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The Quality Culture Inventory: a comprehensive approach towards measuring quality culture in higher education

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ABSTRACT

Quality assurance and quality development represent central challenges of higher education institutions (HEIs). In this context, the term quality culture has gained increasing attention. Quality culture refers to an organizational culture, which emphasizes the importance of continuous quality improvement, shared attitudes, and commitment towards quality. Despite growing discussion of quality culture, sound empirical approaches that capture this key construct have not been developed systematically. Therefore, we developed the 'Quality Culture Inventory' (QCI), which represents a comprehensive approach to operationalizing quality culture in HEIs. In a first step, this paper summarizes the development and empirical validation of the QCI, which comprises six dimensions (e.g. quality-oriented commitment, leadership, and communication). In a second step, relationships between the QCI dimensions and several potential outcome measures (e.g. job satisfaction) are reported. The QCI allows HEIs to evaluate their current state of quality culture based on empirical evidence and develop target-oriented recommendations for quality improvement.

Introduction

The implementation of quality tools and quality management procedures represents one of the major challenges of today's globally acting universities. Higher education institutions (HEIs) face an increasingly competitive environment, leading to elevated quality demands in teaching and research as well as in service and administration. At least since the beginning of the Bologna Process in 1999, quality has also become one of the most prominent topics of higher education policy discussions in Europe. In this context the importance of developing comparable criteria and methods for quality assurance is especially emphasized (Bologna Declaration 1999). As a result, countless guidelines (e.g. 'Standards and Guidelines for Quality Assurance in the European Higher Education Area') and tools (e.g. accreditation, evaluation, audit) have emerged over the last years, aiming to support HEIs in their strive for autonomous quality assurance and development (ESG 2015).

Extensive debates on quality assurance served as a starting point for bringing up the concept of quality culture (EUA 2006). Quality culture extends the rather technocratic view of quality assurance by emphasizing the importance of an organizational-psychological perspective in addition to structural-formal quality assurance tools. Accordingly, the quality culture concept implies a shift in approach from quality control, accountability, and regulation to institutional autonomy, credibility, and quality enhancement (Bendermacher et al. 2017). Whereas academics often disagree on the

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comparability of quality criteria (e.g. bibliometric indicators), quality culture could well become a concept with which they can all identify, regardless of their discipline.

Over the last years, the number of case studies and qualitative research papers on quality culture has clearly increased (e.g. EUA 2005; Huson 2015; Loukkola and Zhang 2010; Shah, Uqaili, and Qureshi 2017; Sursock 2011; Vettori 2012), but empirical approaches operationalizing this important construct have not been developed sufficiently. As Bendermacher et al. (2017) state in a recent review, the exact structure of quality culture remains unclear, even though researchers and practitioners agree on the importance of nurturing a culture of quality within the context of higher education, which is assumed to lead to several favorable outcomes (e.g. staff and student satisfaction). More empirical research is required to provide HEIs with a comprehensive definition, sound conceptualization, and measure(s) of quality culture (Lanarès 2009). Therefore, we initiated the heiQUALITY Cultures Project, which aimed at creating an empirical instrument to allow for a sound and economical assessment of quality culture within the context of higher education. Extensive research resulted in the development of the Quality Culture Inventory (QCI), the first approach to allow institutions of higher education to assess their current state of quality culture empirically.

In the following, we provide information about the theoretical framework of our project and give a detailed description of our methodological approach. We then present the results and discuss strengths and limitations of our study, to conclude with a summary and proposal of future research questions.

Theoretical framework

The terms 'quality', 'quality assurance', 'organizational culture' and 'quality culture' represent interdisciplinary constructs that play an important role in the context of higher education as well as in engineering, business administration, and social sciences. All disciplines have in common, that they thrive to improve the quality of products, processes and/or services (cf. Sattler, Sonntag, and Götzen 2016). As this paper focuses on the context of higher education, key constructs are mainly discussed from this perspective in the following sections.

Definition of quality

A review of existing literature reveals several definitions of 'quality' in the context of higher education (e.g. Vlăsceanu, Grünberg, and Pârlea 2004; EUA 2006). We focus on the most prominent and comprehensive definition provided by Harvey and Green (1993), who propose that quality can be assessed from five perspectives:

(1) Quality as exception: quality is viewed as something special and exceptional (e.g. exceeding defined standards)
(2) Quality as perfection or consistency: quality as the fulfillment of high standards ('getting things right the first time', e.g. administration processes)
(3) Quality as fitness for purpose: quality is judged to the extent to which a product or service fits its purpose (stakeholder-dependent, e.g. demands of students vs. external funding)
(4) Quality as value for money: quality is measured by performance indicators to determine the return on investment (e.g. citation indices)
(5) Quality as transformation: quality as a transformational process that causes changes (e.g. students acquiring knowledge)

The definitions proposed by Harvey and Green clearly illustrate how difficult, if not impossible, it is, to provide a simple or universal definition of 'quality', as the latter always depends on the views of various stakeholders and the particular context. However, what all of these perspectives imply, is

that quality needs to be measured to be evaluable: this is where the concept of quality assurance comes into play.

Quality assurance

Quality ranks among the most important competitive factors of profit and non-profit organizations. Accordingly, quality assurance and quality management procedures constitute central issues within the management strategy of numerous organizations. Intensive research over the past decades has led to countless quality assurance concepts and tools allowing organizations not only to monitor but also develop their quality standards (e.g. DIN EN ISO 9000/9001 and Total Quality Management (TQM); cf. Sattler, Sonntag, and Götzen 2016).

