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This paper analyses Dutch accreditation reports in the field of information and communication technology (ICT) to assess the degree of reported involvement of the professional field in the curricula of universities of applied sciences. Qualitative content analysis of the reports of all the ICT programs in the country indicates loose coupling in reporting on mechanisms of interaction. This means that whereas the involvement of the professional field is strongly suggestive at the strategic levels, there is an underrepresentation of university-industry interaction on operational levels which suggests the need to explore the real interaction taking place between the professional field and the universities of applied sciences, and possible implications for the future of the profession.

Introduction

Increasingly, policymakers are interested in the relationship between higher education and the industry (Teichler, 2007). Since the discourse on the role of higher education has become more market oriented (see; Slaughter and Rhoades, 2004; Sam and van der Sijde, 2014), higher education institutions started paying more attention to the industry and its involvement in shaping concrete learning outcomes (Bennenworth and Jongbloed, 2010; Leisyte, et.al., 2013;). In particular, the interaction between higher education and the industry is the topic of study for the last 30 years that primarily concentrated on research commercialization, and analysing the potential impact of market oriented behaviour on institutional structures of higher education (see Slaughter and Leslie, 1997; Slaughter and Rhoades, 2004). Some scholars are critical to these new developments in higher education and its influences on traditional higher education structures (Awbery, 2002; Lynch, 2006; Washburn, 2005; Alajoutsijarvi, Juusola and Siltaoja, 2013) as well as roles of academia in changed higher education settings emphasizing increasing collaboration with companies (e.g. Hazelkorn and Moynihan, 2010). On the other hand, the shift towards a market oriented higher education and growing industrial stakeholder involvement does not have to mean that universities were forced to displace their traditional activities (see Ylijoki, 2003). Industry collaboration is for instance beneficial for institutional growth, transformation or evolution (Marginson and van der Wende, 2007).

This paper intends to contribute to an ever-growing body of literature analysing the involvement of industry as a stakeholders in higher education, but it goes a step further in exploring the inter-linkage. First, it focuses on universities of applied sciences (UaS) in the Netherlands and second, it uses accreditation reports to explore formal discourse of the UaS on the interaction of the professional field and practice. Accreditation reports are built according to a standard format in the Netherlands controlled by the Dutch-Flemish Accreditation Organisation (NVAO 2011). They report

on programme profile, learning outcomes and assessment, yet the higher education departments and/or teaching staff "make sense" (Weick et.al., 2005) of each program, and structure activities accordingly to their goals and preferences. Their responses to external influences also vary (Pfefer and Salancik, 1978) and are presented in accreditation report as illustrative. By analysing the accreditation reports we should be able to explore the interaction with the industry on strategic level and on operational level in ICT programs at Dutch UaS. **The analysis intends to evaluate the coupling on both strategic and operational levels (Weick 1976; Bromley and Powell, 2012) of the ICT programs as reported in the accreditation**. Coupling implies the extent of interconnectedness of elements within the system, their dependency on each other on the one hand, and the independent development or autonomy on the other.

We focus on universities of applied sciences where linkages with the professional field, although part and parcel of the institutional tissue (Huisman, 2008), have been rather unexplored, and in particular in the context of the accreditation process. Their interaction with companies has intensified over the years with the introduction of the official role of performing research. In particular evidence of curricular innovation, emphasizing problem-oriented and practice-based learning, and growing social and economic landscape entrenchment can be observed (Hasanefendic, Heitor and Horta, 2015). In this light, it is interesting to explore how the interaction with companies is structured and what are the implications for curricular program development.

Our study reveals that universities of applied sciences are more coupled with the industrial field at strategic levels than at operational levels. Formal criteria of collaboration according to Dutch quality regulation system (NVAO, 2011) are thus met. In the case of reporting on collaboration with companies on operational level, outputs of interaction are "obscure" (Bromley and Powell, 2012). Therefore, concrete implications of the involvement of industry in the curricula and the very learning process are hard to determine from accreditation reports and yields further, more empirical, investigation.

