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Practice what you preach: Adoption of internal campus innovations at Dutch research-intensive universities

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Abstract

Campus decision makers are increasingly expected to adopt 'campus innovations' (affecting real estate and different facilities), not only from the market and demand-led (external campus innovations), but also developed by the university's own scientists (internal campus innovations). The adoption of the latter can be driven and hindered by many unique factors that campus decision makers have not dealt with before. To provide insight into them, qualitative data were collected from 13 out of 14 Dutch research-intensive universities. The results indicate that internal campus innovations are driven by co-creation stimulation, collaborative partnership, transparency and accountability, and local development contribution. Their adoption, however, may be obstructed by barriers embedded in the interaction between campus decision makers and scientists, organizational university context, funds unavailability and innovations' supply-pushed characteristics. An increased understanding of these barriers and the practices to overcome them is crucial for universities' campus decision makers to actively engage in the adoption of internal campus innovations.

KEYWORDS

barriers, campus, drivers, innovation, management, universities

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Van besluitvormers op de campus wordt steeds meer verwacht dat zij "campusinnovaties" met betrekking tot vastgoed en faciliteiten toepassen. Deze innovaties worden niet alleen ontwikkeld door de markt en vraaggestuurd (zogenaamde externe campusinnovaties), maar ook door de eigen universitaire wetenschappers (interne campusinnovaties). De invoering van deze laatste kunnen worden bevorderd of gehinderd door vele unieke factoren waarmee campusbeslissers nog niet eerder te maken hebben gehad. Om deze inzichtelijk te maken zijn kwalitatieve gegevens verzameld van 13 van de 14 Nederlandse onderzoek intensieve universiteiten. Uit de resultaten blijkt dat interne campusinnovaties worden bevorderd door stimulering van co-creatie, samenwerkingsverbanden, transparantie en verantwoording, en bijdragen aan de regionale stedelijke ontwikkeling. De toepassing ervan kan echter worden belemmerd door barrières in de interactie tussen beleidsmakers en wetenschappers op de campus, de organisatorische context van de universiteit, de beperkte beschikbaarheid van fondsen en de kenmerken van deze innovaties. Een beter begrip van deze barrières en de manieren om ze te verhelpen is van cruciaal belang voor beleidsmakers op de universiteitscampus. Hiermee kunnen zij proactief werken aan de implementatie van interne campusinnovaties.

1 | INTRODUCTION

Universities since their founding have been inextricably associated with the physical environment (Turner, 1984). Initially, it provided practical attributes: protection from the weather and a setting for the university's first mission—teaching and learning. In the late nineteenth century, when universities were undergoing the first academic revolution, the campus, generally understood as buildings and land (collectively referred to as real estate) and different facilities (Rymarzak et al., 2020), had to be adapted to enable the university to also fulfil its second mission—research.

In recent decades, the campus started to be perceived as an instrument to combat financial pressure (Billing, 1995). To attract students constituting the basis for the existence of the education market and whose individual decisions considerably influence higher education institutions in terms of state subsidies or tuition fees (Rymarzak & Marmot, 2020), its decision makers adopted many so-called 'campus innovations' (causing a particular form of change in real estate and different facilities), which were mostly from the market (originating outside the university and further called external campus innovations). As representatives of the departments responsible for decisions on real estate and/or facilities development (hereinafter referred to as campus decision makers, and

whose viewpoint is taken in this paper), they were involved in the innovation adoption process which is complex and variously defined (Rogers, 2003).

Greenhalgh et al. (2004) present three stages of the adoption process: preadoption (e.g., awareness of innovation), peri-adoption (e.g., continuous access to innovation information) and established adoption (e.g., adopters' commitment to the adoption). Alternatively, Frambach and Schillewaert (2002) characterize two stages associated with adoption: the organization's decision to pursue adoption and the staff's acceptance and initiation of their individual processes of accepting the innovation. In this paper, in line with the propositions of Damanpour and Schneider (2006), and Wisdom et al. (2014) we accept that the adoption process of campus innovation is more fine-grained and it starts with the recognition that a need exists and moves to search for solutions, then to the initial decision on the adoption and finally to the actual approval of campus decision makers to proceed with the implementation of the innovation on campus.

However, along with the second revolution, which reoriented universities away from an 'ivory tower' exclusively focusing on the first and the second mission, the pressure has increased to add the third mission (Etzkowitz et al., 2000). The involvement of universities in third-stream activities relating not only to the commercialization but in recent years also to the generation, use, application and exploitation of knowledge with external stakeholders and society in general (de la Torre et al., 2017; Nelles & Vorley, 2010; Secundo et al., 2017) can have consequences on campus management. It is more and more expected from campus decision makers to adopt campus innovations arising inside the university (being the research outcome of its own researchers and further named internal campus innovations). They are to make it possible for the scientists to develop and validate their innovations in an operational environment on campus in 'real-life' with campus users to prove by practice what they preach.

So far, little has been known about this phenomenon. Therefore, the paper describes unique internal drivers and barriers to the adoption of internal campus innovations (in comparison with external campus innovations) and ways to overcome them based on the example of Dutch research-intensive universities. As the previous publications on internal campus innovations challenges have tended to focus only on the viewpoint of academic scientists (Nearly & Saunders, 2011), or the living lab project(s) or the living lab users (Baletic et al., 2017; Evans et al., 2015; Mazutti et al., 2020; Pilon et al., 2020), this paper expands the existing theory with the managerial point of view. Additionally, this paper develops earlier research presenting only campus decision-makers' perspectives in the context of external campus innovations (Boys, 2011; Coulson et al., 2018; Curvelo Magdaniel, 2016; den Heijer, 2011; Lasakova et al., 2017) with the objective of moving towards a more comprehensive analysis of campus innovations adoption.