In the context of higher education, quality assurance is defined as 'an all-embracing term referring to an ongoing, continuous process of evaluating (assessing, monitoring, guaranteeing, maintaining, and improving) the quality of a higher education system, institutions, or programmes' (Vlăsceanu, Grünberg, and Pârlea 2004, 74). In line with this definition, quality assurance serves the purpose both of accountability and quality improvement. At least since the beginning of the Bologna Process in the 1990s, quality assurance has become an indispensable part of European higher education. Over the last years, various guidelines and tools have emerged, aiming to support HEIs in their quality assurance efforts (ESG 2015; Reichert 2010). These include internal (e.g. monitoring, course evaluation) and external (e.g. accreditation, audit) quality assurance approaches. What all of these approaches have in common, is that 'quality' must be defined on the basis of clear criteria first in order to be measurable. Moreover, it is vital that quality assurance measures are not ends in themselves if they are to contribute to actual quality development: results and findings have to be systematically integrated into a continuous quality evaluation cycle in order to serve their purpose. Vlăsceanu, Grünberg, and Pârlea (2004) propose that quality assurance activities have to be supported by both institutional mechanisms and a solid institutional culture of quality in order to be successful: in this context, some authors have also used the term 'quality assurance culture' (Kohoutek 2016; Ntim 2014). When discussing the relationship between quality assurance and quality culture, most authors state that quality assurance can be understood as a central part of quality culture (e.g. Vlăsceanu, Grünberg, and Pârlea 2004; EUA 2006). At the same time, the quality culture approach is highly related to the concept of 'organizational culture'.

Organizational culture and quality culture

According to Schein and Schein (2017), the culture of each organization can be described at three distinct levels: Artifacts (e.g. furniture, dress code) and espoused values (e.g. customer orientation) represent tangible elements of culture that are rather easily available to non-members of an organization. In contrast, shared basic assumptions represent unconscious beliefs that guide the behavior of organizational members and are rather difficult to specify. Shared basic assumptions are at the core of an organization: they are perceived as self-evident and not questioned by organizational members, thereby strongly influencing the way in which organizational members act, think, and feel in the organizational context. For example a shared basic assumption of an organization could be that all organizational members are highly motivated to fulfill their tasks as well as possible. This assumption is likely to lead to an organization whose members enjoy a high degree of self-responsibility and autonomy at work. In contrast, an organization that doubts the motivation of its employees would rather be characterized by regulations and an atmosphere of control.

Schein and Schein`s conceptualization of organizational culture provides valuable information on the different levels that need to be considered when analyzing the cultural aspects of an organization. In terms of assessing quality culture, it appears essential to consider the visible quality artifacts (e.g. quality assessment tools), espoused quality values (e.g. mission statement), and shared basic quality assumptions (e.g. quality commitment) of an organization.

The first comprehensive definition of quality culture was developed by the European University Association (EUA):

> Quality Culture refers to an organisational culture that intends to enhance quality permanently and is characterised by two distinct elements: on the one hand, a cultural/psychological element of shared values, beliefs, expectations and commitment towards quality and, on the other hand, a structural/managerial element with defined processes that enhance quality and aim at coordinating individual efforts (EUA 2006, 10).

According to this definition, quality culture comprises aspects of quality assurance (artifacts) and important organizational-psychological factors, such as values (espoused values), expectations, and commitment towards quality (shared basic assumptions). This view clearly extends traditional approaches of quality assurance and development, which are often limited to managerial elements (artifacts) and neglect the importance of psychological factors in their implementation. The EUA assumes that the structural-formal aspect of quality culture is manifested as a 'top-down' process since tools and mechanisms for measuring, evaluating, assuring, and improving quality are generally defined and implemented by the management level. In contrast, the organizational-psychological level is understood as a 'bottom-up' process, emphasizing the significance of each HEI member in actually putting a culture of quality into effect. Finally, the EUA assumes that the two quality culture elements do not exist separately, but are connected through communication, participation, and trust, which facilitate the bottom-up process of quality culture development (for a comparable approach, see Ehlers 2009). Accordingly, Loukkola and Zhang (2010) argue that quality assurance and quality culture are highly interrelated as a 'quality culture can be enforced by structural decisions which stimulate shared values and beliefs' (17; cf. Harvey and Stensaker 2008).

Despite the increasing number of qualitative research on quality culture, empirical approaches operationalizing this phenomenon have not been developed sufficiently. We initiated the project 'heiQUALITY Cultures' to address this very important research gap and create an empirical instrument for the organizational diagnosis of quality culture within the context of higher education, considering both structural and cultural aspects (Sonntag, Stegmaier, and Schaper 2016).

The heiQUALITY Cultures project

The following section provides a short overview of our research approach. For more detailed information about the heiQUALITY Cultures Project, see Sattler, Sonntag, and Götzen (2016), and Sattler and Sonntag (2018).

The heiQUALITY Cultures Project ('Development and Testing of an Instrument for the Description and Assessment of Quality Cultures at Higher Education Institutions') was conducted between 2012 and 2015. It was designed as a multidisciplinary cooperation project between three German HEIs, one of which is a public research university while the other two are universities of applied sciences. By involving somewhat different types of HEI, the project aimed at taking multiple professional perspectives into account and allowed for an investigation of HEI-specific quality cultures.

The main objectives of the project were:

(1) to develop a comprehensive definition and practical assessment model of quality culture
(2) to develop an empirically-based Quality Culture Inventory that considers both structural-formal and organizational-psychological aspects

Project milestones

First of all, we conducted a systematic literature review in order to identify previous studies relating to the operationalization of quality culture. Our search included three databases: HEIDI (interdisciplinary database of Heidelberg University), PSYNDEX, and PsycINFO. As a first step, we conducted a title search on the key search term 'quality culture'. A second title search focused on a combination of

the terms 'quality', 'higher education', and 'dimension'. The systematic literature review was limited to English and German peer-reviewed publications up to December 2012. Our search strategy initially identified 786 publications. However, only 17 studies were considered relevant to our research objectives after careful evaluation of the corresponding abstracts. Strikingly, only 3 of these studies focused on the quality culture construct directly (Ali and Musah 2012; Trivellas and Dargenidou 2009; Zeitz, Johannesson, and Ritchie 1997). Moreover, these studies applied very heterogeneous methodological approaches, giving further weight to our research objective of promoting more systematic research in this field (for a more detailed description of the systematic literature review results including critical comments on the studies included, see Sattler et al. 2013, 2016).

