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ORIGINAL PAPER

Enabling educational innovation through complexity leadership? Perspectives from four Dutch universities

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Abstract
Leadership in higher can influence the structurally embedding of educational technologies in higher education institutions. However, HEIs are complex pluralistic organizational environments with loosely coupled systems, diffused power and goal ambiguity which makes governance of educational innovations a wicked problem in which they have to balance dynamic complex interactions while also setting out a clear vision and enacting this vision towards organizational goals. This paper analyses four qualitative case studies with a focus on the choices made by leaders in four Dutch universities that aim to contribute to organisational educational innovation. We investigated the data through the lens of complexity leadership theory in which three types of leadership play an important role: administrative leadership (i.e. top-down oriented), adaptive leadership (i.e. bottom-up oriented) and enabling leadership that emerges as a leadership type between administrative and adaptive leadership and contributes to governing innovation in complex environments. This study sheds light on how, in the case of HEIs as complex environments, leaders made strategic choices and followed up on them to enable the innovative potential of the organisation.

Keywords Higher education · Educational innovation · Leadership · Strategy

Introduction

Over the years higher education institutions (HEIs) have faced major changes, affecting the way they govern education, research and organisation. The use of technology-enhanced educational innovations has become of strategic importance within higher education institutions in order to deal with a growing student population in this changing environment (De Boer et al., 2002; Pucciarelli & Kaplan, 2016). Therefore, higher education institutions are now also challenged to focus on a more structural integration of educational innovations in their educational delivery and support processes. Although it is found that change in HEIs is slow and not radical, those institutions that have a clear view on their mission with learning technology adapted to needs of various target groups, demonstrate higher

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levels of use of learning technology (Collis & van der Wende, 2002). Thus, the way in which a university formulates and follows up on a strategy for (technology-enhanced) educational innovation can have an important impact on the effectiveness of it (Timmis, 2003).

A strategy can be seen as an instrument to steer the internal processes of the institution in a certain direction and give guidance towards tactical and operational activities and can be regarded as an important tool for leaders in organisations to communicate the main themes and topics that are central to a university's governance. However, several studies have called attention to difficulties with top-down strategies that are based solely on traditional leadership views (Birch & Burnett, 2009; de Freitas & Oliver, 2005; Marshall, 2010). The consensus in the literature is that leaders who develop strategies need to consider stakeholders at all levels to ensure its contribution to the long-term implementation of educational innovations (Backhouse, 2013; Ng'ambi & Bozalek, 2013). Earlier accounts of leadership have largely failed to acknowledge that leadership is not merely the influential act of an individual but rather is embedded in a complex interplay of numerous interacting forces. Complexity leadership theory (CLT) focuses on leadership in contexts of dynamically changing networks of informally interacting agents. The basic assumption in this theory is straightforward: Under complex conditions of knowledge production, learning and innovation leaders should enable, rather than suppress or align, informal network dynamics. In other words, CLT focuses on emergent processes within complex systems and suggests that leadership at all levels is process-oriented, contextual, and interactive (Marion & Uhl-Bien, 2001).

In the following section we introduce CLT as a theoretical background that guided this study. We then introduce our methodology and report on the results. The main part of this paper is focussed on a qualitative analysis of four case studies. We conclude with implications of our findings for research and practice.

Theoretical background

Complexity leadership involves the study of social interactions at multiple levels and their effects on innovation and emergent outcomes. One area in which complexity leadership has shown scientific evidence for successful organizational change is in innovation (Lichtenstein et al., 2006). A series of research studies conducted from 2007 to 2015 across 30 complex organizations found evidence that these pressures within a system create innovation and adaptation, which are important when organizations are going through change (Arena & Uhl-Bien, 2016). Complexity leadership behaviours have also been shown to improve team performance, increase the ability of the organization to adapt and innovate, and promote quality outcomes (Shipton et al., 2008; Uhl-Bien & Marion, 2009).

These three roles reflect a dynamic relationship between the bureaucratic functions of the organization (i.e. administrative system) and emergent dynamics of complex systems (i.e. entrepreneurial system) that together can enable innovation and creative capacity (i.e. adaptive system). The relatedness among these leadership roles can be seen in Fig. 1.

Complexity leadership means giving room to change and innovation, and harnessing the results of the natural interactions that take place in organizations. Although complexity leadership theory is a systems theory, the leadership component itself still plays an important role: whenever an event takes place and people react and adapt to it, innovation and creativity can take place. In order to facilitate this, leaders must nonetheless enable this environment within a complex system and a formal structure. Therefore, the main research