In the following sections, the existing literature on the innovation and typology of external campus innovations is presented, as well as their drivers and barriers as background. Then the methods and the results of the empirical analysis are described, relying on interviews conducted among campus decision makers on internal campus innovations across Dutch research-intensive universities. Finally, the discussion of internal campus innovations classification and the unique drivers and barriers of their adoption extended beyond external campus innovations is outlined, followed by the contribution of this work and its implications.

2 | THEORETICAL BACKGROUND

2.1 | Innovation and the typology of external campus innovations

In literature, there are various innovation definitions and classifications. Generally, it is often considered as the introduction of novelty related to the first-time usage, not only within the organization population set but also by the innovating organization (Birkinshaw et al., 2008). Researchers have classified it based on two main criteria: a process perspective (Ettlie, 1980; Rogers, 2003; Van de Ven & Rogers, 1988) and an outcome perspective (Damanpour & Evan, 1984; Kimberly & Evanisko, 1981).

Theorists who take the process perspective of innovation distinguish between internal and external innovations (Laage-Hellman et al., 2021). The first group includes the innovations whose activities of research and development (R&D) are inside the organization's boundaries. At universities, internal innovations can be equated with the research outcomes of the university's own scientists. In comparison, the R&D process of the second group of innovations—external innovations—is outside the boundaries of the organization (Cooper & Zmud, 1990). They are most often bought by universities from the market. This paper concentrates on both—internal and external, but only campus innovations, i.e., affecting real estate and different facilities and requiring the approval of campus decision makers.

The researchers who focus on the outcome view attempt to delineate their antecedents and consequences, often presenting their different types. In this article, the classification from the private-sector innovation literature is adopted. Following Kimberly and Evanisko (1981), and Damanpour and Wischnevsky (2006), as well as Hong and Lee (2018), external campus innovations are divided into two types—one directly related to the organization's core mission and the other related to operational concerns.

Among the first group of external campus innovations, directly related to university missions and later called in more general terms, educational campus innovations can be innovations of various scales from fit-out/equipment (e.g., ergonomic, movable furniture), through a new type of space (e.g., digital centres, makerspaces, hacklabs, etc.), to the whole innovative educational building (Kruger & Steyn, 2020).

The second group, relating to operational concerns and indirectly to university missions, further named operational campus innovations may include: the components of a building structure (e.g., solar panels), catering, transportation services (Pritchard, 2008), technology (e.g., campus smart tools enabling occupancy optimization) (Valks, 2021), and innovations linking with waste recycling (Goel & Nelson, 2018).

2.2 | Drivers of adopting external campus innovations

Campus decision makers have adopted external campus innovations to support universities in achieving many goals. According to the campus management theory (Beckers et al., 2015; Curvelo Magdaniel et al., 2018; den Heijer, 2011) which has its origins in Corporate Real Estate Management (CREM) theory (Joroff et al., 1993; Nourse & Roulac, 1993), their adoption as one of the campus management tasks can be driven by the need to support four university goals and perspectives respectively: users' productivity and well-being (functional perspective), university's competitive advantage (organizational perspective), university profitability (financial perspective) and campus sustainable development (physical perspective).

Campus users' productivity and well-being may be fostered by the adoption of educational campus innovations supporting their activities (teaching, learning and research), improving their satisfaction, and increasing flexibility of buildings and furniture by offering an attractive and comfortable physical environment that meets the users' changing expectations (den Heijer, 2011; Singh & Maini, 2020). The achievement of the university's competitive advantage and its primary goals (namely academic excellence, high academic standards, international reputation and status) may be encouraged by acquiring the educational campus innovations that improve the quality and effectiveness of the primary processes, for instance: stimulating interdisciplinary collaboration, supporting culture, image and improving the quality of the place (Curvelo Magdaniel et al., 2019). The adoption of operational campus innovations can add to the profitability of the university directly by the decrease in costs and resource consumption (Berestova, 2009), as well as by an increase in campus value. In turn, campus sustainable development can be accomplished by adoption of the operational campus innovations reducing footprint (energy use and CO₂ emission, reducing plastic waste) and by enabling more efficient space use (Curvelo Magdaniel, 2016; Niedlich et al., 2019).

However, to achieve the above-mentioned goals, campus decision makers need to identify the barriers in advance to be able to avoid them or minimize their effect.

2.3 | Barriers to the adoption of external campus innovations

The adoption of external campus innovations may be hindered or prevented by many barriers. In this paper, the focus is on the internal barriers as those which can be the object of active and direct response by the campus decision makers, rather than the external ones which are partially or completely beyond influence. According to the factor approach to innovation research (Damanpour et al., 2018; Hasenefendic et al., 2017), they are classified into three groups: individual-related, organizational and innovation-characteristics (Table 1).