Results of the systematic literature review served as a sound empirical basis for developing an initial quality culture model (this model is available from the authors upon request), which was subsequently challenged and discussed in the course of 41 international expert interviews. Interviewees qualified as experts by meeting at least one of the following inclusion criteria: 1) Professional experience based on working for an accredited quality assurance agency; 2) an independent higher education organization (e.g. EUA); 3) practical experience concerning quality assurance and/or quality management within HEIs (e.g. quality managers); or 4) research publications on quality culture within the HEI context.

When asked to elaborate on relevant quality culture dimensions, a total number of 39 experts (95.1%) emphasized the importance of quality-oriented leadership and communication (see Table 1). Moreover, more than 70% of the experts referred to commitment, participation and quality objectives. Additionally, shared quality values, mutual trust, individual responsibility, recognition, and information ranked among the 10 most frequently mentioned quality culture dimensions (for a detailed description of additional expert interview results, see Sattler, Sonntag, and Götzen 2016).

Expert suggestions led to minor revisions of our initial quality culture model resulting in the final quality culture model presented in Figure 1.

Quality culture model

Our final quality culture model is based on the EUA definition, the systematic literature review, and our international expert interview results (see Figure 1).

According to our model, quality culture comprises structural-formal and organizational-psychological elements (Ehlers 2009; EUA 2006). The structural-formal level is further described by normative, strategic, and operative aspects of quality assurance (Bleicher 2011; Sonntag and Stegmaier 2007): Quality goals and/or mission statements are part of the normative level, while the definition of responsibilities belongs to strategic quality assurance (e.g. central quality assurance unit; Sursock 2011). Finally, specific quality tools and measures represent the operative level of quality assurance (e.g. evaluation; EUA 2005). It is assumed that each structural-formal aspect needs to be considered in order to establish a comprehensive and successful quality management system within HEIs.

Table 1. Quality culture dimensions according to international experts ($N = 41$).

Dimension	N (%)
Leadership	39 (95.1)
Communication	39 (95.1)
Participation	32 (78.0)
Quality objectives	30 (73.2)
Commitment	29 (70.7)
Quality values	28 (68.3)
Trust	28 (68.3)
Responsibility	27 (65.9)
Recognition	27 (65.9)
Information	27 (65.9)

Figure 1. Final assessment model of quality culture.

The organizational-psychological level is further described by collective and individual aspects of quality culture: On the individual level, quality culture is expressed by the individual commitment, responsibility, and engagement towards quality (e.g. Ali and Musah 2012; Gvaramadze 2008; Harvey and Stensaker 2008). On the collective level, shared values (e.g. Ehlers 2009; Gordon 2002; Harvey and Green 1993) and trust (e.g. Ehlers 2009; Loukkola and Zhang 2010; Yorke 2000) are assumed to serve as the mutual basis for quality-oriented leadership, communication, and partici-pation (e.g. EUA 2006; Gordon 2002; Loukkola and Zhang 2010). The latter elements are illustrated as an arrow, representing a dynamic relationship between the structural-formal and individual level. Our illustration is inspired by the original EUA model (EUA 2006) and corresponds to the recent literature review of Bendermacher et al. (2017), who identified leadership and communication as key elements in binding structural and psychological aspects of quality culture. Our final quality culture model served as an empirical basis for developing the QCI.

Quality Culture Inventory (QCI)

The QCI consists of two questionnaires operationalizing various quality culture dimensions within HEIs. The structural-formal questionnaire covers normative, strategic, and operative elements of quality assurance. It is designed as a structured interview guideline addressing quality assurance experts, who are assumed to have the necessary knowledge to soundly evaluate the current state of quality assurance within their institution. In contrast, the organizational-psychological question-naire addresses all status groups of HEIs, including academic and non-academic staff (e.g. professors and administration, respectively). As the focus of the current paper lies on the results of the organ-izational-psychological questionnaire, more detailed information about the QCI, which will be pro-vided in the following section, will only concern that part of the instrument (for a more detailed description of the structural-formal questionnaire, see Sattler, Sonntag, and Götzen 2016).

Table 2. Design and sample questions of the organizational-psychological questionnaire (adapted from Sattler and Sonntag in press).

Core Area	Dimension	Sample Item	Source	Items
Individual Level	Commitment	I am particularly intent on supporting the quality development of [HEI].	Adapted from: Jackson (2004) (affective subscale)	4
	Responsibility	'I feel that I am jointly responsible for the quality development of [HEI].'	Adapted from: Jackson (2004) (cognitive subscale)	4
	Engagement	'I am willing to make additional efforts in order to meet the quality demands of my work.'	Adapted from: Jackson (2004) (behavioral subscale)	4
Collective Level	Leadership	'It is important to me to appreciate good working results adequately.'	Adapted from: Heinitz and Rowold (2007)	12
	Communication	'Ideas concerning quality improvement are openly discussed in our department.'	Adapted from: Brodbeck, Anderson, and West (2000)	9
	Participation	'I keep myself up to date concerning new developments at [HEI].'	Adapted from: Staufenbiel and Hartz (2000)	4
	Shared values	'Quality values of [HEI] are actually put into practice.'	Own development	4
	Trust	'I have full confidence in my employee's skills.'	Adapted from: Zeitz et al.(1997)	4
	Global Aspects	'[HEI] is characterized by high quality awareness'	Own development	8
	TOTAL			**53**

Organizational-psychological questionnaire

The organizational-psychological questionnaire is designed as an online tool, which can be easily distributed via email. All items were constructed on the basis of an extensive literature review focusing on previous approaches, which operationalize individual dimensions of the quality culture construct proposed by us. Suitable items were adapted in order to match the quality culture context in terms of wording. Moreover, new items were constructed if the literature review did not produce any suitable results according to our research objective. The original organizational-psychological questionnaire contains a total number of 53 close-ended statements covering individual (commitment, responsibility, engagement), collective (leadership, communication, participation, shared values, trust), and global (comprehensive assessment of the institution's quality culture) elements of quality culture (see Table 2).

