illustrated compatibility as a supporting factor:

> "It helps that the innovations are clearly written by people who also think the way we think or the way the team thinks. It is very recognizable to us and that is why it fits well."

In cases where the innovation was inconsistent, it was supportive if the innovation could be adapted to their own context. However, 31.6% of the participants saw no opportunities for adaptation in one or more innovations, perceiving compatibility as a hindering factor. For example, participant 39 said:

> "My colleagues got the idea that the field labs were very scholarly. (…) They found them quite detailed and not immediately exuding something like: Okay, you can pour your own sauce over it or fill in your own thing."

Among the 21.1% of participants who indicated compatibility as both supportive and hindering, participant 3 explained:

> "The toolkit is more open to adapting to your context, which works better, compared to the field labs that were more closed."

Usability was also mentioned as supportive (34.2%), hindering (18.4%) and both (18.4%). To illustrate usability as a supporting factor, participant 23 explained:

> "These are usable innovations that are both sufficiently practical and have sufficient theoretical underpinnings".

However, participant 31 experienced that the innovations were too complex and therefore less usable:

> "I think it is quite a lot and then I always notice a kind of brake in myself, thinking: it takes me a lot of time to delve into this."

None of the participants mentioned the *primary process* factor found in the literature, which was about a focus on the primary learning process versus on the institution. *Design* was added as a factor based on the data. This means that, according to the participants, it matters what the innovation looks like. For example, participant 14 said:

> "I think all the innovations look great and that helps a lot. It really makes a difference whether you just have an unformatted document or whether the document is just as beautifully designed."

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Table 3

Percentage of Participants (*N* = 38) Mentioning Factors Related to the Innovation

Factors	Total	Supportive	Hindering	Both
Added value	81.6	15.8	31.6	34.2
Compatibility	73.7	21.1	31.6	21.1
Usability	71.1	34.2	18.4	18.4
Evidence-informed approach	42.1	39.5	0.0	2.6
Accessibility	34.2	28.9	2.6	2.6
Trialability	26.3	23.7	2.6	0.0
Design	18.4	15.8	2.6	0.0
Opportunity to reflect	15.8	15.8	0.0	0.0
Costs	5.3	5.3	0.0	0.0
Observability	5.3	0.0	5.3	0.0
Primary process	0.0	0.0	0.0	0.0

Factors related to the development of the innovation
With regard to the factors related to the development of the innovation, 94.7% of all participants mentioned the *knowledge broker*, 50.0% as a supportive factor, 7.9% as a hindering factor and 36.8% as both supportive and hindering (Table 4). Please, see Table A.2 in Appendix A for descriptions of factors related to the development of the innovation. Participant 31 mentioned how the knowledge broker was supporting:

> "It is very supportive that the knowledge broker actively seeks out and informs the right people in the HEI."

Regarding the dissemination channels used by the knowledge broker, oral communication (such as webinars, informal conversations) was experienced to be more effective. Participant 19 reflected:

> "I think that updates by mail do not work so well, whereas verbal consultation works much better."

Several factors related to the characteristics of the knowledge broker were mentioned (Table 5). For example, 52.6% of the participants mentioned the knowledge broker's formal and informal *position in the HEI* as influential. Participant 25 experienced the formal position as supportive, due to decision making authority:

> "I am a project manager (….), so I am in charge of using innovations tomorrow if I want and I can also direct people to use the innovations."

In contrast, participant 11 experienced the formal position as hindering, due to limited visibility:

> "I am part of a central department in the HEI, but things happen locally without me having a good view of it. So I cannot really respond to that."

With regard to the informal position, a good relationship with colleagues turned out to be important, as participant 19 said:

> "I think the relationship with colleagues is very important. I like networking and I know a lot of people. That certainly helped."

In addition, the amount of *time and priority*, the *involvement of knowledge brokers* during the development of the innovations and the *experience* of knowledge broker were added as supportive and/or hindering factors.

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Participants would have found it helpful if the HEI representatives had more time, experience and involvement during development. However, in case of the Acceleration Plan most of the HEI representatives had a maximum of four hours a week, they often had no experience with initiating and implementing innovations, and they were often solely involved in the development of one of the innovations.

Another factor related to the development of the innovation (Table 4) was the degree of *involvement of staff.* In total, 57.9% of the participants indicated that staff involvement contributed to the initiation and implementation of innovations. This means that they participate in the development and adoption of the innovations (Table A.2 in Appendix A). A lot of staff involvement was supportive, while little involvement hindered initiation and implementation. For example, participant 20 reflected:

> "I think it would have helped if more people, for example three or four people from my team, were involved or if the composition had varied from year to year."

Finally, 55.3% of the participants mentioned the factor *nationwide versus local*. The factor was perceived as a supportive factor according to 34.2% of the participants, meaning that they perceived development and cooperation at the national level as an added value. Participants appreciated the brand awareness and status of the national Acceleration Plan, and the collaboration between HEIs. Moreover, national development supported the local staff's perception of the quality of the innovation, as participant 37 said:

> "I have heard several times from my colleagues that they like everything that was developed in the Acceleration Plan and has prominence across the country."

Nevertheless, it also hindered the implementation, as participant 31 pointed out:

> "Centrally initiating and integrating an innovation is difficult. So starting an innovation nationwide and implementing it sustainably in local HEIs is really a big challenge."

Table 4

Percentage of Participants (*N* = 38) Mentioning Factors Related to the Development of the Innovation

Factors	Total	Supportive	Hindering	Both
Knowledge broker	94.7	50.0	7.9	36.8
Involvement of staff	57.9	21.1	34.2	2.6
Nationwide versus local	55.3	34.2	10.5	10.5

Table 5

Percentage of Participants (*N* = 38) Mentioning Factors Related to the Knowledge Broker

Factors	Total	Supportive	Hindering	Both
Position in the HEI	52.6	18.4	13.2	21.1
Time and priority	44.7	18.4	18.4	7.9
Involvement of knowledge broker	42.1	15.8	15.8	10.5
Communication skills	23.7	13.2	2.6	7.9
Self-efficacy	23.7	18.4	5.3	0.0
Experience	15.8	13.2	2.6	0.0
Personal benefits	10.5	7.9	2.6	0.0
Perspective on added value	10.5	7.9	2.6	0.0

Factors related to the individual

Individual factors were mentioned relatively less often by the participants (Table 6). The factor of *motivation* appeared to be an exception here, with 34.2% citing it as a supportive factor, 21.1% citing it as a hindering factor and 21.1% citing it as both. This means that the will to use the innovations in order to renew education with IT had influence on their initiation and implementation, according to the participants (Table A.3 in Appendix A). One of the explanations why it was a hindering factor had to do with the "not-invented-here" syndrome. Participant 40 said:

> "The not-invented-here syndrome plays a major role (...): I did not make it, so it will not fit." And participant 12 said: "People just start with themselves: to what extent do I want to use what someone else has made or do I just want to do it myself?"