2.3.1 | Individual-related barriers

The adoption of external campus innovations (both educational and operational) may be obstructed by the individual-related barriers entailing: the attitude and lack of expertise/knowledge of campus decision makers and innovation users' acceptance. The attitude of the former, being powerful internal actors, is especially important as they influence decisions and allocate resources for adoption of campus innovations. Some of them may be in favour of change, seeing it as an opportunity to support university performance and integrate four university perspectives (den Heijer, 2011). While others may be resistant towards adoption or may not always recognize the changing demands of campus users or adequately respond to their needs (without understanding the relationship between space and what happens in it) (Boys, 2011). There can also be those who lack expertise/knowledge about campus innovations available on the market (Hopkins, 2016).

The users' acceptance of campus innovations, on the other hand, is especially significant after its adoption. Campus decision makers need to be aware that they may respond to it differently. Some of them start to use innovations immediately, and some are slow to adapt and try. Some users resist change for reasonable causes and some resist change temporarily as they await examples of how others have made a leap, that they can follow (Zhu & Engels, 2013). There are also campus innovations popular with one group of campus users (e.g., with students) and perceived as troubling by others (for instance by academics or campus decision makers) (Lasakova et al., 2017).

2.3.2 | Organizational barriers

Barriers can also be linked to the internal organizational context in which the external campus innovations are adopted (Elliott et al., 1993). Among the most common types of those barriers are: ineffective administration of

TABLE 1 Barriers to the adoption of external campus innovations

Barriers	Description
Individual-related	<ul style="list-style-type: none"> attitudes and lack of expertise/knowledge of campus decision makers innovation users' acceptance
Organizational	<ul style="list-style-type: none"> ineffective administration of process activities rigid or inappropriate organizational structure lack of or insufficient financial resources
Innovation-characteristics	<ul style="list-style-type: none"> lack of or low relative advantage complexity lack of compatibility lack of trialability insufficient innovation observability

Source: Own elaboration based on: Rogers (2003); Richardson and Lynes (2007); Hasenefendic et al. (2017); Damanpour et al. (2018); Cinar et al. (2019).

process activities, rigid or inappropriate organizational structure, and lack of or insufficient financial resources (Cinar et al., 2019; Richardson & Lynes, 2007; Rogers, 2003).

Adopting a new initiative (educational or operational) at the campus may foster an additional workload for campus decision makers without any additional incentives (Hopkins, 2016). As a result, they may prefer performing routine operations instead of adopting campus innovations. There can also be logistical problems, such as lack of training (Brandli et al., 2015; Kasai & Jabbour, 2014), or inadequate support for innovation users. The other barriers, related to ineffective administration, can lie in the lack of defined policies and practices (Leal Filho et al., 2015), the lack of leadership (Richardson & Lynes, 2007; Schneckenberg, 2009) and especially top-down managerial thinking (without campus users' participation) (Boys, 2015). Inappropriate university structure (conservative and bureaucratic) is another known obstacle (Dahle & Neumayer, 2001; Lasakova et al., 2017; Zhu & Engels, 2013).

The next organizational barrier that could hamper the delivery of a 'state-of-the-art' campus may be the lack of or insufficient financial resources for capital investments or their inadequate allocation within the university (Bero et al., 2012; Dahle & Neumayer, 2001; Rymarzak & Trojanowski, 2015; Veiga Ávila et al., 2019).

2.3.3 | Innovation-characteristics barriers

The adoption of external campus innovations may also be dependent on the innovation characteristics which are linked to the perceived attributes of innovation (Johnson, 2000; Kapoor et al., 2014; Tornatzky & Klein, 1982). Rogers (2003) five major properties of innovations are often distinguished based on: relative advantage, complexity, compatibility, trialability, and observability.

The first barrier can be the lack of or low relative advantage, defined as the insufficient added-value of innovation over existing practices. The extent to which campus innovation is perceived as worth adopting may be measured in the context of the university's stated goals, in economic terms (e.g., low return on investment) (Kasai & Jabbour, 2014), as well as non-financial. The adoption of operational campus innovations can result in an insufficient decrease in the operating costs or in the case of educational campus innovations—an inadequate growth in the student population or increase in the level of campus users' satisfaction (Coulson et al., 2018).

The complexity, that is the relative difficulty of understanding or using campus innovations, can be the second obstacle (Zaltman et al., 1973). Innovations that are simple, more intuitive and narrower in scope are easier to adopt. It is known that campus users do not usually allocate much time for learning to use them (Sahin, 2006).

The lack of innovation compatibility with the existing campus solutions, past experiences and potential needs (Rogers, 2003) can be the third barrier to the adoption of campus innovations. If innovations are compatible with an individual's needs, then uncertainty will decrease and the rate of innovation adoption will increase. However, there is no universal formula for the 'state-of-the-art' campus. Some exemplify a greater focus on the educational campus innovations linked with the academic mission, while others place more emphasis upon the operational campus innovations in recreation, eating and administrative services (Coulson et al., 2018).

The lack of trialability is also not conducive to innovation adoption (Yetton et al., 1999) and can be perceived as the fourth barrier. Critical for facilitating the adoption of campus innovations is to provide potential users with the opportunity to test them before committing, as some innovations may challenge campus users to change their habits, or faculty members—to find different teaching ways (Parisot, 1995).

Insufficient innovation observability described as a degree to which the results of innovation become clearly visible to various stakeholders (Rogers, 2003) can be the fifth barrier. Eye-catching campuses across the world are no new thing in the realm of universities. Some of them would not have invested heavily in their campus if it did not, as a result, represent the most daring and cutting-edge specimens of architecture, having the ability to attract young generations (Coulson et al., 2018).