Additional items refer to demographic characteristics (e.g. age, sex), potentially dependent (e.g. job satisfaction) and moderating variables (e.g. conscientiousness) resulting in a total questionnaire length of 97 items. Participants are asked to indicate their level of agreement with various statements on a 6-point Likert scale (1='doesn`t apply at all' to 6='fully applies'). The questionnaire takes about 15–20 min to complete. A pretest of the questionnaire among 93 HEI staff members was performed in order to verify its understandability, completeness, and structure. Moreover we tested for the reliability of the constructed scales and items. The pretest results led to minor revisions of the questionnaire's wording. Additionally, three items from the communication scale were removed from the initial survey due to insufficient reliability, resulting in a final questionnaire of 94 items (for a detailed description of the pilot study results, see Sattler, Sonntag, and Götzen 2016).

Methods

Study objectives and hypotheses

The study objectives of this paper are 1) to investigate the psychometric properties of the organizational-psychological questionnaire of the QCI, and 2) to explore relationships between the quality culture dimensions and several potential outcome measures. Since the operationalization of the quality culture construct represents an innovative process, the assessment of potential outcome measures was explorative in nature. However, our literature review and rationale considerations

give weight to several assumptions concerning relevant dependent variables (Sattler et al. 2013). First, higher scores on the QCI dimensions should be related to a more favorable overall evaluation of the institution's quality culture (global items). Related to that, a higher level of quality culture is likely to lead to higher employer (HEI) and job satisfaction as well as a higher level of affective commitment towards the institution (Ali and Musah 2012; Bendermacher et al. 2017). Finally, higher levels of quality culture should also be reflected in quality-oriented behavior of the institution by supporting HEI members in their personal career development and promoting professional quality-related exchange within the institution (Sattler et al. 2013).

We hypothesize that the organizational-psychological questionnaire represents a reliable and valid tool, assessing six dimensions of quality culture (commitment, responsibility, engagement, leadership, communication, and participation) (H1). Moreover, we propose that these quality culture dimensions are positively related to a) the global assessment of the institution's quality culture (H2); b) employer (HEI) and job satisfaction (H3); c) commitment towards the institution (H4); and d) career development and professional exchange orientation of the institution (H5).

Study participants

The QCI was piloted and implemented at three HEIs in Germany, representing different HEI types: a comprehensive university with excellence status (HEI A), a cooperative/dual university (HEI B), and a university of applied sciences (HEI C). Staff members of the participating institutions were invited to take part in the QCI via email distribution lists including a supportive letter of the respective rectorates. Within the study period, participants were reminded once to take part in the survey. Participation in the study was voluntary and data protection was assured. In a first step, the QCI was applied within a pilot study ($N = 93$) leading to minor revisions of the original questionnaire. The main investigation yielded 789 complete and usable questionnaires (response rate: 10%). Detailed sample characteristics are provided in Table 3.

As expected, academic staff account for the largest target group within our sample (17.5% professors, 36.6% academic assistants) followed by administration (20.5%), service (14.3%) and secretariats (10.6%). Corresponding to that, participants are characterized by a rather high level of further education, with 77.1% holding a university, doctoral or postdoctoral degree. Our sample is also characterized by a significantly higher proportion of female participants (59.4%; $\chi^2(1, N = 727) = 25.817$, $p < .001$). Most of our participants belong to the age group of 30–59 years (82.7%). In total, 62.9% of the sample hold a permanent employment contract with their HEI. As to be expected, temporary employment contracts (37.1%) mainly concern academic staff (64.8%). The duration of employment varies between less than one year (5.8%), 1–4 years (26.8%), 5–9 years (27.8%), 10–19 years (23.1%), and more than 20 years (16.4%), representing heterogeneous levels of knowledge and experience with respect to the quality culture of the participating institutions.

Statistical analyses

In order to explore the underlying factor structure of the final organizational-psychological questionnaire an exploratory factor analysis (EFA) was conducted with data from HEI B ($N = 95$) and HEI C ($N = 113$) using IBM SPSS Statistics (Version 22). As the primary interest of the EFA was to investigate the structure of the collective and individual elements in more detail, we decided to include all items that refer to the following quality culture aspects: leadership (12), communication (6), participation (4), commitment (4), engagement (4), and responsibility (4). Items measuring shared values and trust were not considered in the scope of our analysis as these elements are hypothesized to serve as a mutual basis for developing a quality culture rather than being part of the active quality culture itself (cf. Figure 1). A principal component analysis (PCA) with varimax rotation served as the extraction method. We conducted an iterative process to reach the final factor structure solution: Items that

Table 3. Sample characteristics.