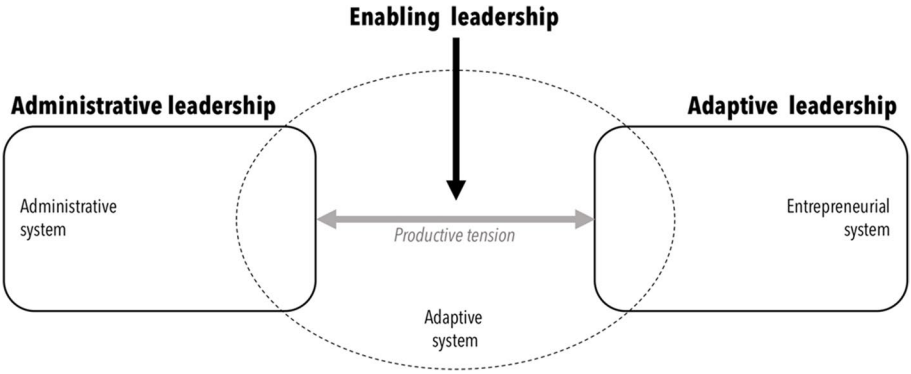

Fig. 1 The relatedness of the three leadership roles of complexity leadership theory (adapted from: Uhl-Bien et al., 2007)

question in this study is: *How do leaders inside HEIs balance top-down coordination (administrative leadership) and bottom-up informal emergence (adaptive leadership) in order to enable innovative capacity (enabling leadership)?*

The conceptual framework behind this theory includes three interwoven leadership roles: *administrative leadership, adaptive leadership* and *enabling leadership* (see Table 1). We will distinguish between these roles because we assume that the capacity to enable educational innovation will be reflected in the balance and synergies between the three leadership roles. This assumes that HEIs can be regarded as complex environments and that they want to foster knowledge creation, learning and innovation of education. We therefore formulated three sub-research questions to answer our main research question.

Administrative leadership requires a strategic direction (i.e. purpose, strategy, goals, planning) and a clear structure of the organization (i.e. processes, coordination and governance) in which work is carried out independently and in collaboration in the so-called administrative system of the organisation. Administrative leadership is similar to forms of

Table 1 The three leadership roles of complexity leadership theory (adapted from: Uhl-Bien et al., 2007)

Leadership role	Description
Administrative leadership	– Top-down oriented – Formal with set patterns – Planning and coordination towards outcomes – Efficiency and effectiveness – Focuses on alignment and control – Represented by hierarchical and bureaucratic functions
Adaptive leadership	– Bottom-up oriented – Informal and emergent – Adaptive, creative learning actions that emerge from the actions of multiple agents in the organisation
Enabling leadership	– Top-down catalyst for optimal conditions for bottom-up adaptive capacity – Leads entanglement between bureaucratic (i.e. administrative) and emergent (i.e. adaptive) forms of leadership

hierarchical leadership, and often top-down oriented and focussed on alignment, effectiveness and efficiency that require a degree of order to be sustained. In the context of CLT, administrative leadership has the goal to positively influence the capacity for creativity, learning and adaptability of the organization (Uhl-Bien et al., 2007). Our first sub-research question following from this role is: *In what way did leaders of HEIs make administrative leadership choices and perform actions towards educational innovation that are related to formal organisational structures and strategic direction?*

Adaptive leadership has the aim to create the circumstances that are required for new ideas, initiatives and experiments in a safe and learning environment. These arise often bottom-up from the informal dynamic interactions between employees in collaboration with for example customers or stakeholders in the so-called entrepreneurial system of the organisation. Adaptive leadership emerges from interpersonal dynamics and conflicts and leads to alliances of peoples, ideas, knowledge levels etc. (Uhl-Bien et al., 2007). In adaptive leadership, there needs to be the awareness that the changes and innovations often represent a challenge for the organization and are only of value when they are embraced by the organization.

Our second sub-research question following from this role is: *In what way did leaders of HEIs make adaptive leadership choices and perform actions towards educational innovation that are related to informal dynamic interactions inside their HEIs and its entrepreneurial system?*

Enabling leadership is focussed on facilitating innovation in the organization. Mainly, this is about connecting change and innovation (i.e. entrepreneurial system) to the operations of the organization (i.e. administrative system). This is done on the basis of self-organization and emergence in the so-called adaptive space (Uhl-Bien & Arena, 2018). In other words, enabling leadership is needed to ensure that bottom-up and top-down forms of leadership become "intertwined" in beneficial ways (Uhl-Bien & Marion, 2009). While administrative leadership is focusing on the top-down strategic decisions for CLT and adaptive leadership is focusing on bottom-up dynamics, enabling leadership serves as a middle-ground to create the conditions in which the different goals of CLT can emerge. It suggests a capacity to pull together the divergent forces inherent to pluralistic organizations such as HEIs (Lusiani & Langley, 2019). Our third sub-research question following from this role is: *In what way did leaders of HEIs make enabling leadership choices and perform actions towards educational innovation that are related to balancing between administrative and adaptive capacities inside their HEIs?*