3 | METHODS

3.1 | Study design

The study is based on the example of Dutch research-intensive universities to investigate drivers and barriers to the adoption of internal campus innovations. The Netherlands was chosen as one of the countries perceived as leaders of higher education policy modernization (Antonowicz & Jongbloed, 2015; de Boer et al., 2006), where universities are encouraged to share knowledge (through co-design and co-creation) as well as utilize research findings in the society and the economy (NWO, 2018).

Since adoption of internal campus innovations is a relatively unexplored phenomenon in general and at Dutch universities, and information about it is not publicly available, qualitative research using semi-structured interviews that seeks to generate in-depth insights on people's experiences was deemed appropriate (Saunders et al., 2019). In comparison to the more structured approach of quantitative study (directing the researcher more, and leaving less leeway to explore other paths), it allows for obtaining unexpected information and a holistic understanding of complex issues (Cooper & Schindler, 2005).

The campus decision makers as interviewees were selected based on institutional literature stressing that those routinely participating in organizational decisions are more influential actors than the participants (like scientists) whose involvement is part-time (and often only applies to individual innovations) (Greenwood et al., 2011). Moreover, without their participation, the adoption of internal campus innovations would not be possible (or at least very difficult) for scientists.

3.2 | Data collection

The interviews were conducted among campus decision makers from 13 out of 14 Dutch research-intensive universities including comprehensive, technology and specialized (Appendix A). The Open University was excluded from the group as it focuses on distance learning and operates in a mode that is very different from the others.

The interviews were undertaken from October 2020 to January 2021 and lasted around 90 minutes each. The Covid-19 restrictions caused them to be conducted online. To get the responses more honest in nature as there is little time to consider (Mann & Stewart, 2000, p. 153), and see the presence of nonverbal and social cues (Sullivan, 2012), synchronous online interviewing was chosen, although, compared with email interviews, this data collection method does not provide anonymity to the participants (Pearce et al., 2019). Additionally, the quality of the result is dependent on reliable access to the internet and smooth use of software platforms. To reduce these disadvantages the interviewees were requested to situate themselves in environments with a strong Internet connection, preferably over Ethernet connection and in private environments that are free of distraction. MS Teams platform was selected, with which the respondents were familiar.

In total, 30 campus decision makers were interviewed, including directors of real estate and/or facilities, their subordinates, as well as policy officers. Each interview followed a similar format, beginning with an explanation of the purpose of the study and guidelines for participants, then transitioning to open-ended questions about the internal drivers and barriers to the adoption of internal campus innovations. With the permission of the participants, all interviews were audio-recorded and later transcribed, using a simplified approach (Dresing & Pehl, 2015).

3.3 | Data analysis

Data were analysed using thematic analysis, which included several phases following the approach presented by Braun and Clarke (2006) and referred to Lincoln and Guba (1985) criteria for trustworthiness. Firstly, since the

interviews were conducted in Dutch, the interviewees' statements were translated into English. We familiarized ourselves with the data by reading and re-reading transcripts of interviews and listening to audio-recording. Additionally, we took notes on the main ideas for coding (Lincoln & Guba, 1985). Secondly, we created codes using a combination of deductive and inductive approaches. Major and subcategories of drivers and barriers for the analysis were derived from the theory on external campus innovations to make the analysis comparative. Individual factors were matched with the content of the data to find the unique ones for internal campus innovations. For the coding stage, Atlas.ti 9.0 software was used. Thirdly, we reviewed and developed descriptions of drivers and barriers (by sorting and comparing interviewees' answers) and linked them with the main drivers and barriers categories. To enhance the credibility of data analysis, in all phases at least two researchers were involved and the data analysis and interpretation were validated among researchers during in-depth discussions. Meeting minutes were kept to register emerging impressions of the unique drivers and barriers to the adoption of internal campus innovations. Any developments were documented to become evidence to support the trustworthiness of the study. The detailed notes were archived to help establish confirmability (Nowell et al., 2017). The next section presents all the main findings that emerged from the data analysis.

4 | RESULTS

4.1 | Classification of internal campus innovations

The conducted research shows that universities adopted various internal campus innovations that required the approval of campus decision makers. Due to their adoption context, they can be grouped into three categories: educational, operational and social. The latter, however, in comparison to the previous two types, aimed not only to improve the campus itself but also tackle societal challenges.

Among examples of educational campus innovations (introduced at comprehensive university) were '*room types' impact on teaching and learning*' 8:97. In turn, the operational campus innovations (adopted by technology and comprehensive universities) included '*smart campus tools*' 13:33, '*smart dashboard COVID-19*' 13:105, '*indoor navigation system*' 4:79; 7:29, '*furniture acquisition and transparency*' 9:49, '*mobility tests*' 4:100; 9:53; 10:49, and '*circular use of building material*' 2:119; 7:116; 10:99; 11:99.

The examples of social campus innovations were: components of a building structure (e.g., '*solar panels*' 2:103; 5:120; 7:50; 8:91; 9:20; 10:95, '*green roof*' 1:2, '*rainwater buffer systems*' 7:46, '*geothermal energy generator*' 2:118, '*hydrogen generator*' 5:112, '*water taps and dryers in one*' 9:14), components of land (e.g., '*grass type*' 12:106), components of campus infrastructure (e.g., '*super-asphalt cycle paths*' 6:108, '*anti-flood pavement*' 7:46). Although they were adopted on campuses of three types of universities, they were the domain of comprehensive and technology universities. Among them were also '*insects as food experiments*' 6:111, '*healthy catering on campuses*' 2:119; 3:109, and '*vegetarian meat alternatives*' 8:97, introduced at comprehensive and specialized universities, as well as '*crowd management and communication systems*' 13:105 adopted on the campus of technology university.