Table 6

Percentage of Participants (*N* = 38) Mentioning Factors Related to the Individual

Factors	Total	Supportive	Hindering	Both
Motivation	76.3	34.2	21.1	21.1
Beliefs	39.5	23.7	5.3	10.5
IT literacy	42.1	7.9	23.7	10.5
Self-efficacy	28.9	10.5	13.2	5.3
Perceived autonomy	7.9	5.3	2.6	0.0

Factors related to the institution

Table 7 shows the percentages of participants who mentioned supportive and hindering factors related to the institution. *Facilitation of implementation of the innovation by providing time and financial resources* appeared to be a hindering factor according to 63.2% of the participants. In more detail, the perceived workload was experienced as too high and the amount of time available was too little to implement the innovations. Another frequently mentioned hindering factor was *leadership,* which was defined as the degree to which formal leaders encourage, support and prioritize the adoption of the innovation (Table A.4 in Appendix A). Among all participants, 36.8% perceived this as a hindering factor. They lacked prioritization and direction from the board; for example, participant 31 indicated:

> "I think there has been little direction for the people in the HEI about the expectations (…) There has been no one who has said: We are sending an HEI representative to the Acceleration Plan, there are fantastic innovations developed. So that means: This is just how we are going to do it."

In addition, they lacked some encouragement from their leaders. For example, participant 12 indicated:

> "I think it is important that management, such as an education quality manager, is also informed and proactively talks about the innovations and encourages employees to get started. (…) or perhaps at an even higher hierarchical level: employees, this fits exactly with our educational vision, so use this."

The *knowledge infrastructure* factor, mentioned by 73.7% of the participants, is about the degree to which units in the HEI are linked by interpersonal networks. The presence of networks and partnerships was very encouraging, while the lack of them was an obstacle. For example, participant 18 indicated how knowledge structure supported the implementation:

> "The network structures in our HEI were very positive. (…) Short lines. If something needed to be done, the designated people were also at the table and could just lay it out. That worked very well."

And participant 13 said:

> "A network is different from people who know each other. There are a lot of people who know each other, but within a network we are really sharing knowledge. That is really important."

Participant 24 explained why their knowledge infrastructure was an obstacle:

> "There are several groups. Things are kept within the group or people do things only in that group (…). Not even out of unwillingness, but that just happens. If you put people in a group, you get islands."

Furthermore, 42.1% of the participants mentioned the factor *climate of readiness for change* as hindering. They indicated that their HEI was in another transition, a reorganization in other areas was underway, or other priorities were being set due to the COVID-19 pandemic and its impact on education. With regard to *vision and ambition*, participants indicated that it was supportive if the HEI has a concrete vision focused on educational innovation with IT and lecturer professional development, but 18.4% of the participants indicated that this was missing or not concrete enough. Staff turnover was hindering for 39.5%, as it often caused delays and information was lost. Finally, *HEI size* was perceived as a hindering factor by 34.2%. Disadvantages mentioned in a large HEI were the difficulty of getting an innovation off the ground and difficulty of reaching all employees. Disadvantages of a small HEI were limited capacity and financial resources.

Table 7

Percentage of Participants (*N* = 38) Mentioning Factors Related to the Institution

Factors	Total	Supportive	Hindering	Both
Facilitation of implementation of the innovation by providing time and financial resources	92.1	7.9	63.2	21.1
Leadership	84.2	21.1	36.8	26.3
Knowledge infrastructure	73.7	34.2	21.1	18.4
Climate of readiness for change	52.6	10.5	34.2	7.9
Vision and ambition	50.0	18.4	18.4	13.2
Staff turnover	50.0	2.6	39.5	7.9
HEI size	50.0	5.3	34.2	10.5
(De)centralized position Center for Teaching and Learning	47.4	13.2	31.6	2.6
External expectations	44.7	26.3	15.8	2.6
Autonomy of faculties	42.1	0.0	31.6	10.5
IT infrastructure	36.8	15.8	18.4	2.6
Learning culture	21.1	2.6	18.4	0.0
Formalization	21.1	2.6	18.4	0.0
PD opportunities	15.8	13.2	0.0	2.6
Prioritizing education	0.0	0.0	0.0	0.0

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5 Conclusions and discussion

This study investigated how two types of innovations from a nationally driven innovation project (the Dutch Acceleration Plan for Educational Innovation with IT) have been initiated and implemented by local HEIs and what factors supported or hindered this process. What is unique about this study is that several factors that we know from research hinder the initiation and implementation of educational innovation were taken into account in the program. The national program did not have pre-set goals or key performance indicators. Representatives of the local HEIs (selected by the HEIs) determined the goals themselves. Moreover, boards of the local HEIs had to commit to the program both by facilitating time for the participants and by including the innovations from the national program in their vision. However, even if you take these factors into account, initiating and implementing national innovations in local HEIs is still complex, as the results of this study also show. Results from

38 interviews showed that the innovations within the HEIs were in different stages of Rogers' (2003) innovation-process model, meaning that the innovation process within the local HEIs varied. These differences can be explained by several factors related to the innovation, its development, the individual and the institution; the last three categories were found to be significantly related to the stage of the innovation process. Five factors seem to be the most influential when trying to implement nationally developed innovations in local HEIs: (1) knowledge brokers who serve as a liaison between the national program and the local institutions, (2) the perceived added value of the innovations as perceived by local users, (3) individual motivation to innovate, (4) facilitation, and (5) leadership. Below we will explain how these factors supported or hindered the nationally developed innovations we studied.