The following section will introduce theoretical framing for analysis and explore the implications for this research. Then we focus on the method of analysis and explain the selection of qualitative content analysis to understand the coupling dimensions as discerned from the accreditation report. This section is followed by results and a discussion where we model our summations. Conclusion provides an overview of our most relevant findings and indicates lines for future research.

Loosely (de)coupled systems: Strategic and operational level of involvement of industry in the curriculum

Majority of studies analysing higher education-industry collaboration has been undertaken at operational levels (Keep, 2012), or by analysing concrete outputs and implications, rather than focusing on formal compliance to policies in place which stimulate such interaction. This makes sense as policy outcomes are most visible when we look at organizational practices. The collaboration between the two "worlds", should however not be restricted to just the operational level. The nature of the two types of collaboration (strategic and operational collaboration) and the mechanisms involved presupposes a kind of "coupling" between the two types (e.g. Weick, 1976) and it is the coupling between these two levels in the accreditation reports that is the central topic of this study.

Coupling theory was introduced by Weick in 1976 and later Orton and Weick (1990) to explain the behaviour of independent units embedded within larger systems. They showed that actions within these independent units may have little or no effect to the other unit or even the overall system (Gilmore et.al., 1999). This phenomena is called *loose coupling* (). The basic thought is that, unlike tight coupling which presupposes highly integrated and responsive to each other systems (Orton and Weick, 1990), , loose coupling indicates that the system is less robust and units are free to adjust accordingly to change without causing transformation to the entire system.. Literature has substantiated proof of the existence of loosely coupled systems, either within organizations or outside organizations creating interdependent partnerships (Sharp, 2009), where misalignments are present (Soh and Sia, 2004). Such literature always emphasizes the process of mutual adaptation towards some form of eventual alignment (see Berente, 2009). Less has literature focused on the concrete benefits of loose coupling (e.g. Ravasi and Verona, 2001) or advantages of such systems to organizational environment and effectiveness (e.g. Dubois and Gadde, 2002). It is envisioned in this work to address this juxtaposition as well in terms of industry collaboration in curricular programs on strategic and operational levels.

Methodology

Our analysis draws on systematic comparison of accreditation reports conducted in 2009 - 2012. It is substantiated with our experiences and observations as either researchers or professionals in the field of higher education and quality assurance, especially within the Dutch context. Therefore, this research approach is depleted with observations and discussions with professionals in the accreditation field, ICT field and from university of applied sciences setting.

The overall data collection represents the 53 accreditation reports on ICT program curricula across 22 universities of applied sciences in the Netherlands in 2012. The program field of information and communication technologies can be divided based on a particular curricular focus; either on (technical) computer science (n=15), business information technology & management (n=18) and information technology (n=20). The field of ICT has been growing in importance in the Dutch context in past couple of decades (Cucchiarini, Daelemans and Strik, 2001; den Adel, Blauw and Entzinger, 2003) and research in the field of ICT has been gaining on prominence (Frederik, 2013). Still, each year ICT industry shows a demand of over 10.000 professionals which points to a lack of critical mass in the field (van Ruud, 2001). Shortage of people trained in the ICT field could become potential disadvantage for the economic development and hamper international competitiveness of the Dutch ICT sector (den Adel, Blauw and Entzinger, 2003). It is in this context that the quality of the overall educational curricula is sought and in particular with close industry collaboration and participation of companies in practice based and problem oriented learning.

In the Netherlands, the responsibility for quality assurance lies within the higher education institutions. They assure that their programs are periodically evaluated by an independent Review and Assessment Agency (VBI) and accredited as official degrees by the NVAO, the Dutch-Flemish Accreditation Organization (Scheele, Limbach and Rijcke, 2006). The accreditation decision is based on the report that the external evaluation body sends to the NVAO and they are publicly available. The external evaluation body is always composed of one student representative, one professional and one higher education representative besides official Chairman and Secretary positions (NVAO 2011). Industry therefore has their representative in the quality assurance processes in the Dutch

context. Furthermore, it is expected that the views of industry and employers are built into the quality assurance management, and that they partake a role in program formulation and definition of concrete learning outcomes (Kolster and Westerheijden, 2014).