Methods

Participants

Our sample consisted of leaders of Dutch HEIs who were selected through purposeful sampling. Contrasting to quantitative research designs that use random or probability sampling in order to generalise data from the sample to a population, qualitative research intentionally seeks those individuals or sites that can best speak to the research problem being investigated (Creswell & Poth, 2018). Since this research problem addressed in this paper is focussed on leadership inside HEIs related to educational innovation, the sample that resulted from our sampling strategy was fitting for our research question, namely, leaders of publicly funded Dutch universities that can be regarded as complex environments

in which they strive for knowledge creation, learning and innovation. In identifying and recruiting the participants, convenience sampling was used additionally. The reason for selecting this sample through convenience sampling was that the research team had close connections to these vice-rectors because of the bridging role the department plays for universities in the region. Since leaders of HEIs often have full schedules and are not easily available, we made use of the existing collaborations and connections. Additionally, this sample concerns four very fundamentally different institutions with different focus areas, different staff demographics and student populations as well as the type (content wise) and kind (delivery wise) of education that is delivered. This makes it interesting to examine the differences in their approach towards innovation.

Procedure

In this study we applied a qualitative exploratory approach and used case-study methodology in order to collect and analyse our data. By using this qualitative mode of inquiry, we aimed to enrich our understanding of structural embeddedness of technology-enhanced educational innovations as it allowed us to do research in depth and generate information-rich and detailed data. According to Yin (2018), a case-study is an appropriate research approach when human activity is embedded in the real world and can only be studied or understood in its context, and where it is difficult to distinguish context and organisation. The current study is suited to case-study research because one of its primary aims is to build an understanding of the role of leadership and governance of educational innovation in a complex setting which requires a rich collection and analysis of data.

The main sources of data in this study were collected through conducting semi-structured interviews with four vice-rectors located across four publicly funded universities in the Netherland. All vice-rectors have confirmed their informed consent and agreed to be possibly identified via the published article. Interviews are a key source of in-depth and detailed material, and it helps the researcher in becoming physically and psychologically closer to the phenomena under study (Tellis, 1997). All the interviews were conducted face to face and lasted between 30 and 90 min. All the interviews were recorded and transcribed verbatim by the research team in person; therefore, the understanding of the data is apt. The interview transcripts and were uploaded into Atlas.ti and coded in two rounds.

In round one we used an open coding approach to code every part that we considered as an action or initiative of leadership to get an overview of the total inventory of leadership and governance behaviours, initiatives and actions. After this first round of open coding, we deductively applied categories stemming from our CLT framework in a two-step manner. In the primary step we distinguished between the two categories of leadership roles that are at the opposite sides of the CLT relational overview: administrative leadership (i.e. C1) and adaptive leadership (i.e. C2). In the secondary step we coded enabling leadership by distinguishing two codes to identify bottom-up to top-down processes (i.e. C3) and conversely also top-down to bottom-up processes (i.e. C4). This secondary step in the coding process was created to capture the dynamic interplay and direction of actions that were observed in the data. For C3 we used the definition that the initiative or action coded needs to originate from a top-down level, but is resting on actors or structures that are not placed or located at that same level. For C4 we used the definition that the initiative or action needed to be originating based on bottom-up level actors or actions, and builds towards connecting to a top-down idea or notion. In both cases, for C3 and C4 we are thus looking at boundary-crossing aspects, yet make a distinction between the origin and direction. If

Table 2 Coding scheme

Category	Codes
Administrative leadership	C1 Top-down
Adaptive leadership	C2 Bottom-up
Enabling leadership	C3 T-B Catalyst C4 B-T Catalyst

Table 3 Overview of general characteristics of the institutional sample

Organisation/HEI	Anno Natalis	Number of faculties	Number of staff (2019)	Bachelor & master programs (2019)
A) Erasmus University	1913	7	3398 in numbers 2591 in fte	31 BSc 76 MSc
B) Leiden University	1575	7	7100 in numbers 4408 in fte	47 BSc 78 MSc
C) Open Universiteit Nederland	1984	6	671 in numbers 562 in fte	26 BSc 24 MSc
D) Technical University Delft	1842	8	6072 in numbers 5383 in fte	16 BSc 33 MSc

we did not make this distinction between C3 and C4 the view on this boundary-crossing leadership category would lose nuance in the dynamic and directional sense. An overview of coding categories and the codes can be found in Tables 2, 3.

Results

In Table 4, 5, 6, and 7 we summarise the findings by charting the interview data. The aim of this paper was to investigate how leaders of HEIs balance top-down coordination (i.e. administrative leadership) and bottom-up informal emergence (i.e. adaptive leadership) in order to enable innovative capacity (i.e. enabling leadership). We will first discuss a general overview of our results and consequently we will focus on our sub questions that we will answer per HEI separately. The answer to our main research question, where the findings from our sub questions and thus separate HEIs come together, will be addressed in the discussion part of this paper.