Knowledge brokers, perceived added value and motivation in local HEIs
Participants mentioned factors as supportive, hindering or sometimes even as both. The same factor in the same HEI could enable and hinder the innovation process at the same time. The results of our study show that three factors seem most supportive for the initiation and implementation of nationally developed innovations: (1) the role of knowledge broker, (2) the perceived added value of the innovations and (3) the motivation of the individual staff. With regard to knowledge brokerage, other studies also have shown that this is crucial for the initiation and implementation of innovations, and even more so for the innovation becoming a sustainable routine in the institution (e.g., Akkerman & Bruining, 2016; Prenger et al., 2022). Knowledge brokers share knowledge about the innovation with others in the institution, so that the information about the innovation can travel through the institution (Dekker & Feijs, 2005). Collegial relations, personal and informal contact, and communication among staff are important preconditions for this (Dekker & Feijs, 2005; Elder & Prochnow, 2016; Kirtman, 2002). Effective knowledge brokers share their knowledge in different but accessible forms, for example, in the form of conversations, phone calls, written materials about the program and emails (Peters, 2011; Prenger et al., 2022), including information on what from the innovation is working and what needs adaptation (Benz et al., 2004; Elder & Prochnow, 2016; Prenger et al., 2022; Zehetmeier, 2015). As these explanations were present in our interviews as well, our results are in line with previous study results. As in our study, other studies also showed that oral communication, such as webinars and informal conversations, is preferred over written forms of communication (Van den Boom-Muilenberg et al., 2022). Knowledge brokers can also play a role in making the added value of the innovation clear to their colleagues. In terms of the perceived added value of the innovation, this is also related to buy-in, level of interest, and feeling positive towards the innovation (e.g., Drits-Esser et al., 2017; Gibson & Chase, 2002; King, 2016; Prenger et al., 2022)(e.g., Drits-Esser et

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al., 2017; Gibson & Chase, 2002; King, 2016; Prenger et al., 2022). Perceived added value is probably also linked to the motivation of the individual staff to use the innovation, another important factor for the initiation and implementation of innovations, as also found by others (Prenger et al., 2022).(Prenger et al., 2022). For example, Esdar et al. (2016) found that lecturers are more likely to be involved in improving teaching if the values underlying the educational innovations matches their own. Intrinsic motivation seems to be more important than extrinsic motivation, which can be influenced the local HEIs. Stupnisky et al. (2018) for example found that teachers who worked in contexts that provided them with autonomy were more likely to use educational innovations than teachers who worked in contexts that did not meet teachers' autonomy needs and where external regulation prevailed.

A lack of facilitation, leadership and perceived lack of added value in local HEIs

The results of this study also show that even if you take away several of the possible hindering factors at the national level, this does not solve the complexity local HEIs have to deal within their organization. The factors most frequently mentioned as hindering were a lack of facilitation in terms of time and financial resources and a lack of leadership. Interestingly, where perceived added value was mentioned as supportive factor, a lack of added value was also often mentioned as a hindering factor for the initiation and implementation of the innovations. Facilitation is a well-known factors from the literature. For example, Prenger et al. (2022) conducted a review of factors influencing the sustainability of innovations and found nineteen articles that addressed how facilitation of implementation as far as providing time, money, and organizing resources enhanced sustainability, as it enabled the staff to carry out their work. Although the representatives that participated in the national program were facilitated in time, their colleagues were not. Facilitation directly links to leadership, as leaders can often facilitate staff's work. However, leadership means more than facilitation, it also means encouraging, supporting and prioritizing the initiation and implementation of the innovation. This is also consistent with other studies that have shown that leaders can support, champion, and facilitate implementation of innovations as well. In addition, studies (Bryman, 2007; Kannan et al., 2012; Van den Boom-Muilenburg et al., 2022) have shown that there are several leadership building blocks for the effective initiation and implementation of innovations, including: facilitation; developing a vision, mission, and goals that are clear, consistent, and coherent; creating a safe environment to use the innovation; being a role model; providing intellectual and emotional support; monitoring the use of the innovation in schools; and communicating and networking. However, leaders' failure to use these building blocks can hinder the initiation

and implementation of innovations. Finally, leaders and other board members can also play a role in making the added value of the innovation clear, for example, by putting the theme of the innovation higher on the institutional agenda.

5.1 Limitations

There are a few remarks to consider when interpreting these results. First, even though a factor is mentioned most often, this does not necessarily imply that this factor is also the most important one. A factor mentioned only once by one HEI might have been decisive for that specific HEI. Nevertheless, the number of times a factor is mentioned provides a lot of insight into the number of participants who marked this factor as supporting or hindering the process.

A second limitation is that the two types of innovations used in this study are what is known as open educational resources (OER). Beaven (2018) showed that in OER, most practices are hidden, and adoption mainly takes place in what Wiley (2009) has called "dark reuse": anticipated but unobserved behavior. To avoid having an incomplete picture, we asked the HEIs' representatives and PD providers whether they are aware of other initiatives in their HEI regarding the use of the innovations. This resulted in two additional participants. Nevertheless, we realize that the innovations may also have been used beyond the knowledge of our participants.

Third, some HEIs used other innovations from the Acceleration Plan, while we classified the HEIs based only on the initiation and implementation of the two specific types of innovations: the field labs and a toolkit. Therefore, it is worth noting that our classification of HEIs using Rogers's (2003) model is only applicable for these two innovations. If we were to classify the HEIs using Rogers's model based on other innovations, the HEIs might be classified differently, as they might be further ahead with another innovation than with those we considered. Thus, the current classification does not necessarily give an indication of the state of affairs with regard to other educational innovations.

Fourth, we interviewed the HEI representatives, the PD providers and two other initiators to generate a complete picture of the initiation and implementation of the innovations. Although we expect that these respondents have a good overview of the process in the entire organization, we should take into account that we may have overlooked an initiative and that there are possible differences between faculties and departments with regard to the innovation process. Moreover, their responses were considered complementary in determining the stage of the innovation. Although the interview questions asked for factual information, there may be some bias, with especially representatives putting their HEI in a better light that it actually was. We have overcome this by asking as many questions as possible and the results show that the innovation processes of most HEIs can be improved.