In order to systematically interpret meaning from the accreditation reports we developed categories for analysis (Mayring, 2000) which served as reference during the process of content data synthesis (van Dijk, 1980). These have been developed from existing literature (see Davey et. al., 2011) and in close consideration of the very content and structure of accreditation reports. Categories follow mechanisms through which university-business collaboration is transparent, developed by Davey et. al. (2011). Table 1 provides an overview of the key mechanisms of collaboration and specifies their operationalization. All 53 reports were analysed according to the concepts and mechanisms described in Table 1. We used trigger words (vocabulary on university-business collaboration) to allocate text/content to selected category. Whenever a word was encountered in the content it would be flagged and the text allocated to the category. The work was done in Excel and the flags were manually checked and double checked for validity of the content allocated to categories.

Mechanisms for coupling on the *strategic level*	*Governance*	Professionals from IT industry field in Boards and Committees in universities of applied sciences
	Curriculum evaluation	IT industry involvement in regular (e.g. annual) evaluation of the curriculum (quality management)
	Curriculum design	IT industry involvement in curriculum design
	Lifelong learning	IT industry and lifelong learning
Mechanisms for coupling on the *operational level*	*Mobility*	Frequency of temporary or permanent assignments offered to students and teachers in collaboration with IT industry.
	Collaboration in R&D	Impact of the collaboration with IT industry on curricular development.
	Commercialization of R&D results	Impact of commercialization of R&D projects on the curriculum involvement of industry.
	Entrepreneurship	Integration of entrepreneurship into the IT curriculum and the role of the IT industry in this (via collaboration).

Table 1 – Mechanisms of university-business collaboration and their operationalization. Source: adapted from Davey et.al., 2011.

Results

Coupling on the strategic level

Table 2 shows the results of qualitative content analysis of 53 accreditation reports and the mechanisms for coupling on the strategic level. Coupling with the industry takes place most

frequently on the governance levels, which includes, "business representatives involved in education decision making boards" (Davey et.al., 2011:10).

	Mechanisms for coupling on the strategic level									
	Total			Information Science			Business IT & management			Computer Science
	n=53			n=20			n=18			n=15
	n	%		N	%		n	%		N	%
Governance	47	91%		18	90%		16	89%		13	87%
Curriculum Development	49	94%		18	90%		16	89%		15	100%
Curriculum Evaluation	38	72%		14	70%		12	67%		12	80%
Lifelong learning	40	74%		16	80%		12	67%		12	80%
		83%			83%			78%			87%

Table 2 – Mechanisms of coupling on the strategic level and percentage of reporting in total and by field of the ICT program

For example, the Fontys UaS appoints ICT professionals in the Advisory Council, the Professional Committee and the Board of External Experts. Similarly, Saxion UaS and UaS Arnhem – Nijmegen, have a Professional Committee which advises on the position of the industry in education . At UaS Leiden professionals are represented in the education Advisory Committee and the same goes for NCOI Nederland . These findings indicate that there is a strong presence of ICT industry stakeholder representatives at managerial levels in universities of applied sciences in the Netherlands. These representations in Boards, Councils or Committees are also important in the curriculum evaluation, as between 67% and 80% of the programs organise regular meetings with them to discuss the results of evaluations considering the (degree of) involvement of the professional field, or send out a (bi)annual survey for evaluation (e.g. UaS Zeeland, Vlissingen) to industrial stakeholders.

Another mechanism for coupling on strategic or management levels is the curriculum development. In other words, there is a strong influence of the industrial stakeholder on the design of courses, modules, minors and internships/apprenticeships. These are project based and practice oriented where company collaboration is particularly fostered. For instance, at UaS Amsterdam within the course "Social Smart City" each group of students works on a unique case for an external partner. In Fontys UaS ICT students participate in problem solving activities with regional companies of which fifty are already integrated as partners. Most UaS seem to encourage participation of external stakeholders in their ICT courses as tools to building a learning environment that stimulates project based and problem oriented practices.

Both the involvement of the professionals from the ICT field in the governance and through course programs relying on practice based research and problem solving activities at companies ensures

that curricula is depleted with references from PROFESSIONAL FIELD which suggests a higher likelihood to impact curricular development. It follows that, collaboration with the (regional) industry plays a role in skill development and modernisation of practices of teaching and learning thus contributing to curricular innovation processes.