University A: top-down transformation through bottom-up impact

In university A (see Table 4), the vice-rector described several choices that reflected administrative leadership. A central example of an administrative leadership choice is that the mission of their university was established from the top-down, yet based on that mission a strategy was build which is inherently bottom-up oriented. Although this sounds contradictory, this institution made the deliberate choice to take a value as their main mission that draws upon the bottom-up networks, connections, initiatives and actors inside and also around (i.e. local stakeholders and networks) the organisation. This mission: 'impact at the core' is the

Table 4 Charting of interview data university A

Administrative leadership	Enabling leadership		Adaptive leadership
C1 Top-down	C2 T-B Catalyst	C3 B-T Catalyst	C4 Bottom-up
Core university mission - Pursuing core tasks of the university: research innovation & teaching - Creating university wide programmes	- Complementing all core tasks with: impact - University wide programme "Impact at the core" - Educational quality requirements adapted to core task impact	- Strategy design labs (students, staff faculty, externals) input for future strategy and 'impact at the core' - Experimental space (EX): - Out-of-the-box creation of educational innovation - Experimentation without formal requirements	
- Formally interweaving connecting educational programmes with partnerships in the region into the curriculum - Gear student administration and scheduling to cross-faculty collaborations	**Community of Learning & Innovation** - A set place/space for university wide development of educational innovation & development - Support on the innovation cycle (i.e. design, start, end, evaluation) - Multidisciplinary educational program requirements vs. traditional / silo's - Inter faculty collaborations - Double degree programs - Honours programmes - Connecting faculty leaders with industry leaders in set meetings	- Encourage educational/learning activities that connect learning with practice and real-world problems - Facilitate a place for creation and experimentation for students	**Outside in approach** - Tapping into local region and connections abroad - Tapping into societal requirements - Incremental change by looking for connections through start-ups
- Having patience with change inside HEIs (i.e. expect 10–15 years for organisation wide changes)	- Take local good/best practices into faculty board meetings across the organisation - Facilitate by making use of university wide programs to connect activities and practices of ambassadors to & create new ideas for programs based on bottom-up ambassador activities	**Create ambassadors** - Facilitate grassroot collaborative cross-faculty projects (staff oriented) - Facilitate organisation-student pairing in assignments (student oriented)	**Coalition of the willing** - Build upon the people that are already motivated and active - Snowball effect among staff inspiring each other

Table 4 (continued)

Administrative leadership	Enabling leadership		Adaptive leadership
C1 Top-down	C2 T-B Catalyst	C3 B-T Catalyst	C4 Bottom-up
Facilitation not forcing - Support structures for staff towards educational innovation - Incentive structures - Corporate communication: putting exemplars in the spotlight - Formal UFO profiles vs. recognition and awards VSNU programme **Additional funding** - invest the additional funds from OCW quality agreements directly into university quality improvements on education (including bottom-up initiatives and activities)			

Table 5 Charting of interview data university B

Administrative leadership	Enabling leadership		Adaptive leadership
C1 Top-down	C2 T-B Catalyst	C3 B-T Catalyst	C4 Bottom-up
Formulation of educational strategy based on bottom-up vision formulation - Formulation of 8 didactical pillars that forms strategy **Corporate communication of vision & strategy** - Dedicated communication team - Corporate communication and marketing (i.e. website, promotion materials) - Following up on bottom-up formulation by having a 'roadshow'	**Autonomy of faculties to choose strategic focus** - Choose one of 8 strategy pillars - Adapted to needs of faculty - Adapted to educational innovation maturity **Internal call for proposals educational innovation** - Stimulate motivated staff - Enforce bottom-up ideas with funds	**Bottom-up vision formulation on educational innovation** - Involvement scientific staff - Involvement students - Involvement support staff	
		No strict performance criteria or KPI's - Any activity on educational renewal and innovation is regarded as positive development - Only measurable and traditional outcomes not enough (i.e. grades, evaluations, graduation numbers) **Stimulation through connection events** - Highlighting best-practices - Peer enforcement of enthusiasm	**Defining of performance indicators from the bottom-up as ongoing process** - Doing justice to heterogeneity of faculties - Accounting for tailored definitions of innovation success

Table 5 (continued)

Administrative leadership	Enabling leadership		Adaptive leadership
C1 Top-down	C2 T-B Catalyst	C3 B-T Catalyst	C4 Bottom-up
Additional funding - invest the additional funds from OCW quality agreements directly into university quality improvements on education (including bottom-up initiatives and activities) - Coordination top-down	**Investment in central support** - ICT and technical tools for education - Centre for innovation (i.e. university wide teaching support centre) - Using central facilities as think tanks for out-of-the-box educational innovations **Investment in local support** - Faculty coordinators especially appointed - Local creation of technical facilities (i.e. studio's etc.)		