N (%)	Total	HEI A	HEI B	HEI C
N	789	581	95	113
contacted staff	7897	7100	321	476
response rate	10%	8.20%	29.60%	23.70%
HE Group				
presidential level	3 (0.4)	2 (0.3)	–	1 (0.9)
professor	138 (17.5)	74 (12.7)	26 (27.4)	38 (33.6)
academic staff	289 (36.6)	232 (39.9)	21 (22.1)	36 (31.9)
administration	162 (20.5)	126 (21.7)	15 (15.8)	21 (18.6)
secretariats	84 (10.6)	55 (9.5)	26 (27.4)	3 (2.7)
service	113 (14.3)	92 (15.8)	7 (7.4)	14 (12.4)
Sex				
male	295 (40.6)	206 (37.2)	34 (42.0)	55 (59.8)
female	432 (59.4)	348 (62.8)	47 (58.0)	37 (40.2)
Age				
< 30 years	87 (11.8)	72 (12.9)	10 (11.9)	5 (5.4)
30–39 years	194 (26.4)	153 (27.3)	25 (29.8)	16 (17.4)
40–49 years	211 (28.7)	159 (28.4)	28 (33.3)	24 (26.1)
50–59 years	203 (27.6)	144 (25.7)	18 (21.4)	41 (44.6)
≥ 60 years	41 (5.6)	32 (5.7)	3 (3.6)	6 (6.5)
Further Education				
no further education	7 (0.9)	5 (0.9)	1 (1.1)	1 (1.0)
vocational education	130 (17.3)	91 (16.1)	23 (26.1)	16 (16.2)
university degree	308 (41.0)	233 (41.3)	36 (40.9)	39 (39.4)
doctoral degree	202 (26.9)	139 (24.6)	24 (27.3)	39 (39.4)
postdoctoral degree	69 (9.2)	69 (12.2)	0 (0.0)	0 (0.0)
other	35 (4.7)	27 (4.8)	4 (4.5)	4 (4.0)
Duration of Employment				
< 1 year	42 (5.8)	29 (5.3)	10 (12.7)	3 (3.4)
1–4 years	193 (26.8)	140 (25.4)	31 (39.2)	22 (25.0)
5–9 years	200 (27.8)	160 (29.0)	21 (26.6)	19 (21.6)
10–19 years	166 (23.1)	133 (24.1)	12 (15.2)	21 (23.9)
≥ 20 years	118 (16.4)	90 (16.3)	5 (6.3)	23 (26.1)
Temporary Employment				
yes	270 (37.1)	222 (40.4)	28 (33.7)	20 (20.8)
no	458 (62.9)	327 (59.6)	55 (66.3)	76 (79.2)

Note: HEI A = comprehensive university; HEI B = cooperative/dual university; HEI C = university of applied sciences.

did not significantly contribute to the underlying factors were gradually discarded. Eigenvalues >1 were considered sufficient in order to qualify as an independent factor.

In a next step, a confirmatory factor analysis (CFA) was performed with data from HEI A (*N* = 581) in order to strengthen the conclusions from the EFA and test how well the factor solution fits the data. Maximum likelihood estimation methods were used by applying IBM SPSS AMOS (Version 21). The goodness of fit of our measurement model was evaluated by absolute and relative fit indices (χ^2-test, RMSEA, GFI, AGFI, SRMR; and CFI, PCFI, respectively). Reliability and validity of the extracted factors was tested by calculating and analyzing the following measures: Cronbach`s Alpha (internal consistency), average variance extracted (AVE), and composite reliability index (CR). The CFA was followed by a structural equation analysis (SEM) including all independent and dependent variables of our research model.

Results

Exploratory factor analysis (EFA)

First of all, the Kaiser-Mayer-Olkin (KMO) and Bartlett's test for sampling adequacy were significant (KMO = .893, Bartlett-Test: $\chi^2(351) = 4340.486$, $p < .001$). Communalities ranged between $h2 = .590$-.867 with an average of $h2 = .746$. This indicates that the chosen items were adequately correlated in order to perform a factor analysis. Moreover, anti-image correlations were within a reasonable

Table 4. Results of the exploratory factor analysis (EFA).

Scale	Item	Rotated factor loadings						h²
		1	2	3	4	5	6	
1 Leadership behavior	FEE3	**.882**	.063	.060	.087	.037	.030	.795
	VOR2	**.863**	.102	.166	.079	.084	.020	.796
	SUP3	**.859**	.066	−.034	.060	.089	.097	.765
	VOR1	**.855**	.142	.086	.071	.159	.044	.790
	SUP2	**.853**	.086	−.009	.024	.189	.129	.788
	FEE1	**.851**	.092	.119	.050	.191	.103	.796
	FEE2	**.824**	.083	.141	.123	.177	.014	.752
	VOR3	**.773**	.027	.202	−.002	.139	.025	.659
	SUP1	**.770**	.199	−.091	.053	.127	.153	.684
2 Communication	DIS3	.121	**.902**	.028	.070	−.026	.063	.839
	INF1	.067	**.897**	.005	.024	.119	.068	.829
	DIS2	.147	**.875**	.130	−.034	−.024	−.067	.810
	INF2	.069	**.834**	.016	.006	.164	.090	.736
	DIS1	.187	**.834**	.132	.067	.065	.075	.763
	INF3	.061	**.823**	−.085	.099	.172	.087	.734
3 Engagement	ENG1	.078	.018	**.816**	.250	.001	.169	.764
	ENG3	.096	.183	**.730**	.197	.106	.199	.666
	ENG4	.178	−.044	**.680**	.139	.143	.233	.590
4 Commitment	COM1	.066	.041	.072	**.839**	.058	.245	.778
	COM3	.133	.037	.216	**.811**	.070	.103	.739
	COM2	.117	.112	.397	**.730**	−.001	.039	.719
5 Leadership expectations	ERW2	.391	.186	.085	.015	**.818**	.057	.867
	ERW1	.356	.183	.051	.151	**.762**	.116	.780
	ERW3	.495	.144	.260	−.005	**.632**	−.087	.741
6 Participation	PAR2	.108	.026	.117	.043	−.025	**.783**	.642
	PAR3	.008	.109	.209	.199	.133	**.740**	.660
	PAR1	.218	.130	.232	.157	.001	**.719**	.660
Cronbach´s Alpha		.956	.939	.752	.792	.853	.726	
Eigenvalues	Total	9.39	3.97	3.19	1.32	1.24	1.04	
Variance explained	74.6%	26.2%	17.5%	8.2%	8.0%	7.4%	7.3%	