4.2 | Drivers of adopting internal campus innovations

Universities were driven to adopt internal campus innovations for various reasons which were grouped and linked to four university perspectives (functional, organizational, financial and physical). Firstly, the adoption of campus innovations (educational and social) was supposed to contribute to the increase of campus users' productivity and well-being as well as their involvement in innovation co-creation (functional perspective). For campus decision makers, it was intended to provide campus problem-solving. At the same time, for the scientists (as innovation-providers), according to campus decision makers, the adoption was to give the opportunity to boost

their creativity and skills (*'partly [their] role [has been] changing—academic becomes part of campus team'* 10:28). It was to allow converting tacit knowledge into explicit knowledge, turn theory into practice (through the applicability in *'real-life situations'* 7:20), learn from mistakes (*'experience the teething problems'* 6:17) and experience in daily operation (through feedback from innovation adoption), as well as upskill in project management.

Secondly, the adoption of internal campus innovations (especially social ones) meant to contribute to the achievement of competitive advantage (*'to be frontrunner'* 10:42) and stimulate and support engagement and collaborative partnership (organizational perspective) not only between various groups inside the university (including scientists, student community, departments and/or different faculties) but also with triple- or even quadruple-helix partners (e.g., other universities, local firms, municipalities, local communities). It *'connects the science, the outside world and campus development'* 12:20.

Additionally, the adoption of the university's innovative operational achievements on the campus was to add to the university's profitability by reducing costs (*'less spent on energy bills'* 8:38), and in the case of social campus innovations—supporting the technology transfer office in their commercialization through multiple pathways (including patents, licences, start-up and spin-off firms) as innovations *'have become part of the university business model'* 13:24. By serving as an exhibition, adopted innovations allow also promoting transparency and accountability in spending public money (financial perspective). As it was mentioned (*'(...) academics have to promote their own projects to show how investments in science payback to society'* 10:35. (...) *We want to showcase what we are doing as a university* 12:17 (...) *we also have our social responsibility'* 12:19.

Finally, by adopting campus innovations (some operational and social ones) universities wanted to achieve campus sustainable development and contribute to the growth of regional and local economic systems (physical perspective) by *'developing the region'* 5:26, and solving *'problems in the neighbourhood'* 3:4. They aimed not only to respond to climate change (*'sustainable development'* 4:32), but also to meet challenges such as *'energy transition'* 8:17; 5:14, 9:51; or *'healthy living'* 3:26.

4.3 | Barriers to the adoption of internal campus innovations

Barriers to the adoption of internal campus innovations were analysed according to the presented three groups: individual-related, organizational and innovation-characteristics.

4.3.1 | Individual-related barriers

The individual-related barriers are linked with three main categories: attitude and lack of expertise/knowledge to innovation adoption of campus decision makers and scientists, innovation users' acceptance and the conflicting logics of campus decision makers (as innovation-adopters) and scientists (as innovation-providers) in time orientation, type of involvement, working practices and risk expectations (Table 2).

In campus decision makers' opinion, to overcome individual-related barriers, the adoption of internal campus innovations should be perceived as an *'opportunity coalition'* 2:1. This, however, frequently requires effort from scientists. *'They have to promote their own projects to show what opportunities there are and how we can cooperate'* 10:35. Additionally, the long-term investment in interactions based on a mutual understanding of different logics is needed. It requires, as campus decision makers emphasized, *'to put the effort'* 6:10 and a focus on face-to-face *'personal contacts'* 1:44 between *'people who want to do things on campus'* 2:23, initiated through personal referral and sustained by repeated interactions, overlapping personal and professional relationships. At some universities, it has been overcome by active involvement of *'both sides from the beginning'* 6:1 and/or campus decision makers in the innovation process as *'testers giving feedback'* 6:19. The recurrent interaction of campus decision makers with academics gave a deeper understanding of the working methods and the knowledge produced. The frequent

TABLE 2 Examples of individual-related barriers to the adoption of internal campus innovations according to campus decision makers