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5.2 Theoretical and practical implications

We indicated in the theoretical framework of our study that the reality of innovation is more complex than a linear process. The results of this study reaffirm that. For example, the innovations within HEI-J and HEI-K were placed in stage 3 of the innovation process because of their one-time use of a field lab. However, the vision of these HEIs related to IT was still evolving, and the deployment of the field lab was more due to the enthusiasm of the individual HEI's representative rather than a decision by the entire HEI. The innovations within these HEIs will therefore go through several more loops before the innovation process will be completed. Furthermore, it remains questionable whether the innovations of HEI-J and HEI-K were closer to a sustainable implementation than the innovation in an HEI placed in stage 1 that took its needs and vision of IT thoroughly into account. Moreover, HEIs differ from other organizations in that they consist of autonomous units with their own goals rather than departments that coordinate their activities to achieve a common goal (e.g., Kottmann, 2023). This has consequences for the way in which educational innovations are implemented. We therefore conclude that the linearity of Rogers's model impedes decent classification of HEIs. Future research is needed that takes into account the multilevel and cyclical ways in which an innovation travels through an institution, with the individual, the group and the institutional levels interacting with each other (e.g., see Rikkerink et al., 2016).

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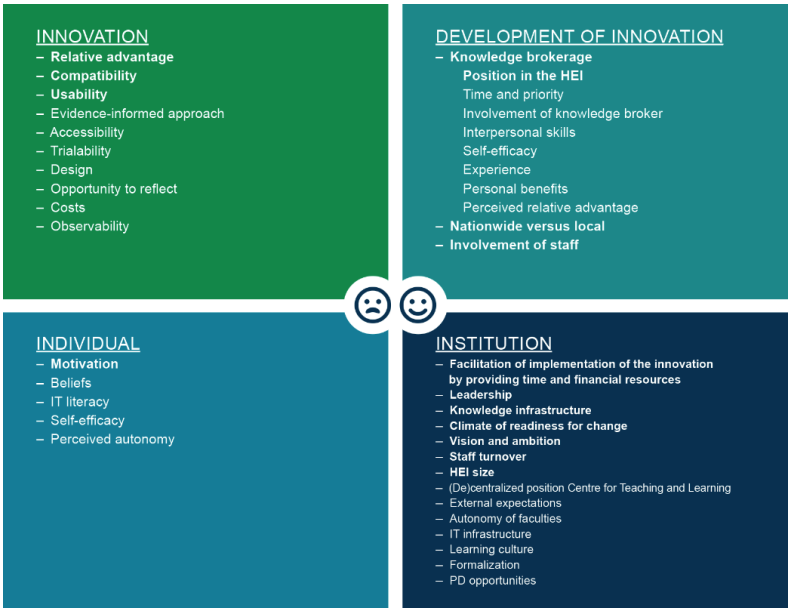
Furthermore, this study contributes to increasing understanding of factors that support and/or hinder the initiation and implementation of nationally developed innovations. Figure 3 provides an overview of all identified factors. As previously described, these factors found in a large-scale nationally driven innovation project (the Dutch Acceleration Plan) merely correspond to the factors found in earlier studies. Figure 3 is based on a small-scale study and needs further validation. For example, two factors found in the literature (primary process and prioritizing education) were not mentioned by the participants, possibly because these factors did not apply to these two types of innovations. Furthermore, some additional factors emerged based on the data: amount of experience, time and priority, and involvement of the knowledge broker. This provides new insights into the best way of fulfilling the role of knowledge broker.

Finally, our findings lead to practical recommendations that could be taken into account in future national programs involving nationally developed innovations, such as the Npuls program which is the follow-up program to the Acceleration Plan (see: https://npuls.nl/en/). First of all, if you want to ensure that a nationally developed innovation is initiated and implemented in local institutions, you must consider the factors related to the innovation itself. For example, align your innovation with the needs of the local institution to show

its added value and to make the innovation compatible and usable. Second, if you want to locally implement an innovation that was developed outside your institution, make sure the individual and institutional factors will drive the process. For example, motivate your staff and facilitate their implementation work by providing time and financial resources. Third, collaborate at the local and national levels during the development of the innovation, and leverage each other's strengths. Identify potential knowledge brokers who have the formal and informal position needed to share knowledge in an accessible and effective way, and involve as many staff as possible. Knowledge brokers need to be selected carefully taking into account their formal and informal position (e.g., their network) and preferably there should be more than one per HEI. For example, the NPuls program has been creating a knowledge infrastructure in which each HEI delegates a team of participants (instead of individuals), consisting of people from different gremia and with different expertise. Moreover, we would like to encourage lecturers to take a formal and active role from the start of the innovation process, making it a collective learning process. These recommendations will increase the likelihood of success when initiating and implementing nationally developed innovations within a local institution.

Figure 3

Model with Factors Supporting and Hindering the Initiation and Implementation of Innovations



Note. Factors mentioned by more than 50% of the participants are shown in bold.

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References

Akkerman, S., & Bruining, T. (2016). Multilevel boundary crossing in a professional development school partnership. *Journal of the Learning Sciences*, *25*(2), 240–284. https://doi.org/10.1080/10508406.2016.1147448

Association of Universities, Association of Universities of Applied Sciences, & SURF. (2018). *Acceleration plan educational innovation with IT.* https://www.universiteitenvannederland.nl/files/documents/Acceleration%20plan%20educational%20innovation%20with%20ict.pdf

Baas, M., Admiraal, W., & Van den Berg, E. (2019). Teachers' adoption of open educational resources in higher education. *Journal of Interactive Media in Education*, *2019*(1), 1–11. https://doi.org/10.5334/jime.510

Beausoleil, A. M. (2018). Revisiting Rogers: The diffusion of his innovation development process as a normative framework for innovation managers, students and scholars. *Journal of Innovation Management*, *6*(4), 73–97. https://doi.org/10.24840/2183-0606_006.004_0006

Beaven, T. (2018). 'Dark reuse': an empirical study of teachers' OER engagement. *Open Praxis*, *10*(4), 377–391. https://doi.org/10.5944/openpraxis.10.4.889

Beggs, T. A. (2000, April 9-11). *Influences and barriers to the adoption of instructional technology* Paper presented at the 2000 Mid-South Instructional Technology Conference. Murfreesboro, TN.