Note: Extraction method: Principal Component Analysis; Rotation method: Varimax; h^2 = communalities.

range (MSA = .758–.955; average: .878). The EFA resulted in six factors with eigenvalues >1, accounting for 74.6% of the total variance (see Table 4). The factors were labeled leadership behavior, communication, engagement, commitment, leadership expectations, and participation. Interestingly, leadership items were divided into two distinct factors, representing quality-oriented expectations (e.g. 'My supervisor has high demands on the quality of my work') and actual quality-oriented behavior (e.g. 'My supervisor provides constructive feedback concerning the quality of my work').

Contrary to our hypothesis, responsibility was not identified as an independent factor within our dataset. The corresponding items showed ambiguous factor loadings leading to their exclusion from the final factor solution (4 items). Another three items were excluded due to insufficient communalities (ENG2, COM4, PAR4), resulting in a total number of 27 items for the final EFA.

Cronbach´s alpha values for the extracted factors are provided in Table 4. All values range between α = .726 and α = .956 indicating good (participation) to excellent (leadership behavior, communication) reliability of the derived factors.

Confirmatory factor analysis (CFA)

Adequacy of the EFA factor solution was further evaluated by applying a CFA (maximum likelihood estimation). The goodness of fit of the measurement model was sufficient: χ^2/df = 2.200. Moreover all of the reported absolute (RMSEA, GFI, AGFI, SRMR) and relative fit indices (CFI, PFI) reached highly satisfactory values, in light of the recommendations given by Hooper, Coughlan, and Mullen (2008) (see Table 5).

Table 5. Results of the CFA-analysis ($\chi^2 = 640.182$; df = 291; $p < .001$).

Metric	Observed value	Recommended*
χ^2/df	2.200	2.0–5.0
RMSEA	.045 [90% CI: .041 − .050]	<.06
GFI	.924	>.90
AGFI	.902	>.90
CFI	.971	>.95
PCFI	.805	>.50
SRMR	.035	<.05

Note: Values recommended by Hooper, Coughlan, and Mullen (2008); df = degrees of freedom; RMSEA = Root mean square error of approximation; GFI = Goodness-of-fit index; AGFI = Adjusted GFI; CFI = Comparative fit index; PCFI = Parsimony-adjusted CFI; SRMR = Standardized root mean square residual.

Validity and reliability

The composite reliability (CR) for each factor was >.700 indicating the extraction of reliable factors within the CFA. AVE (average variance extracted) values were calculated in order to test for convergent validity (Fornell and Larcker 1981). The AVE was above .500 for all scales except participation, which was close at .438. However, as the reliability score was greater than .700 we decided to retain the participation scale in the model. A comparison between the square root of the AVE (diagonal values in Table 6) to the inter-factor correlations served as a test for discriminant validity. As all square roots of the AVE were greater than the inter-factor correlations, adequate discriminant validity was demonstrated by the data.

In summary, the results of the CFA strongly support the six-factor solution suggested by the previously performed EFA including a total number of 27 items.

Common-method bias

In order to test for common-method bias, we first conducted the Harman`s single-factor test (Podsakoff et al. 2003). The six-factor solution of the EFA accounted for 74.6% of the total variance. As required, the strongest factor (leadership behavior) did not explain the majority of the total variance (26.2%). In addition, we did not find an overarching factor in the unrotated factor loading matrix. In a second step, we performed the single-common-method-factor test (Podsakoff et al. 2003). The goodness of fit of a common latent factor (CLF) model, in which all manifest variables are explained through a single factor ($\chi^2 = 4704.481$, df = 306; χ^2/df = 15.374, $p < .001$) was significantly worse than the goodness of fit of the actual research model ($\Delta \chi^2 = 4064.299$; Δ df = 15; $p < .001$). Moreover, standardized factor loadings were not significantly affected by the presence of a CLF ($\Delta <.0100$). The same holds true for CR and AVE values. These results indicate that it is very unlikely that a common-method should explain the observed relations between our study variables.
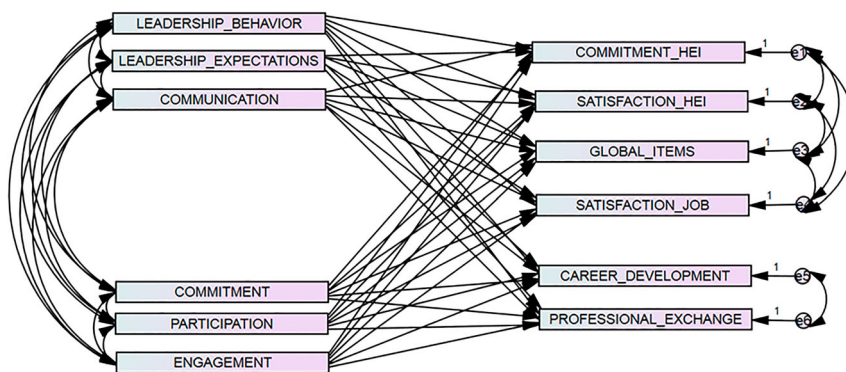
Structural equation model (SEM)

In a next step, we performed a structural equation analysis in order to identify significant relationships between our independent and dependent variables (see Figure 2).

Table 6. Validity and reliability (CFA).