Barrier	Description and quotations
Attitude and lack of expertise/knowledge of campus decision makers and scientists	<p>Campus decision makers reported preferring innovations that <i>'come from consultants, not really from our own people'</i> 11:3; <i>'We do not really want to test new things in our buildings'</i> 11:1</p> <p>They were also unaware or had little knowledge about <i>'what happens in every faculty'</i> 5:21</p> <p>In turn, scientists were seen as not showing initiative <i>'we don't also frequently get questions from the research side'</i> 12:12. They also often <i>'do not take all aspects into consideration'</i> 9:49</p>
Innovation users' acceptance	Campus decision makers emphasized that the innovation adoption should not lead to the situation that <i>'nobody used it'</i> 10:6
Conflicting logics of campus decision makers and scientists	<p>Time orientation</p> <p>Campus decision makers often concentrated on providing short-term or medium outputs: <i>'normally we do not have the time that the scientists have'</i> 13:12; <i>'at the operation side we mostly want to go faster'</i> 2:12</p> <p>Scientists' logic was perceived as primarily long-term: <i>'a scientist can (...) put the process on pause'</i> 1:48; <i>'the agenda of the research program does not match in terms of time'</i> 4:21</p>
	<p>Type of involvement</p> <p>Campus decision makers were more interested in providing results or solutions to concrete problems: <i>'we are very practical'</i> 3:17; finding the <i>'balance between facilitating research, education and valorization'</i> 8:24; <i>'constantly looking for improvements'</i> 1:21; <i>'helping and supporting research and education'</i> 6:20; concentrating on <i>'secondary processes'</i> 9:47; <i>'applied research'</i> 3:31, 11:19</p> <p>Scientists were seen as opting for more theoretical knowledge and focusing on <i>'primary processes'</i> 9:47, 12:23; <i>'fundamental research'</i> 3:31, 11:19</p>
	<p>Working practices</p> <p>Campus decision makers' decisions were formed on strict project plans and integrated four university perspectives: <i>'managers want to optimize ten things at the same time'</i> 1:11; <i>'as a facilitator you end up on a fence (drawn to two sides)'</i> 8:4; <i>'people do not see how complex the decisions we need to take are, also it is hard to satisfy all stakeholders'</i> 8:18; <i>'need to connect the science and the practical part'</i> 9:24</p> <p>In turn, scientists were perceived as the ones who: <i>'want to maximize one thing'</i> 1:11; can <i>'research the null hypothesis'</i> 1:7; <i>'have ground-breaking ideas but as operations, we cannot always accommodate'</i> 9:24</p> <p>Academic freedom and autonomy in research were highly valued by them, however: <i>'it often is not applicable enough for real life. Not feasible enough sometimes'</i> 7:7</p>
	<p>Risk expectancy</p> <p>Campus decision makers mostly provided low-risk deliverables: <i>'we don't integrate not proven technology'</i> 8:15; <i>'contractually we cannot install things that are not approved—the risk is too high'</i> 8:44; <i>'I think we are quite innovative, but cautious with new concepts in buildings that are not proven'</i> 11:8</p> <p><i>'the ideas were so innovative that we could not implement them in our campus development'</i> 8:17</p> <p>In turn, scientists, although pursuing a risky direction in their research, were also seen as fearing <i>'losing reputation'</i> 6:31, because <i>'innovation on campus is always very visible, to everyone, (...) everyone can observe and judge it'</i> 8:16</p>

meetings and deliberations with scientists contributed to changing the campus decision makers' attitudes. As campus decision makers from one of the universities highlighted, to mitigate differences in risk expectations it is also important to assume that *'when you allow people to experiment you have to keep in mind that failure is an option'* 2:10. Such an approach will reduce the scientists' fear of losing reputation. Consequently, scientists will not be forced to validate innovations elsewhere and will more likely choose their own campus as test ground.

4.3.2 | Organizational barriers

The organizational barriers to the adoption of internal campus innovations identified through the content analysis entail three main categories: ineffective administration of process activities, lack of funds and/or their unavailability at one time and the university nature. Ineffective administration was mainly caused by the lack of formalization and incentives, role fading and intra-organizational coordination.

The lack of formalization was linked with no implementation of adoption policy, including extra incentives as *'for many people, it would be something extra to do apart from their main job'* 3:13. The role fading was related to the lack of a clear division of responsibility, which *'leads to endless discussions about who takes ownership'* 8:48, and *'(...) takes control over the ambition of the innovation'* 10:29. In turn, the lack of intra-organizational coordination was explained as a shortage of staff (called by the interviewees, *'portfolio manager'* 2:19, *'location manager'* 6:21 or *'knowledge broker'* 12:33, 11:18) responsible for the knowledge transfer between scientists and campus decision makers.

Besides ineffective administration, the next obstacle was the lack of funds and/or their unavailability at the same time (asynchronicity), namely *'mixing of money flow'* 4:22 and *'simultaneous application for subsidization'* 10:8. Moreover, it was stated that the *'research grant may fail'* 7:32 or *'the subsidy can be gone'* 6:27.

The barrier was also noticed in the universities' nature. It was argued that the adoption of internal campus innovations is the specificity of *'universities of technology'* 2:42, and *'universities of applied science'* 1:16, and not of comprehensive universities *'focusing on fundamental research'* 2:30.

To overcome organizational barriers, campus decision makers (from all types of universities) highlighted the need for the application of a clear policy framework for the adoption of campus innovations and the employment of a person who will connect both sides. Those practices were perceived as effective and facilitating the knowledge conversion and translation of scientists' results to the context of campus decision makers and vice versa.

As a solution to the lack of funds and/or asynchronicity in funds, campus decision makers emphasized the necessity to *'find the match in the project planning and the budgets, and combining this with the research ambitions'* 10:7. In turn, to overcome the barrier that lied in the universities' nature, they pleaded for the adoption of *'small research projects'* 3:21, mostly in collaboration with other universities and/or other triple-helix partners.

4.3.3 | Innovation-characteristics barriers

The innovation-characteristics barriers include five categories: lack of relative advantage, immaturity, lack of compatibility, innovations-space availability mismatch and insufficient innovation observability.

According to the research results, the undesirable feature of internal campus innovations was the lack of relative advantage measured in the context of the university's stated goals. As it was mentioned: *'we need to find the added value'* 1:49 to adopt innovations. Apart from being useful for individual scientists (as their creators), they should not lead to a situation when *'no one knows why it was implemented'* 3:15.