Benz, M. R., Lindstrom, L., Unruh, D., & Waintrup, M. (2004). Sustaining secondary transition programs in local schools. *Remedial and Special Education*, *25*(1), 39–50. https://doi.org/10.1177/07419325040250010501

Brinkman, M. (2022). *Sharing is caring: factors influencing knowledge sharing from PLC participants to other teachers in secondary education* (Master's thesis, University of Twente). University of Twente Student Theses. http://essay.utwente.nl/89829/

Bryman, A. (2007). Effective leadership in higher education: A literature review. *Studies in Higher Education*, *32*(6), 693–710. https://doi.org/10.1080/03075070701685114

Cai, Y. (2017). From an analytical framework for understanding the innovation process in higher education to an emerging research field of innovations in higher education. *Review of Higher Education*, *40*(4), 585–616. https://doi.org/10.1353/rhe.2017.0023

Cohen, D. K., & Mehta, J. D. (2017). Why reform sometimes succeeds: Understanding the conditions that produce reforms that last. *American Educational Research Journal*, *54*(4), 644–690. https://doi.org/10.3102/0002831217700078

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development.* Learning Policy Institute.

Dekker, T., & Feijs, E. (2005). Scaling up strategies for change: change in formative assessment practices. *Assessment in Education: Principles, Policy and Practice, 12*(3), 237–254. https://doi.org/10.1080/09695940500337215

Elder, K. I., & Prochnow, J. E. (2016). PB4L school-wide: what will support the sustainability of the initiative? *New Zealand Journal of Educational Studies, 51*, 83–97. https://doi.org/10.1007/s40841-016-0036-1

Esdar, W., Gorges, J., & Wild, E. (2016). The role of basic need satisfaction for junior academics' goal conflicts and teaching motivation. *Higher Education, 72*(2), 175–190. https://doi.org/10.1007/s10734-015-9944-0

Eveleens, C. (2010). *Innovation management; a literature review of innovation process models and their implications*. https://www.researchgate.net/profile/Chris-Eveleens/publication/265422944_Innovation_management_a_literature_review_of_innovation_process_models_and_their_implications/links/5534fe9f0cf2df9ea6a41548/Innovation-management-a-literature-review-of-innovation-process-models-and-their-implications.pdf

Facilitating Professional Development for Lecturers Zone. (2020). *Digital peer feedback field lab.* Acceleration Plan Educational Innovation with IT. https://www.versnellingsplan.nl/en/Kennisbank/field-lab-for-professionalization/field-lab-digital-peer-feedback/

Facilitating Professional Development for Lecturers Zone. (2021a). *(Digital) formative assessment field lab.* Acceleration Plan Educational Innovation with IT. https://www.versnellingsplan.nl/en/Kennisbank/field-lab-for-professionalization/field-lab-digital-formative-assessment/

Facilitating Professional Development for Lecturers Zone. (2021b). *Learning analytics field lab.* Acceleration Plan Educational Innovation with IT. https://www.versnellingsplan.nl/en/Kennisbank/field-lab-for-professionalization/field-lab-learning-analytics/

Facilitating Professional Development for Lecturers Zone. (2021c). *Designing and teaching blended education field lab.* Acceleration Plan Educational Innovation with IT. https://www.versnellingsplan.nl/en/Kennisbank/field-lab-for-professionalization/field-lab-blended-education/

Facilitating Professional Development for Lecturers Zone. (2021d). *AI in higher education field lab.* Acceleration Plan Educational Innovation with IT. https://www.versnellingsplan.nl/en/Kennisbank/field-lab-for-professionalization/field-lab-ai-in-higher-education/

Facilitating Professional Development for Lecturers Zone. (2021e). *Open educational resources field lab.* Acceleration Plan Educational Innovation with IT. https://www.versnellingsplan.nl/en/Kennisbank/field-lab-for-professionalization/field-lab-open-educational-resources/

Findik, C., & Ozkan, S. (2013). A model for instructors' adoption of learning management systems: Empirical validation in higher education context. *Turkish Online Journal of Educational Technology*, *12*(2), 13–25. https://files.eric.ed.gov/fulltext/EJ1015409.pdf

Gibson, H. L., & Chase, C. (2002). Longitudinal impact of an inquiry-based science program

on middle school students' attitudes toward science. *Science Education*, *86*(5), 693–705. https://doi.org/10.1002/sce.10039

Graham, C. R., Woodfield, W., & Harrison, J. B. (2013). A framework for institutional adoption and implementation of blended learning in higher education. *Internet and Higher Education*, *18*(3), 4–14. https://doi.org/10.1016/j.iheduc.2012.09.003

Gravetter, F. J., & Wallnau, L. B. (2017). *Statistics for the behavioral sciences* (10th ed.). Cengage Learning. https://ndl.ethernet.edu.et/bitstream/123456789/29095/1/Frederick%20J%20Gravetter_2017.pdf

Hixon, E., Buckenmeyer, J., Barczyk, C., Feldman, L., & Zamojski, H. (2012). Beyond the early adopters of online instruction: Motivating the reluctant majority. *Internet and Higher Education*, *15*(2), 102–107. https://doi.org/10.1016/j.iheduc.2011.11.005

Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Jusinski, M. M. (2021). Knowledge broker teachers and professional development. *Teacher Development*, *25*(2), 178–195. https://doi.org/10.1080/13664530.2021.1879922

Kirkup, G., & Kirkwood, A. (2005). Information and communications technologies (ICT) in Higher Education teaching – a tale of gradualism rather than revolution. *Learning, Media and Technology, 30*(2), 185–199. https://doi.org/10.1080/17439880500093810

Kirschner, P. A., Hendriks, M., Paas, F., Wopereis, I., & Cordewener, B. (2004, October). *Determinants for failure and success of innovation projects: The road to sustainable educational innovation*. Paper presented at the AECT Conference, Chicago, IL. Retrieved from eric.ed.gov

Kirtman, L. (2002). Policy and practice: restructuring teachers' work. Education Policy Analysis Archives, 10(25). https://doi.org/10.14507/epaa.v10n25.2002

Kottmann, A. (2023). *Innovation of Education at Higher Education Institutions: The Contribution of Centres of Excellence for Teaching and Learning*. [PhD Thesis - Research UT, graduation UT, University of Twente]. University of Twente. https://doi.org/10.3990/1.9789036559195

Kottmann, A., Van der Meulen, B., & Westerheijden, D. (2020). *Learning from innovations in higher education: Evaluation of innovation impacts of the Norwegian Centers for Excellence in education initiative*. Center for Higher Education Policy Studies (CHEPS). https://www.persistent-identifier.nl/urn:nbn:nl:ui:28-11dbe404-730c-4a54-8735-7ae99c50140b.