	Scale	a	CR	AVE	1	2	3	4	5	6
1	Leadership behavior	.952	.947	.668	**.817**					
2	Communication	.940	.940	.722	.302	**.850**				
3	Engagement	.816	.816	.597	.241	.268	**.773**			
4	Commitment	.850	.852	.659	.195	.206	.633	**.812**		
5	Leadership expectations	.857	.862	.676	.639	.230	.325	.270	**.822**	
6	Participation	.700	.700	.438	.279	.382	.494	.536	.325	**.662**

Note: a = Cronbach's Alpha; CR = composite reliability, AVE = Average variance extracted.

Figure 2. Applied Structural Equation Model.

Previous analyses confirmed that the connection between independent and dependent variables was linear. Moreover, multicollinearity was not an issue within the data set as all variance inflation factor values were below VIF < 3. Means, standard deviations, and correlations between independent and dependent variables are provided in Table 7.

Standardized regression weights of the SEM are provided in Table 8. The strongest beta-values were detected concerning quality-oriented leadership behavior (β = .205–.554), which was positively related to all dependent variables. In contrast, leadership expectations were not significantly related to the dependent variables except for job satisfaction. Interestingly, this relationship was negative in nature, which means that higher leadership expectations were associated with lower job satisfaction values. Quality-oriented communication was found to be related to higher HEI commitment (β = .148), HEI satisfaction (β = .250), global assessment of quality culture (β = .202), job satisfaction (β = .214), and professional exchange (β = .083). On the individual level engagement showed positive relations with HEI commitment (β = .120) and job satisfaction (β = .120). The same holds true for commitment, which was additionally associated with a more favorable assessment of global quality culture (β = .196). Finally, participation was linked to HEI commitment (β = .105), career development (β = .122) and professional exchange (β = .161) while all other proposed relationships remained non-significant. Construct variance explained ranged between R^2 = .232 (professional exchange) and R^2 = .365 (job satisfaction).

Discussion

Our study yielded the following major findings: First of all, EFA and CFA analyses confirmed a six-factor structure of the QCI, supporting the reliability and validity of the questionnaire (H1). Secondly, these quality culture factors were found to be related to several desirable outcome variables, such as job satisfaction, HEI commitment, and career development (H2-H5). This was especially true for quality-oriented leadership behavior, which showed the strongest effect on our proposed quality culture outcomes, followed by communication and commitment towards quality.

While all of the collective factors (leadership, communication, participation) were confirmed by the EFA and CFA analyses, only commitment and engagement were derived as independent factors on the individual level. Items reflecting responsibility towards quality issues had to be discarded from further analyses due to ambiguous factor loadings leading to an insufficient overall factor solution. These results indicate that the responsibility items need to be revised in further studies in order to obtain an independent responsibility factor. However, all of the other proposed quality culture dimensions were adequately represented in our questionnaire and in-depth analyses supported the reliability and validity of the developed scales.

Table 7. Means (M), standard deviations (SD), and correlations between independent and dependent variables.

Scale	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
Lead BEHV	12.01	4.31	1											
Communication	14.01	3.58	.276	1										
Engagement	15.93	2.43	.212	.231	1									
Commitment	14.97	2.99	.182	.171	.502	1								
Lead EXP	13.67	3.64	.572	.206	.276	.256	1							
Participation	13.45	3.12	.235	.303	.362	.395	.254	1						
Commitment HEI	13.12	3.45	.308	.290	.324	.354	.216	.310	1					
Satisfaction HEI	10.82	2.82	.429	.371	.194	.202	.268	.232	.470	1				
Global Items	10.11	2.99	.391	.334	.238	.313	.298	.265	.466	.735	1			
Satisfaction Job	13.42	2.85	.531	.369	.290	.250	.285	.223	.504	.509	.452	1		
Career DEV	9.55	2.51	.579	.146	.171	.114	.355	.229	.238	.260	.238	.400	1	
Professional EX	10.54	2.61	.430	.242	.200	.138	.313	.283	.194	.286	.209	.320	.518	1

Note: Scales were transformed to a maximum of 18 points; All correlations are significant ($p < .05$); M = mean, SD = standard deviation; Lead BEHV = Leadership behavior; Lead EXP = Leadership expectations; HEI = higher education institution; Career DEV = career development; Professional EX = professional exchange.

Table 8. SEM: standardized regression weights.

	Scale	Commitment HEI		Satisfaction HEI		Global Items		Satisfaction JOB		Career DEV		Prof EXCH	
		β	t	β	t	β	t	β	t	β	t	β	t
1	Leadership behavior	**.205*****	4.551	**.340*****	7.640	**.263*****	5.900	**.483*****	11.716	**.554*****	13.254	**.330*****	7.266
2	Communication	**.148*****	3.772	**.250*****	6.469	**.202*****	5.230	**.214*****	5.974	−.047	−1.292	**.083***	2.120
3	Engagement	**.120****	2.752	.014	0.322	.007	0.172	**.120****	3.027	.044	1.099	.058	1.323
4	Commitment	**.201*****	4.606	.076	1.770	**.196*****	4.553	**.094***	2.358	−.051	−1.251	−.044	−1.011
5	Leadership expectations	-.043	−0.955	−.013	−0.285	.041	0.913	**−.090***	−2.159	.020	0.477	.062	1.354
6	Participation	**.105***	2.523	.045	1.091	.052	1.250	−.014	−0.363	**.122****	2.893	**.161*****	3.841
	Construct R²	.240		.263		.259		.365		.348		.232	

Note: $p < .001$***; $p < .01$**; $p < .05$*; HEI = higher education institution; Career DEV = career development; Professional EX = professional exchange.