Table 6 Charting of interview data university C

Administrative leadership	Enabling leadership		Adaptive leadership
C1 Top-down	C2 T-B Catalyst	C3 B-T Catalyst	C4 Bottom-up
Educational purpose obliged by law - Focus on digitisation and flexibilization - Legal task: education delivery - Client (i.e. students) evaluation is leading for steering educational innovation - Recruitment of staff also adapted towards this educational task of the organisation			
Societal demands decide on the relevance of educational innovation and disciplines in the university - Students - Society and labour market **Disruptive innovation in higher education sector** - Focus on clients and markets - Client journey: facilitating students to increase access	**Student need driven educational innovation development** - Catering to student wishes and needs - Service orientation **Products for new markets & target groups (non BaMa)** - Lifelong learning - Post-graduate professional degrees - Short learning programmes		
Top-down strategy and direction is leading - Decisions taken only from top-down - Initiatives from bottom-up disturb strategic focus - University size (i.e. staff & funding) too small for distractions on strategic level	**Scaling up technologies top-down driven** - No grassroot bottom-up initiatives - Control over focus and direction of innovations **Focus on showcasing educational products as innovation** - LMS integrated with student instruction and teaching - Educational resources as innovation signalling - Online activation as trademark **Experimentation & bottom-up initiatives as risk** - Unexpected costs of experimental pilots - Scaling-up difficulties - Uncontrollable single person initiatives not supported (non-compliancy & risk avoidance) - University size too small for uncoordinated bottom-up innovation **Support centrally organised** - Support center for all faculties - Educational advisory		

Table 7 Charting of interview data university D

Administrative leadership	Enabling leadership		Adaptive leadership
C1 Top-down	C2 T-B Catalyst	C3 B-T Catalyst	C4 Bottom-up
Strategic emphasis on open online education development - Decision made top-down - Disrupting traditional views on education	**Open online education support organisation wide** - Technical support - Teaching and learning center - Didactical support **Experimentation in line with open online education** - Open online education as innovation pathway - Other bottom-up initiatives less supported	**Campus as driving force of educational innovation** - Benefitting from online educational innovation to increase value offline - Putting more value to teachers and staff on campus - Different value proposition for the campus in spectrum of technology enhanced online education - Campus students are key in deciding what the value of educational innovation is	
Riding the wave of disruptive global educational innovations - Global trend on open online education and MOOCs as disruptive force - Drive out-of the box thinking about education	**Outside-in innovation through MOOCs** - Education innovation acceleration - Exposure effect (i.e. global success and visibility) motivates on-campus teachers	**Opening up the minds of teachers** - New ways of teaching in MOOCs spark new ideas on educational resources - New media and technology encouraged through MOOCs - Making sense of new concepts of teaching, learning and instruction - Blended learning - Flipped classroom	**Create a trial-and-error mentality on education** - Research mindset trial and error translated to teaching
Ownership of direction - Top-down boundaries and direction are set out - Creating value for organisation		**Culture change** - Internal recognition for educational innovation - Teaching lab for peer interactions among teachers - Create an internal sense of community **Teaching fellowships** - Spotlighting ambassadors - Incentivised with funding	**Ownership of teaching** - Scientific staff 'owns' education - Owners should be able to decide direction on their own teaching - Top-down facilitation over control - Room for failure

driver for bottom-up actions. And by making it a core value from the top-down the leader ensures that this value is something that is strived for at all levels of the organisation. This is supported by other administrative leadership choices for example with the creation of several initiatives such as the establishment of university-wide programs that embody this value by formally interweaving connecting educational programmes with partnerships in the region into the curriculum and by gearing student administration and scheduling to cross-faculty collaborations. Additionally, there are formal support and incentive structures for staff for educational innovation and the adaptation of formal UFO profiles (i.e. formal job descriptions according to Dutch labour law in higher education) towards new definitions of recognition and awards are prioritised (VSNU, FNU, KNAW, NWO & ZonMw, 2019).

With regard to enabling leadership choices, several of these are a result of the mission that is inherently drawing upon bottom-up forces. This can be seen in the creation of an experimental space that is independent of faculties and also of formal educational programs and quality requirements. A small group of individuals gets the freedom to build, experiment and try out new and out-of-the box ideas, with the assumption that this so called 'free-space' is needed to break loose from old habits and thinking structures. The same is done with strategy formation labs, in which stakeholders from all layers of the organisation, but especially those who are located further away from leadership, to take part in the creation and formulation of the future strategy of the organisation. Also, a central enabling leadership initiative, that is created from the top-down position, yet creates value through involving a bottom-up network is the 'community of learning and innovation'. Although the main funding and also the leverage created by this funding is coming from top-down directly, the mechanism behind this community is to enable bottom-up actors to get acquainted with new ways of teaching and learning, new technologies and media, and to inspire them and empower them with knowledge but also to foster connectedness throughout the institution and beyond (i.e. industry or local governmental/intergovernmental stakeholders). This community also serves as a catalyst for creating multidisciplinary educational programs, double degrees and shared honours programmes and to break away from the faculty silos.

In turn this then encourages several adaptive leadership actions or consequences, as for example benefitting from the role of ambassadors for educational innovation in the organisation. These ambassadors facilitate grassroot collaborative cross-faculty projects (i.e. staff oriented) as well as organisation-student pairing in assignments (i.e. student oriented). This so called 'coalition of the willing' builds upon the people that are already motivated and active, which causes a snowball effect among staff inspiring each other and sometimes even stretches beyond the organisation to enable an 'outside in approach' by tapping into local region and connections abroad encouraging incremental change by looking for connections through for example start-ups. These adaptive leadership effects then make the circle for 'impact at the core', the mission of this university, complete. Where the strong emphasis to build upon networks and reaching outside is encouraged through administrative leadership, it creates the possibility to spark adaptive leadership actions. The enabling leadership choices and initiatives in between these two then serve as a catalyst for both sides.