Another barrier was the immaturity of campus innovations equated with a very low technology readiness level, or technology still in a primary stage of development. Not all internal campus innovations were applicable in a real environment and validated with campus users. The innovations produced by scientists should be mature enough, and safe for their users. As it was highlighted *'we don't integrate not proven technology'* 8:52 or *'this is not*

tested yet, so we cannot use it' 6:15. Moreover, the campus innovations cannot be adopted at the cost of functionality, be too distracting for the users or have a negative effect on the university's image: *'innovation on campus is always very visible, to everyone, everyone can observe and judge it'* 8:16.

The successful adoption of internal campus innovations depended also on whether it could be adjusted to the campus context. Here, the obstacles stemmed from the lack of compatibility. As was stated, campus innovations that *'hindered normal operations were not facilitated'* 7:33. It was explained that innovation adoption *'(...) did not work because (...) of what we would have to do with our maintenance plans'* 4:24.

The innovations-space availability mismatch was the next barrier. In some cases, a part of the land or building (as space or façade), in others, an entire building or campus was required. For instance, there was *'not enough space to experiment'* 8:47; *'there is no building available for implementation'* 10:43, or possibility to *'roll out on the larger campus'* 9:51. Another problem was to provide space on time (or fast enough) for the scientists. The campus decision makers were unable to *'provide space immediately'* 6:29.

The internal campus innovations which were not clearly visible on campus (serving as an exhibition) to various stakeholders were also unwillingly accepted. The insufficient observability (result-demonstrability) of innovations caused *'hard time displaying this to the outside world'* 1:22 and university could not become a *'showcase of what [it is] doing (...)'* 12:17.

To overcome the barriers related to innovation-characteristics, some campus decision makers started to adopt internal campus innovations that would enable them to gain additional value such as regional or international recognition. Others (especially representing comprehensive universities) to avoid or reduce the risk associated with the innovation immaturity adopted simple, safe or smaller-scale products (namely solar panels, indoor navigation systems, vegetarian meat alternatives) or involved in prior testing in a simulated environment or in a limited space serving as a living laboratory at campus. There were also such campus decision makers (from universities of technology) that encouraged partnerships with various companies when there was a need for professional industry design or construction so that internal campus innovations would not negatively affect campus aesthetics.

5 | DISCUSSION

The results of the research show that the campus decision makers are increasingly expected to adopt internal campus innovations. Among them, there are not only educational and operational ones (like in the case of external campus innovations), but also linked with social context. Their adoption drivers extend beyond drivers of external campus innovations they have dealt with before and which have been presented so far in the literature in each of the four university perspectives (Table 3).

The adoption of internal campus innovations is not only driven by the need to deliver a 'state-of-the-art campus' (as in the case of external campus innovations) but is also intended to enable campus innovations

TABLE 3 Drivers of adopting external and internal campus innovations

Drivers from university perspective	Overlapping drivers of adopting external and internal campus innovations (based on literature review and research results respectively)	Additional drivers of adopting internal campus innovations (based on research results)
Functional	<ul style="list-style-type: none"> users' productivity and well-being 	<ul style="list-style-type: none"> innovation co-creation stimulation
Organizational	<ul style="list-style-type: none"> competitive advantage 	<ul style="list-style-type: none"> collaborative partnership
Financial	<ul style="list-style-type: none"> profitability 	<ul style="list-style-type: none"> transparency and accountability (campus as an 'exhibition')
Physical	<ul style="list-style-type: none"> campus sustainable development 	<ul style="list-style-type: none"> local/regional development contribution

development and to contribute to the shifting focus of campus management from university performance only to an impact on society. It allows scientists to transform from being exclusively users of external campus innovations to co-creators of internal campus innovations (various types: educational, operational, social) that are adopted on campus as well. This is particularly important for a smooth shift of promising innovative ideas (solutions of real problems) from the basic research to the next stages of innovation development, and consequently to utilize research outcomes in practice. Additionally, the adoption of internal campus innovations (especially social ones) may lead to the creation of a collaborative partnership between triple- or even quadruple-helix partners and fill the gap between the outside world and universities. It may allow the latter to legitimize themselves as campus innovations engines and become agents of local and regional change, in line with higher education policy assumptions.

Campus decision makers planning to adopt internal campus innovations, however, need not only to overcome the barriers overlapping with the external campus innovations (described in the literature), but also additional ones in each of the four university perspectives (Table 4).

Among the individual-related barriers, the unique ones applying to the adoption of internal campus innovations result mainly from the additional roles of scientists. They may be embedded in academics' attitude, their lack of expertise/knowledge in innovation adoption and interaction with campus decision makers as they can become providers of internal campus innovations, from being external campus innovations users only. These may be a particular challenge for comprehensive universities with scientists that represent many disciplines such as the humanities, social sciences, natural sciences, life sciences, and who are not perceived by campus decision makers as typical providers of internal campus innovations. To address those barriers, long-term investment in interactions with academics is needed and a deeper understanding of their logic.