Interestingly, EFA and CFA analyses resulted in two independent leadership factors, representing leadership behavior and leadership expectations. However, only the behavior factor was positively related to the proposed outcome measures, showing the strongest effects on career development and job satisfaction. By contrast, high leadership expectations were negatively related to job satisfaction while all other proposed model paths remained insignificant. Thus, providing an adequate role model in terms of quality-oriented leadership behavior seems to have a much more beneficial effect than just communicating high performance expectations. These results indicate that quality-oriented leadership behavior represents a decisive factor in furthering various favorable quality culture outcomes. Hence, our results empirically support the literature review by Bendermacher et al. (2017), who identified leaders as being of key importance to quality culture development as they have the 'ability to influence resource allocation, clarify roles and responsibilities, create partnerships and optimize people and process management' (39). Our results are also in line with Gvaramadze (2008) and other authors (e.g. Ali and Musah 2012; EUA 2006; Gordon 2002; Loukkola and Zhang 2010; Yorke 2000), who stress the decisive role of the university management level in creating a common quality vision, common quality values, and a common quality strategy, while at the same time transferring responsibility to HEI members. In summary, it seems to be crucial for quality culture development that higher education leaders exemplify a quality orientation in their day-to-day work, providing an appropriate role model for others.

Communication was positively related to all dependent variables in our model (except career development). Accordingly, our results give weight to the assumption that effective communication leads to a higher level of job satisfaction, HEI satisfaction, HEI commitment, and a more favorable assessment of the institutions quality culture (global items). Several authors consider the existence of effective communication and information paths a necessary condition for a successful, strategic implementation of quality culture in higher education (e.g. Ehlers 2009; EUA 2006; Harvey and Stensaker 2008). Accordingly, communication is considered to be essential to develop a common quality understanding, disseminate quality strategies, implement quality-related measures, evaluate results, and learn about staff values and beliefs (Bendermacher et al. 2017; Yorke 2000). In this context, it is important to note that quality culture is not only about vertical (top-down) communication: effective horizontal (collegial) communication and discussions about quality issues are considered essential in order to guarantee a vital discursive process in quality culture development (Bendermacher et al. 2017; EUA 2006; Yorke 2000). The QCI offers the opportunity to investigate potential differences between horizontal and vertical communication paths, which will be an interesting part of our upcoming data analyses.

Finally participation, commitment, and engagement were positively related to HEI commitment and several additional outcome variables. Previous publications state that quality culture requires a high level of commitment, engagement, and participation of all stakeholders (EUA 2006; Gvaramadze 2008). The aim is to ensure a bottom-up approach and a democratic process so all HEI members take responsibility for quality culture development (EUA 2006; Harvey and Green 1993). In this context, commitment on the part of the management level is seen as a necessary but not sufficient condition for quality culture development, as commitment to quality needs to be present throughout an institution (Bendermacher et al. 2017). Further analyses of our data will focus on potential status group differences concerning participation, commitment, and engagement levels. Respective results have the potential to contribute to target-oriented quality improvement measures, as these QCI dimensions may not be equally pronounced among all HEI status groups.

Limitations

Our results clearly indicate that the collective and individual elements of quality culture represent relevant predictors of various dependent variables such as HEI commitment and job satisfaction.

However, longitudinal designs need to be applied in future studies in order to allow for the testing of causal relationships, as our cross-sectional results can only point to correlative connections.

The QCI relies on the subjective statements of participants, which makes it susceptible to social desirability effects. While mean values of some study factors were on the upper end of the scale (e.g. commitment, engagement), sufficient standard deviations indicate adequate variability within our data. Moreover, a test of items for normality revealed that the skewness and kurtosis of almost all items was within an acceptable range, except for five items, which were slightly peaked (COM2, COM3, ENG1, ENG3, ENG4). Data collection for this study included three HEIs in Germany, which limits the transferability of the results to other national contexts. Related to that, the validation of the QCI was limited to a German version of the questionnaire. Accordingly, the results of the current study need to be supplemented by the validation of an English version of the QCI, which can be applied in international contexts. Unfortunately, our overall response rate was relatively low at 10%, so that a response bias cannot be ruled out with certainty. However, demographic data support the assumption that our sample represents the members of the participating HEI institutions adequately in terms of HE group, age, further education and so forth (cf. Table 3). Future studies need to address the question of how to motivate more HE members to participate in the QCI in times of information flooding and general survey fatigue.

Summary and future prospects

The Quality Culture Inventory represents a comprehensive approach that enables HEIs to analyse their quality culture in an economical way. Our statistical analyses determined the reliability and validity of the QCI scales, which provide detailed insights into various quality culture dimensions, such as commitment and engagement on the individual level, or quality-oriented leadership and communication on the collective level. Data from the organizational-psychological and structural-formal survey offer the possibility to create differentiated quality culture profiles, which allow for institution-specific analyses of strengths and developmental potential (for examples of quality culture profiles, see Sattler and Sonntag 2018).

Our future studies will focus on in-depth analyses of potential moderating variables. It would be very interesting, for instance, to examine whether temporary employment affects the level of individual commitment and engagement towards quality. Another research question pertains to the possible existence of HEI-specific and multiple quality cultures within HEIs (e.g. on the faculty or status group level). Future studies are also needed to explore the proposed connecting function of quality-oriented leadership, communication, and participation with respect to the individual and structural-formal level in more detail. Longitudinal studies are desirable in order to investigate causal relationships between the study variables. Finally, the planned English language version of the QCI will allow further studies in an international context.

In summary, our research results empirically support the findings of previous – mainly qualitative – research on relevant quality culture dimensions in the context of higher education. Moreover, our empirical data shed light on potential favorable outcome measures, thereby emphasizing the benefits of nurturing a culture of quality in the higher education context. The QCI has proven to be a reliable and valid tool that can be readily used for quality culture analyses. The respective results of the QCI point to institution-specific strengths and weaknesses of quality culture, which serves as a sound starting point for reflecting on quality culture and developing focused measures for improving it.

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