University B: identification of opportunities for innovation through autonomy

In university B (see Table 5), the vice-rector described several choices that reflected administrative leadership, yet the origin of the strategy is to be found in enabling leadership choices. The vision of this university came about by bottom-up vision formulation in which scientific staff, students and support staff were asked to come up with ideas towards educational

innovation. The creation of this vision, although created together with actors inside the organisation, was then formulated and elaborated upon in more detail by administrative leadership actions. This resulted in an eight-pillar based strategy on educational innovation. The administrative action to follow-up on this bottom-up vision formulation was the organisation of a road-show supported by a corporate communication team and coherent marketing vehicles (i.e. website, promotion materials). This administrative leadership initiative had the aim to ensure a clear and strong message regarding the educational strategy. However, this was not meant to 'force' the organisation into these ideas. On the contrary this clear message was meant to set out the boundaries in which the faculties were given the freedom to choose and emphasize one of the eight pillars to their own needs and specific educational context.

The enabling leadership choices that supported this was the creation of an internal call for proposals for educational innovation. The idea with this call was to inspire and stimulate motivated staff and enforce bottom-up ideas with funds. Additionally, also local support staff was divided among the faculties to guide and support teachers with writing proposals for this call, and to streamline the process of realisation once the funds had been granted. From this example it becomes clear that administrative leadership facilitation (i.e. call for proposals, providing support staff locally) is used as a breeding ground to facilitate and cater to the ideas from the bottom-up. The distribution of the vision through corporate communication could be perceived as limiting, yet because the vision was also formulated through a bottom-up procedure initially it was already 'adopted'. In a sense the journey from vision creation to strategy execution can be viewed as an iterative process in which enabling leadership mechanisms are used in alternating turns with administrative leadership actions. In this cycle stakeholders inside the organisation are taken on-board early in the process in order to start the 'adoption' process early, and to reap the benefits from this involvement later in the development of the strategy. In these iterations there is also an alternation of the amount of autonomy that is given to the parts of the organisation. For example, in the vision creation there was given autonomy of direction, then this input was then formalized in a top-down manner in which later, freedom was given in the interpretation of the strategy by giving the opportunity to write proposals, be it within the boundaries of the eight strategy pillars. In the case where proposals for educational innovation were granted, the actors inside the organisation again received autonomy in defining the performance indicators of their efforts. No requirements or measurement indicators were demanded from the top-down in order to define educational innovation success. In this regard, the adaptive leadership choice made here gave the actors in the organisation the freedom to decide on their own successes. The definition given by the leader was solely: "*if something happens, we are doing a good job as an institution*". The efforts of educational innovation were also supported by enabling leadership initiatives such as making an investment in central support for ICT and technical tools for education.

University C: central coordination to serve student-oriented innovation

In University C (see Table 6), the rector mostly described choices that reflected administrative leadership, or actions that stemmed from administrative leadership crossing over to enabling leadership. There was a strong emphasis in the description of the rector related to the role of this university and what values it is obliged to serve on a societal level (i.e. obliged by law). The main responsibility that comes forward from this role is that the emphasis should always lie on delivering education in a flexible and digital manner to make the pursuit of an academic degree accessible for 'second chance' students or students

that would not be able to follow a traditional educational program (i.e. university C is a distance university). The rector described the students therefore as clients, and places their experience and evaluation at the centre of the success or failure of educational improvement and innovation. Indirectly this places the validation and support of educational innovation outside of the institution. This connects also with the idea that has been mentioned that strategic decisions are made only from the top-down, regarding the initiatives from the bottom-up as 'disturbances' of the institutional strategy. Additionally, the rector mentions that the university is too small in size for these bottom-up disturbances on strategic level.

Although the actions and choices made by this rector all very much rely on administrative top-down decisions, there are some enabling leadership catalysts that aim to connect more to the people inside the institution. For example, there are some centrally organised support structures for all faculties. These serve as educational and didactical advisory bodies, as well as points of contact for technical assistance since all of the education is delivered digitally and/or online. The faculties of this university also have a role in creating new 'products' (i.e. post-graduate and professional degree programs) for new 'target groups' (i.e. life-long learning students). However, although these new ideas that are created at faculty level, scaling up on new educational products and innovations are driven by top-down decisions, framed by heavy strategic frameworks and boundaries to ensure a clear focus and direction (i.e. there is no room for bottom-up grassroot educational innovation). It was also noteworthy that there was an emphasis on the view that experimentation with educational innovations by staff and all other related bottom-up initiatives are regarded as an institutional risk with regard to unexpected costs, scalability, and compliance to privacy laws.