TABLE 4 Barriers to the adoption of external and internal campus innovations

Barriers from university perspective	Overlapping barriers to the adoption of external and internal campus innovations (based on literature review and research results respectively)	Additional barriers to the adoption of internal campus innovations (based on research results)
Individual-related barriers linked to functional perspective	<ul style="list-style-type: none"> attitudes and lack of expertise/knowledge of <i>campus decision makers</i> innovation users' acceptance 	<ul style="list-style-type: none"> attitudes and lack of expertise/knowledge of <i>scientists</i> conflicting logics between campus decision makers (innovation-adopters) and scientists (innovation-providers)
Organizational barriers linked to organizational perspective	<ul style="list-style-type: none"> ineffective administration: lack of incentives 	<ul style="list-style-type: none"> ineffective administration: lack of formalization, role fading and intra-organizational coordination by 'portfolio manager/location manager/knowledge broker' nature of universities (comprehensive, technology, specialist)
Financial perspective	<ul style="list-style-type: none"> lack of financial resources 	<ul style="list-style-type: none"> unavailability of funds at the same time (asynchronicity)
Innovation-characteristics barriers linked to physical perspective	<ul style="list-style-type: none"> lack of or low relative advantage lack of compatibility insufficient innovation observability 	<ul style="list-style-type: none"> immaturity (not proven technology) innovations-space availability mismatch

Regarding organizational barriers, the ones that exclusively apply to the adoption of internal campus innovations mainly stem from the lack of regulation of the new relationship between campus decision makers and scientists, the university's nature (their scientists' ability to create innovation that is ready for on-campus adoption, which can be a particular challenge for comprehensive universities, whose research is less application-oriented), as well as the need for a simultaneous application for funds (notably in universities of technology, where capital-intensive innovations are often developed).

The ways to overcome them should be determined on several levels. The policy framework for adoption of campus innovations should be deployed that includes the achievement of desired university goals, the structure and capacity of scientists, the incentive structure for both the campus decision makers and scientists, as well as the formalized description of their roles, and the rules of funds allocation. University managers (e.g., rector, provost, vice-rectors) should be responsible for its guiding so that adoption of internal campus innovations would not be only a choice of campus decision makers. Additionally, a wide range of systemic solutions, a communication platform and the organization of cyclical events at the university should be implemented to promote the adoption of internal campus innovations.

For barriers related to innovation-characteristics, the unique ones originate in the specificity of internal campus innovations, as the supply-pushed. A particular obstacle for their adoption may be innovation immaturity and the lack of space for their adoption. To break down the former, universities can introduce various materialization spaces and living labs to enable innovation development, which may be especially important for comprehensive universities that usually do not have as many as universities of technology and specialized universities. In turn, to address the latter, campus decision makers' cooperation with local government and other universities can be strengthened in order to extend the adoption practices beyond campus boundaries.

6 | CONCLUSIONS

This paper has reported unique drivers and barriers to the adoption of internal campus innovations (in comparison to external campus innovations) and ways to overcome them based on the example of Dutch research-intensive universities. The study was designed to expand existing theory on innovation within a campus environment from a managerial point of view, as the literature has so far focused on external campus innovations and scientists' point of view. Researchers might find the results a useful contribution to the scientific debate on the involvement of universities in third-stream activities. In turn, for campus decision makers, they can be used as a foundation for evidence-based management.

However, several limitations of the current research should be acknowledged. Although the choice of major categories of drivers and barriers to the adoption of internal campus innovations was guided by prior theory and research on external campus innovations, the strategy of using existing categories could limit the range of factors available for analysis. Furthermore, the sample was limited in its representation to campus decision makers. The scientists' perspective is almost wholly lacking, apart from being seen through the eyes of involved interviewees. Finally, the research was carried out in research-intensive universities from only one country and different or additional factors might prove to be relevant in other university settings.

Future studies to expand the analysis can draw on various methods. While qualitative research seems particularly promising for developing a comprehensive understanding of the adoption of internal campus innovations, standardized instruments such as surveys could be useful in generating a more representative picture of this phenomenon. Overall, it would be valuable to consider exploring parallelly the perspectives of both sides on the adoption of internal campus innovations. This might provide new insights and stronger evidence based on observations and experiences. Additionally, future work can focus on universities from other countries as there may be important cross-national differences at an institutional level that will influence the adoption of internal campus innovations. Finally, perhaps in the future, the research may be extended to include detailed drivers and barriers

to various types of internal campus innovations (products, services, and/or technologies) when universities start to practice what they preach on a large scale.

AUTHOR CONTRIBUTIONS

Małgorzata Rymarzak: Conceptualization; Investigation; Writing - original draft; Methodology; Visualization; Writing - review & editing; Formal analysis; Project administration; Validation; Data curation; Resources. **Alexandra den Heijer:** Conceptualization; Investigation; Funding acquisition; Writing - review & editing; Supervision; Methodology; Validation; Resources. **Monique Arkesteijn:** Conceptualization; Investigation; Funding acquisition; Writing - review & editing; Supervision; Resources. **Mathilda Du Preez:** Writing - review & editing; Software; Validation; Formal analysis.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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The data that support the findings of this study are available on request from the authors. The data are not publicly available due to privacy or ethical restrictions.

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APPENDIX A

Interviews about the adoption of internal campus innovations

University type	University (n = 13)	Interview date (Oct 2020–Jan 2021)	Number of interviewees (n = 30)
Comprehensive	Radboud University	9.10.2020	1
	Erasmus University	29.10.2020	2
	Utrecht University	3.11.2020	7
	Tilburg University	4.11.2020	2
	Maastricht University	26.11.2020	1
	University of Groningen	27.11.2020	2
	Leiden University	3.12.2020	1
	University of Amsterdam	9.12.2020	5
	VU Amsterdam	29.01.2021	2
Technology	Twente University	30.10.2020	2
	TU Eindhoven	21.10.2020	2
	TU Delft	10.12.2020	1
Specialised	Wageningen University	4.12.2020	2