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, *33*(1), 159–174. https://doi.org/10.2307/2529310

Lin, C., Huang, C., & Chen, C. (2014). Barriers to the adoption of ICT in teaching Chinese as a foreign language in US universities. *ReCALL*, *26*(1), 100–116. https://doi.org/10.1017/S0958344013000268

Liu, Q., Geertshuis, S., & Grainger, R. (2020). Understanding academics' adoption of learning technologies: A systematic review. *Computers and Education*, *151*(1), 2197–9987. https://doi.org/10.1016/j.compedu.2020.103857

McKenney, S., & Reeves, T. C. (2012). *Conducting educational design research.* Routledge.
Mtebe, J. S., & Raisamo, R. (2014). Challenges and instructors' intention to adopt and use open educational resources in higher education in Tanzania. *International Review of Research in Open and Distance Learning*, *15*(1), 249–271. https://doi.org/10.19173/irrodl.v15i1.1687
Mulder, R. H. (2011). *Bevorderen van disseminatie van innovaties in het beroepsonderwijs.* Expertisecentrum Beroepsonderwijs.
Niederhauser, D. S., Howard, S. K., Voogt, J., Agyei, D. D., Laferriere, T., Tondeur, J., & Cox, M. J. (2018). Sustainability and scalability in educational technology initiatives: Research-informed practice. *Technology, Knowledge and Learning*, *23*(3), 507–523. https://doi.org/10.1007/s10758-018-9382-z
Peters, J. (2011). Sustaining school colleagues' commitment to a long-term professional experience partnership. *Australian Journal of Teacher Education*, *36*(5). https://doi.org/10.14221/ajte.2011v36n5.2
Porter, W. W., & Graham, C. R. (2016). Institutional drivers and barriers to faculty adoption of blended learning in higher education. *British Journal of Educational Technology*, *47*(4), 748–762. https://doi.org/10.1111/bjet.12269
Porter, W. W., Graham, C. R., Bodily, R. G., & Sandberg, D. S. (2016). A qualitative analysis of institutional drivers and barriers to blended learning adoption in higher education. *Internet and Higher Education*, *28*, 17–27. https://doi.org/10.1016/j.iheduc.2015.08.003
Prenger, R., Tappel, A. P. M., Poortman, C. L., & Schildkamp, K. (2022). How can educational innovations become sustainable? A review of the empirical literature. *Frontiers in Education*, *7*:970715. https://doi.org/10.3389/feduc.2022.970715
Rathenau Instituut (2022). *Naar hoogwaardig digitaal onderwijs*. Den Haag
Redecker, C. (2017). European Framework for the Digital Competence of Educators: DigCompEdu. Punie, Y. (ed). Luxembourg: Publications Office of the European Union. doi:10.2760/159770, JRC107466
Rienties, B., Brouwer, N., Carbonell, K. B., Townsend, D., Rozendal, A. P., Van der Loo, J., Dekker, P., & Lygo-Baker, S. (2013). Online training of TPACK skills of higher education scholars: A cross-institutional impact study. *European Journal of Teacher Education, 36*(4), 480-495. https://doi.org/10.1080/02619768.2013.801073
Rikkerink, M., Verbeeten, H., Simons, R.J., & Ritzen, H. (2015). A new model of educational innovation: Exploring the nexus of organizational learning, distributed leadership, and digital technologies. *Journal of Educational Change, 17,* 223-249. https://doi.org/10.1007/s10833-015-9253-5
Ritmeester, C. J. B., & Boulogne, W. (2021). *Toolkit Building blocks for effective lecturer professional development in higher education aimed at educational innovation with IT.* Acceleration Plan Educational Innovation with IT. https://www. versnellingsplan.nl/en/Kennisbank/toolkit-building-blocks-effective-lecturer-professional-development
Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.
Schildkamp, K., Wopereis, I., Kat-De Jong, M., Peet, A. & Hoetjes, I. (2020). Building blocks of instructor professional development for innovative ICT use during a pandemic. Journal

of Professional Capital and Community, 5, 281-293. doi:10.1108/JPCC-06-2020-0034
Schildkamp, K., Hopster-den Otter, D., Ter Beek, M., Uerz, D., & Horvers, A. (2021). *Building blocks for effective lecturer professional development in higher education aimed at educational innovation with IT. Version 2.0.* Acceleration Plan Educational Innovation with IT.
Shen, C., & Ho, J. (2020). Technology-enhanced learning in higher education: A bibliometric analysis with latent semantic approach. *Computers in Human Behavior, 104*, 106-177. https://doi.org/10.1016/j.chb.2019.106177
Smith, K. (2012). Lessons learnt from literature on the diffusion of innovative learning and teaching practices in higher education. *Innovations in Education and Teaching International*, *49*(2), 173–182. https://doi.org/10.1080/14703297.2012.677599
Southwell, D., Gannaway, D., Orrell, J., Chalmers, D., & Abraham, C. (2010). Strategies for effective dissemination of the outcomes of teaching and learning projects. *Journal of Higher Education Policy and Management*, *32*(1), 55–67. https://doi.org/10.1080/13600800903440550
Straub, E. T. (2009). Understanding technology adoption: Theory and future directions for informal learning. *Review of Educational Research*, *79*(2), 625–649. https://doi.org/10.3102/0034654308325896
Stupnisky, R. H., BrckaLorenz, A., Yuhas, B., & Guay, F. (2018). Faculty members' motivation for teaching and best practices: Testing a model based on self-determination theory across institution types. Contemporary Educational Psychology, 53, 15–26. https://doi.org/10.1016/j.cedpsych.2018.01.004
Uerz, D., Van Zanten, M., Van der Neut, I., Tondeur, J., Kral, M., Gorissen, P. & Howard, S. (2021). A digital competences framework for lecturers in higher education. Utrecht: Acceleration plan Educational innovation with IT.
Van den Boom-Muilenburg, S. N., Poortman, C. L., Daly, A. J., Schildkamp, K., De Vries, S., Rodway, J., & Van Veen, K. (2022). Key actors leading knowledge brokerage for sustainable school improvement with PLCs: Who brokers what? *Teaching and Teacher Education*, *110*, 1–17. https://doi.org/10.1016/j.tate.2021.103577
West, M. A., & Farr, J. L. (1990). Innovation at work. In M. A. West, & J. L. Farr (Eds.), *Innovation and creativity at work: Psychological and organizational strategies* (pp. 3–13). John Wiley and Sons.
Wiley, D. (2009, June 10). Dark matter, dark reuse, and the irrational zeal of a believer. *Iterating Toward Openness*. http://opencontent.org/blog/archives/905
Wiltsey Stirman, S., Kimberly, J., Cook, N., Calloway, A., Castro, F., & Charns, M. (2012). The sustainability of new programs and innovations: a review of the empirical literature and recommendations for future research. *Implementation Science*, *7*(17), 1–19. https://doi.org/10.1186/1748-5908-7-17
Zehetmeier, S. (2015). Sustaining and scaling up the impact of professional development programmes. *ZDM Mathematics Education*, *47*(1), 117–128. https://doi.org/10.1007/s11858-015-0671-x