Coupling on the operational level

Table 3 exemplifies the coupling of "UaS" with industry on operational levels. The results indicate a relatively low percentage of reporting on the type and purpose of collaborative activities. According to the accreditation report only 19% of the programs used mobility to report involvement with the professional field. For example Saxion UaS has arrangements with some companies to exchange professionals. An employee thus becomes a lecturer at Saxion for a year, while at the same time one of the lecturers works for the company.

In accreditation reports, details on collaboration in R&D, such as contract research, R&D consulting, cooperation in innovation, informal and personal networks, joint publications, are rarely provided and only included for 9% of the programs. One of the programs which reports on the collaboration in more practical terms is at the ICT program at Leiden UaS. They specify that industry is involved via external projects, internships and graduation, guest lectures and other forms of cooperation such as consulting.

Avans UaS also specifies that their lecturers from the field of Automation set up knowledge networks. Professionals from the field and companies participate in these knowledge networks, which enables transfer of professional or field knowledge to the curriculum. Additionally, knowledge networks are also a basis for projects with companies in which students actively participate.

As a mechanism for coupling with the industry at operational levels, entrepreneurship is rarely mentioned. However, the reports mention that some ICT programs stimulate students entrepreneurial capabilities. For instance at the Hague UaS, regular ICT programme is combined with running a business. Students are thus also independent entrepreneurs .

	Mechanisms for coupling on the operational level									
	Total			**Information Science**			**Business IT & management**			**Computer Science**
	n=53			n=20			n=18			n=15
	n	%		N	%		n	%		N	%
Mobility	10	19%		4	20%		4	22%		2	13%
Collaboration in R&D	5	9%		3	15%		1	6%		2	13%
Commercialization of R&D results	5	9%		3	15%		1	6%		1	7%
Entrepreneurship	5	9%		3	15%		1	6%		1	7%
		15%			22%			13%			13%

Table 3 – Mechanisms of coupling on the operational level and percentage of reporting in total and by field of the ICT program

Discussion and conclusion

This paper explored the coupling of the universities of applied sciences and the industry as discerned from accreditation reports on ICT programs in the Netherlands. Drawing on Weick (1976) to exemplify loose coupling we have two important implications for the way industry is involved in the ICT curriculum. First, our results indicate that on both the strategic and the operational level, there are mechanisms in place to couple the industry with the curricula. The 53 programs all use different combinations of mechanisms to ensure the coupling yet the strengths of the coupling vary (Weick, 1976; De Caluwe, 2012). Figure 1 specifies the relationship between the universities of applied sciences and the industry on strategic and operational levels by observed mechanisms of interaction. According to the accreditation reports, the involvement of industry is most prominent at governance or strategic levels which suggest a high degree of commitment and compliance to formal requirements. Dutch Accreditation Process specifies that industry collaboration in governance is an obligatory element for positive evaluation (NVAO, 2011). This may be problematic as accountability is limited to few representatives from the industry which occupy positions in Advisory Boards. It cannot clearly show in what ways does the industry actually exert influence over the curricula. In accreditation reports, we therefore have a symbolic compliance to national regulation whereas the goals of industry interaction are not clearly reported or are considered "obscure" (Bromley and Powell, 2012).

At the same time, the analysis suggests that the coupling with the industry is low on operational or practical levels. This leads us to conclude that this is either due to a lack of interaction or an underrepresentation of real practice. The operational level shows loose coupling (Weick, 1976) with industry, or the collaboration with industry is not as tightly coupled as on strategic (governance) levels.

Future studies should address the interaction with companies at more practical levels and by conducting in depth interviews with lecturers and industrial stakeholders which participate in curricular activies.. At the same time, research is needed to understand how well are the representatives of the industry able to capture the essential requirements and company needs in training the labour force. Exploring the mechanisms by which industry collaboration can be better entrenched with the teaching and research programmes and evaluation procedures which would incorporate the perspective of companies in the field or industry should be the next important step if adequately skilled workforce is to be provided to ever changing labour markets.

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