None of the choices described by the rector reflected any adaptive leadership decisions or initiatives. This is in line with the heavy reliance on top-down leadership and viewing bottom-up decisions as disturbing the strategy of the institution. The emphasis that was placed on viewing students as clients, the educational offering as products and placing educational innovation in a context of entering new markets and fulfilling 'customer satisfaction' goals is in line with having no leadership choices related to adaptive leadership and places the inside of this organisation more towards an external market-orientation rather than an internally oriented institutional space for generation of initiatives and experiments (i.e. that are not necessarily connected to the 'market').

University D: reflecting on traditional and new practices to spark innovation

In University D (see Table 7), the rector made administrative leadership decisions predominantly related to putting strategic emphasis on open online educational development to disrupt traditional views on education. By placing open online education at the centre of the educational innovation strategy the rector aims to take ownership of this direction and to connect to 'riding the wave' of disruptive global educational innovation. By doing this, and setting out these clear boundaries and direction he wants to encourage out of the box thinking by the staff of the university and at the same time create institution-wide value.

There are many enabling leadership initiatives that are following from this administrative direction. First, the support for the design, creation and execution or open educational courses and initiatives is centrally organised and professionally reinforced by a specialized team that acts university wide (i.e. extension school). Also, didactical support, organised by the teaching and learning centre is available university-wide and also is a place for facilitating peer learning among teaching staff and exposure for educational innovation initiatives within the university across faculties. Another aspect that is related to the nature of open

online education (i.e. MOOCs) is that it enables outside-in innovation through experimenting with teaching to wide and non-campus based students, and generates global visibility for teachers, which is also an indirect incentive to accelerate educational innovation (i.e. exposure). By spotlighting and creating visibility for new ways of teaching the rector aims to enable a culture change towards education (opposed to an emphasis on research) and opening up the minds of teachers to new concepts, methods and educational technologies that, in the end, benefit the campus students. Additionally, the teaching fellowship program, a formal program that incentivises teachers for innovative teaching initiatives by naming them ambassadors and supporting them with additional funds. It is explicitly mentioned by the rector that the campus is seen as the driving force of educational innovation. The benefits that come along with open online educational innovation in the end are all creating more value for campus students and university staff. It creates a different value proposition to the campus: it creates added value complementary to online and digital learning opportunities and enables blended and flipped classroom learning opportunities.

Lastly, adaptive leadership choices were more regarded as consequences of the enabling leadership initiatives by the rector. On the one hand he aims to create a trial-and-error mentality on education. He underlines that this mentality has always been present in the research work of staff, but also needs to be more present in relation to education and educational innovation. He describes that he wants the staff to take ownership of their teaching, decide their own direction and experience that there is also room for failure. From a leadership perspective it is underlined that top-down facilitation towards this ownership and reflection on traditional versus new ways of teaching is more important than imposing top-down control.

Discussion

In this article we investigated how leaders of HEIs balance top-down coordination (i.e. administrative leadership) and bottom-up informal emergence (i.e. adaptive leadership) in order to enable innovative capacity (i.e. enabling leadership) and we contributed to the development of a theoretical base for institutional embedding of educational innovations through leadership perspectives. Complexity leadership theory was used as a lens to investigate the leadership and the necessary leadership roles that are required in complex environments such as HEIs to enable learning and innovation. Additionally, this study also complements research focussed on operational individual actors towards the processes and mechanisms used by leaders on a strategic level to create a space in which educational innovation can arise, followed up on and embedded in the longer term. We answered the question: *How do leaders inside HEIs balance top-down coordination (administrative leadership) and bottom-up informal emergence (adaptive leadership) in order to enable innovative capacity (enabling leadership)?*

The results in our study suggest that in order to change the current status in a complex environment multiple components in the organization often require simultaneous and sustained interventions in order to gain momentum for change. Especially in complex environments with high degrees of autonomy and distributed power, a collective sense of responsibility and a need for action is essential to initiate change and to work towards set goals. As also noted in different studies, the notion of enabling leadership offers potential to deepen understanding of the entanglement of bottom-up and top-down processes in the social construction of strategic coherence (Luisiani & Langley, 2019).

In addition to this, in earlier studies we encountered that successful governance is built upon collaboration, facilitation and trust rather than sole hierarchical decision making

(Schophuizen & Kalz, 2020). Moreover, in order for long-term educational innovation to occur, feedback is required from a variety of sources, reflecting a rich array of perspectives on a regular basis, since new ways of teaching have different requirements within an organisation (Schophuizen et al., 2021). The perspectives on learning mechanisms that can take place can serve as a way to compare the cases in this study (i.e. identification, coordination, reflection and transformation) (Akkerman & Bruining, 2016).

University A display's a *transformative* learning and innovation mechanism in the sense that change becomes visible either in modifications in existing practices or by new intermediate practices that are generated. Transformation processes are characterised by dealing with new issues and the recognition that this is a shared problem space where hybridization of views and actions takes place and where new ideas are being thought out. Transformation typically means some maintenance of unique and different practices and perspectives yet continuous joint work at the intersection for added value. At university A this is being seen in the strong emphasis to build upon networks and reaching outside the organisation. Through deliberate strategic action new partnerships, and spin-offs of these partnerships are being generated. This is encouraged through administrative leadership, and then creates the possibility to spark adaptive leadership actions.