Auteurs

Dorien Hopster-den Otter is onderwijskundig onderzoeker aan de Universiteit Twente.
Myrthe Lubbers is als onderzoeker verbonden aan de Universiteit Twente en Hogeschool Saxion.
Kim Schildkamp is hoogleraar en afdelingshoofd van ELAN, vakgroep voor docentontwikkeling aan de Universiteit Twente.

Correspondentieadres: Dorien Hopster-den Otter, Universiteit Twente, Postbus 217, 7500 AE Enschede. E-mail: **d.denotter@utwente.nl**

Samenvatting

Het implementeren van professionele ontwikkeling voor docenten in hoger onderwijs: van nationaal naar lokale onderwijsinnovatie met ICT

Het initiëren en implementeren van landelijk ontwikkelde innovaties binnen lokale onderwijsinstellingen is een complex proces. Innovaties worden vaak geen onderdeel van de organisatorische routines. Daarom was het doel van deze studie om vast te stellen hoe twee soorten onderwijsinnovaties voor de professionele ontwikkeling van docenten, ontwikkeld door het landelijke Versnellingsplan Onderwijsinnovatie met ICT, werden ontvangen en geïmplementeerd in lokale instellingen voor hoger onderwijs, en welke factoren dit proces ondersteunden of belemmerden. Resultaten van 38 interviews met vertegenwoordigers van de instellingen en aanbieders van professionele ontwikkeling lieten zien dat de initiatie en implementatie van de innovaties bij de lokale instellingen uiteenliepen. Deze verschillen kunnen worden verklaard door factoren die verband houden met de (perceptie van de) innovatie, de ontwikkeling van de innovatie, de kenmerken van de individuen en de onderwijsinstelling; met name de laatste drie categorieën blijken significant gerelateerd te zijn aan de stadia van het gebruikte innovatieprocesmodel.

Kernwoorden initiëren, implementatie, landelijk ontwikkelde innovaties, hoger onderwijs, professionele ontwikkeling van docenten

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Appendix A. Supportive and hindering factors

Table A.1

Factors Related to the Innovation

Factor	Definition	Reference(s)
Added value (Merged with: Innovation meets need, Relevance, Efficiency and profit)	The degree to which an innovation is perceived as having relative advantage.	Beggs, 2000; Brinkman, 2022; Cai, 2017; Findik & Ozkan, 2013; Kottmann et al., 2020; Liu et al., 2020; Mtebe & Raisamo, n.d2014.; Mulder, 2011; Prenger et al., 2022; Rogers, 2003; Smith, 2012
Compatibility (Merged with: Tolerance, Standardization)	The degree to which an innovation is perceived as consistent with or adaptable to current values and methods.	Beggs, 2000; Brinkman, 2022; Cai, 2017; Kottmann et al., 2020; Liu et al., 2020; Mulder, 2011; Rogers, 2003
Usability (Merging of: Scope, Clarity of targets, Clarity of how to apply, Complexity)	The degree to which the innovation is perceived as clear, concrete and practical to use.	Beggs, 2000; Brinkman, 2022; Findik & Ozkan, 2013; Kottmann et al., 2020; Mtebe & Raisamo, n.d2014.; Mulder, 2011; Rogers, 2003
Evidence-informed approach	The degree to which both practical knowledge and knowledge obtained from research are used to mold the innovation.	Brinkman, 2022; Prenger et al., 2022
Accessibility	The degree to which the innovation is perceived as easy to access.	Brinkman, 2022; Mulder, 2011
Trialability	The degree to which the innovation can be experimented with on a limited scale.	Kottmann et al., 2020; Liu et al., 2020; Rogers, 2003
Design (Generated from data)	The degree to which the design of the innovation is perceived as beautiful.	
Opportunity to reflect	The degree to which the innovation allows for reflection.	Mulder, 2011
Costs	The degree to which money is required to get or use the innovation.	(Kottmann et al., 2020

Observability	The degree to which the results of the innovation are visible to others.	Kottmann et al., 2020; Mulder, 2011; Prenger et al., 2022; Rogers, 2003
Primary process	The degree to which the innovation is focused on the primary learning process versus on the institution.	Mulder, 2011

Table A.2

Factors Related to the Development of the Innovation

Factor	Definition	Reference(s)
Knowledge brokerage (Merged with: Dissemination channels)	The degree to which HEI representatives disseminate the innovation, using several dissemination channels and connecting to existing processes.	Mulder, 2011; Rogers, 2003; Van den Boom-Muilenburg et al., 2022
Nationwide versus local (Merged with: Top-down versus bottom-up)	The extent to which it is perceived as valuable that the innovation was developed in a collaborative effort at the national level.	Mulder, 2011; Southwell et al., 2010
Involvement of staff	The degree to which lecturers and other staff were involved during development and adoption of the innovation.	Brinkman, 2022; Cai, 2017; Mulder, 2011; Rogers, 2003; Smith, 2012

Table A.3

Factors Related to the Individual

Factor	Definition	Reference(s)
Motivation (Merged with: Attitude, Desire to innovate)	The degree to which the individual wants to use the innovations to renew education with IT. This also includes the not-invented-here syndrome, that can be defined by a tendency for people and organizations to avoid things that they did not create themselves.	Brinkman, 2022; Liu et al., 2020; Mulder, 2011; Prenger et al., 2022

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Beliefs (Merged with: Norms, Trust in ICT and innovation).	Individuals' beliefs about what constitutes good teaching, how students learn and the role and added value of IT.	Liu et al., 2020
IT literacy	The ability to make informed and reasoned decisions on using existing technologies that improve teaching and learning.	Brinkman, 2022; Liu et al., 2020; Mtebe & Raisamo, n.d.;2914; Prenger et al., 2022; Smith, 2012
Self-efficacy (Merged with: Fear of change)	The degree to which individuals believe in their own abilities to implement educational innovations with IT in practice.	Beggs, 2000; Findik & Ozkan, 2013
Perceived autonomy	The ability and capacity that individuals perceive themselves to have in the decision-making processes within their department and HEI.	Liu et al., 2020; Mulder, 2011

Table A.4

Factors Related to the Institution

Factor	Definition	References
Facilitation of implementation of the innovation by providing time and financial resources (Merging of: Time, Financial resources and HR regulations and rewards)	The amount of available time, (perceived) workload and financial resources for use of the innovation.	Brinkman, 2022; Kottmann et al., 2020; Lin et al., 2014; Mulder, 2011; Porter et al., 2016; Smith, 2012
Leadership (Merged with: Positioning of the innovation)	The degree to which formal leaders encourage, support and prioritize the adoption of the innovation.	Beggs, 2000; Brinkman, 2022; Cai, 2017; Kottmann et al., 2020; Lin et al., 2014; Liu et al., 2020; Mulder, 2011; Prenger et al., 2022; Smith, 2012; Southwell et al., 2010
Knowledge infrastructure (Merging of: Knowledge sharing, Collaboration, Network structures)	The degree to which the units in the HEI are linked by interpersonal networks.	Kottmann et al., 2020; Liu et al., 2020; Mulder, 2011; Prenger et al., 2022; Smith, 2012

Climate of readiness for change	The degree to which the institution is inclined to accept, embrace, and adopt the innovation to purposefully alter the status quo. This factor also includes: reorganizations and the COVID-19 pandemic.	Southwell et al., 2010
Vision and ambition	The degree to which vision and ambitions are clear regarding educational innovation for lecturer professional development with IT.	Liu et al., 2020; Mulder, 2011; Porter et al., 2016; Prenger et al., 2022; Smith, 2012
Staff turnover	The amount of staff turnover, changes in functions and layoffs.	Mulder, 2011; Prenger et al., 2022
HEI size	The degree to which the HEI is perceived as large or small.	Kottmann et al., 2020; Mulder, 2011
(De)centralized position Center for Teaching and Learning	The way in which lecturer PD is organized.	Smith, 2012
External expectations (Merged with: Non-commitment, Stakeholder interests)	The degree to which external stakeholders, such as the Acceleration Plan or the professional, set expectations and provide support.	Kottmann et al., 2020; Mulder, 2011; Prenger et al., 2022; Southwell et al., 2010
Autonomy of faculties	The degree to which faculties are independent to make their own decisions.	Kottmann et al., 2020; Porter et al., 2016
IT infrastructure	The degree to which facilities, learning resources and support are available that are necessary to integrate IT into education and the associated PD.	Beggs, 2000; Brinkman, 2022; Liu et al., 2020; Mtebe & Raisamo, n.d.;2014; Porter et al., 2016; Smith, 2012; Southwell et al., 2010
Learning culture	The degree to which the HEI has a professional atmosphere, beliefs, perceptions, responsibilities, relationships and objectives, focused on the ongoing development of lecturers.	Kottmann et al., 2020; Liu et al., 2020; Mulder, 2011; Prenger et al., 2022

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Formalization	The degree to which the HEI emphasizes compliance with rules and procedures among its members.	Kottmann et al., 2020; Liu et al., 2020
PD opportunities	The PD opportunities in the field of IT available to lecturers within the HEI, such as courses, training and professional learning communities.	Beggs, 2000; Liu et al., 2020; Mulder, 2011; Porter et al., 2016; Smith, 2012
Prioritizing education	The degree to which the HEI prioritizes education (versus research).	Kottmann et al., 2020; Liu et al., 2020

Table A.5

Factors Related to Knowledge Brokerage (Part of Innovation Development)

Factor	Definition	Reference(s)
Position in the HEI (Merged with: Relationship with colleagues, Recipient agreement).	The formal and informal position of the knowledge broker.	Brinkman, 2022; Kottmann et al., 2020; Rogers, 2003
Time and priority (Generated from data)	The amount to which the knowledge broker experience time and prioritize dissemination.	
Involvement of knowledge broker (Generated from data)	The degree to which the knowledge broker was involved in the zone and the development of the innovation.	
Interpersonal skills	The degree to which the knowledge broker is able to exchange information in an effective way.	Brinkman, 2022; Rogers, 2003
Self-efficacy	The degree to which knowledge brokers belief in their own abilities to disseminate the innovation.	Brinkman, 2022

Experience (Generated from data)	The amount of experience the knowledge broker has in education and in this HEI.	
Personal benefits	The degree to which the knowledge broker has status, rewards or other benefits from dissemination.	Brinkman, 2022; Kottmann et al., 2020
Perceived added value	The degree to which the knowledge broker perceives the innovation as having added value.	Brinkman, 2022; Porter et al., 2016

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Appendix B. Characteristics of participants

Table B.1

Participant Characteristics

Participant	Type	HEI	Stage
1	PD provider (replacement of head)	I	3
2	PD provider (additional participant)	I	3
3	HEI representative	I	3
4	PD provider	O	5
5	HEI representative	O	5
6	PD provider	A	1
7	HEI representative	A	1
8	PD provider	J	3
9	HEI representative	J	3
10	PD provider	K	3
11	HEI representative	K	3
12	PD provider	C	2
13	HEI representative	C	2
14	PD provider	P	5
15	PD provider	P	5
16	HEI representative	P	5
17	PD provider	L	4
18	PD provider	L	4
19	HEI representative	L	4
20	PD provider	M	4
21	HEI representative	M	4
22	PD provider	N	4
23	PD provider	N	4
24	HEI representative	N	4
25	HEI representative	N	4
26	PD provider	B	2
27	HEI representative	B	2
28	PD provider	E	3
30	HEI representative	E	3
31	PD provider (replacement of head)	F	3
32	HEI representative	F	3
33	PD provider; HEI representative	G	3
34	PD provider	H	3
36	HEI representative	H	3
37	PD provider	D	2
38	PD provider	D	2
39	HEI representative	D	2
40	PD provider (additional participant)	K	3