University B displays an *identification* learning and innovation mechanism whereby intersecting practices are (re)created in contrast to one another. In this process, people are concerned with (re)defining the way in which the intersecting practices are different from one another and how they can justifiably coincide. In this university administrative leadership facilitation is used to create a breeding ground to facilitate and cater to the ideas from the bottom-up, yet also to give space to the local needs and identities of different parts of the university. Stakeholders inside the organisation were taken on-board early in the process in order to start the 'adoption' process early, and to reap the benefits from this involvement later in the development of the strategy adapted to their environments.

University C displays a *coordination* learning and innovation mechanism. Different practices take place yet a standardized procedure and way of working is sought, allowing diverse practices to cooperate efficiently in distributed work, even in the absence of consensus. In these cases, dialogue between the different organizational actors and levels is established only when necessary to sustain the flow of work. Characteristics of a coordination mechanism are peoples' attempts to find a communicative connection between actors or translate between them, efforts to organize the activity as smoothly as possible, and attempts to create routines to rely on. This is in line with the finding at this university that strategic decisions are made only from the top-down, and that initiatives from the bottom-up are seen as disturbances of the institutional strategy. Likewise, scaling-up on new educational innovations is driven only by top-down decisions, framed by heavy strategic frameworks and boundaries to ensure a clear focus and direction. It was also noteworthy that there was a heavy emphasis on the view that experimentation with educational innovations by staff and all other related bottom-up initiatives are regarded as an institutional risk.

University D displays a *reflective* learning and innovation mechanism which is about reciprocally defining different perspectives that each intersecting practice can bring, and openness to use somebody else's perspectives to reflect on one's own. Accordingly, reflection can be recognized by efforts at perspective making and perspective taking. This is being displayed by the creation of a trial-and-error mentality on education, where staff should take ownership of their teaching, decide their own direction and experience that there is also room for failure. It is underlined that top-down facilitation towards this ownership and reflection on traditional versus new ways of teaching is more important than imposing top-down control.

One limitation of the study was the focus on individual accounts of only four vice-rectors of Dutch HEIs. A larger sample was not possible due to practical reasons as discussed in the introduction. The original plan for this study was to integrate data from the managerial level of HEIs with data from another study in which directors of teaching and learning centers have been interviewed about their role in the innovation chain. Due to the amount of data and the difficulty of integrating data on those two levels, the second study is treated as a separate study and the data is not integrated in this paper. But the results of this second study can function as an enhancement of the perspective of vice-rectors and will contribute to a triangulation of data sources.

Conclusion

The results of this study are an empirical identification of leadership and governance towards structural implementation of educational innovation, and shedding light on the choices that leaders made towards enabling educational innovation through different leadership roles. This was shown through complexity leadership theory and specifically by investigating administrative, adaptive and enabling leadership and the connection between these roles.

Our results can be seen in the light of previous research, especially linked towards an earlier study by Schophuizen and Kalz (2020) in which it was found that operational level actors acknowledge and express that top-down action is needed to enable and facilitate them to learn, create and work out their ideas towards creating educational innovations. In that study we argued that top-down and bottom-up efforts constantly need to be adapted to each other and synchronized in order to establish organizational embedding that meets the non-linear nature of innovation. This study sheds light on how, in the case of HEIs as complex environments, leaders made strategic choices and followed up on them to enable the innovative potential of the organisation and create this synchronization.

Additionally, this study sheds new light on leadership, and how leadership can be enacted inside HEIs. We propose that looking at higher education leadership through complexity leadership theory moves beyond the managerial viewpoint of the industrial age to meet the new leadership requirements of the knowledge era (Eddy & VanDerLinden, 2006). We argue that if it is required that higher education is constantly adapted to an increasing knowledge-based society, and if we also want to harness the innovative potential of complex organisations such as HEIs, that this calls for a new leadership paradigm (Kezar et al., 2006). The first signs of this paradigmatic change inside higher education have been shown in this study.

However, there remains a persistent view of leadership that stimulates a vision-led, top-down style of control by leaders of universities (Mathieu et al., 2001). Though this approach may fit well from the perspective of performance management and accountability, it can supress an organisations innovation potential (Marion & Uhl-Bien, 2001; Schneider & Somers, 2006). We therefore would like to conclude with the notion that HEIs hold a lot of potential to create and sustain educational innovation inside their existing structures, but that a reconsideration in socio-political spheres is also needed in order to see change on a broader level.

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Data availability The datasets generated and/or analysed during the current study are not publicly available due to privacy reasons and compliance with GDPR rules and ethical standards but are available from the corresponding author on reasonable request.

Code availability Not applicable.

Declarations

Conflicts of interest/Competing interests The authors declare that they have no competing interests.

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