Rapid Evidence Assessment
of the research literature on the link between
organizational culture and performance

Organizational Culture & Performance:
a rapid assessment of the scientific evidence

1.   Rationale for this review

For decades organizational culture has been claimed to be an important driver of organizational success. It is assumed that certain cultures are 'bad' or 'weak' and need to be changed, whereas others are more constructive and need to be strengthened. As pointed out by Scott at al 2003, the claim that organizational culture affects firm performance rests upon three underlying assumptions: 1) an organization has an identifiable culture; 2) culture is related to performance; 3) a culture can be changed to positively impact performance. Although intuitively appealing and often accepted as fact - a recent survey showed that 78 percent of Fortune 1000 CEO's believe culture to be one of the top three factors affecting their firm's performance (Graham, 2016) - academia has a somewhat uneasy relationship with this claim. In fact, many scholars question whether 'organizational culture' is a valid construct to start with, whereas others suggest that you can't measure - and thus can't manage or change - an organization's culture. For this reason, Novartis approached the Center for Evidence-Based Management (CEBMa) to undertake a review to understand what is known in the scientific literature about the link between culture and performance.

2. Main question: What does the review answer?

What is known in the scientific literature about the link between organizational culture and performance?

Other issues raised, which will form the basis of our conclusion regarding the main question above, are:

1. *What is meant by organizational culture (what is it)?*
2. *What is the assumed logic model (how is it supposed to enhance performance)?*
3. *How can organizational culture be measured?*
4. *What is known about the link between organizational culture and performance?*
5. *What culture elements in particular are linked with performance (is there a difference in impact)?*
6. *Is there a different impact on specific performance outcomes (e.g. operational efficiency, innovation, commercial performance, society's trust)?*
7. *What is known about the effectiveness of strategies to change organizational culture?*

3.   Search strategy: How was the research evidence sought?

The following three databases will be used to identify studies: ABI/INFORM Global from ProQuest, Business Source Premier from EBSCO, and PsycINFO from Ovid. The following generic search filters will be applied to all databases during the search:

1. Scholarly journals, peer-reviewed
2. Published in the period 1980 to 2019 for meta-analyses and the period 2000 to 2019 for primary studies.
3. Articles in English

A search was conducted using combinations of different search terms, such as 'culture', 'performance', and 'workplace'. In addition, a search was conducted for studies that used the four most prominent quantitative approaches to assessing organizational culture: the Denison Organizational Culture Survey (DOCS), the Organizational Culture Assessment Instrument (OCAI), the Organizational Culture Inventory (OCI) and the Organizational Culture Profile (OCP).

We conducted 21 search queries and screened the titles and abstracts of more than 500 studies. An overview of all search terms and queries is provided in Annex I.

In addition, the MetaBUS database - an online repository of meta-analytic effect sizes and related information from the field of applied psychology - was searched for correlations between the constructs organizational culture and performance. This search yielded 60 studies.

Finally, the Cochrane Library and Medline were searched for systematic reviews. This search yielded 2 studies.

4.   Selection process: How were the studies selected?

Two reviewers worked independently to identify which studies should be included. Where the reviewers disagreed on selection, a third reviewer assessed whether the study was appropriate for inclusion with no prior knowledge of the initial reviewers' assessments. The decision of the third reviewer was final.

Study selection took place in two phases. First, the titles and abstracts of the studies identified were screened for their relevance to this review. In case of doubt or lack of information, the study was included. Duplicate publications were removed. This first phase yielded 14 secondary studies (meta-analyses) and 49 primary studies.

Secondly, studies were selected based on the   full text of the article according to the following inclusion criteria:

1. Type of studies: Only quantitative, empirical studies. Qualitative research will also be drawn on for the logic model (what is culture & how is it assumed to work) but not for association or effect.

2. Measurement: Only studies in which the link between culture/climate and organizational outcomes was measured

3. Context: Only studies related to workplace settings.

4. Level of trustworthiness: Only studies that were graded level C or above (see below).

In addition, the following exclusion criteria were applied:

1. Cross-cultural studies

2. Studies on the effect of national cultures or the socio-cultural environment

3. Studies on the effect of subcultures (e.g. team-, group- or professional culture)

This second phase yielded 9 secondary studies and 6 primary studies. An overview of the selection process is provided in Annex II.

5. Critical appraisal: What is the quality of the studies included?

In almost any situation it is possible to find a scientific study to support or refute a theory or a claim, and sometimes to quite a large degree. It is therefore important to determine which studies are trustworthy (i.e. valid and reliable) and which are not. The trustworthiness of a scientific study is first determined by its methodological appropriateness. For cause-and-effect claims (i.e. if we do A, will it result in B?), a study has a high methodological appropriateness when it fulfils the three conditions required for causal inference: co-variation, time-order relationship, and elimination of plausible alternative causes (Shaughnessy & Zechmeister, 2006). A study that uses a control group, random assignment and a before-and-after measurement is therefore regarded as the 'gold standard'. Non-randomized studies and before-after studies come next in terms of appropriateness. Cross-sectional studies (surveys) and case studies are regarded as having the greatest chance of showing bias in the outcome and therefore sit lower down in the ranking in terms of appropriateness. Meta-analyses in which statistical analysis techniques are used to pool the results of controlled studies are therefore regarded as the most appropriate design.

To determine the methodological appropriateness of the included studies' research design, the classification system of Shadish, Cook and Campbell (2002), and Petticrew and Roberts (2006) was used. The following four levels of appropriateness were used for the classification:

Design	Level
Systematic review or meta-analysis of randomized controlled studies	AA
Systematic review or meta-analysis of controlled and/or before-after studies	A
Randomized controlled study	A
Systematic review or meta-analysis of cross-sectional studies	B
Non randomized controlled before-after study	B
Interrupted time series	B
Controlled study without a pretest or uncontrolled study with a pretest	C
Cross-sectional study	D

It should be noted, however, that the level of methodological appropriateness as explained above is only relevant in assessing the validity of a cause-and-effect relationship that might exist between a predictor/driver (organizational culture) and its outcomes (performance), which is the purpose of this review.

In addition, a study's trustworthiness is determined by its methodological quality (its strengths and weaknesses). For instance, was the sample size large enough and were reliable measurement methods used? To determine methodological quality, all the studies included were systematically assessed on explicit quality criteria. Based on a tally of the number of weaknesses, the

trustworthiness was downgraded and the final level was determined as follows: a downgrade of one level if two weaknesses were identified; a downgrade of two levels if four weaknesses were identified, etc.

Finally, the effect sizes were identified. An effect (e.g. a correlation, Cohen's d or omega) can be statistically significant but may not necessarily be of practical relevance: even a trivial effect can be statistically significant if the sample size is big enough. For this reason, the effect size – a standard measure of the magnitude of the effect – of the studies included was assessed. To determine the magnitude of an effect, Cohen's rules of thumb (Cohen, 1988) were applied. According to Cohen a 'small' effect is an effect that is only visible through careful examination. A 'medium' effect, however, is one that is 'visible to the naked eye of the careful observer'. Finally, a 'large' effect is one that anybody can easily see because it is substantial.

5.   Outcome of the critical appraisal

The overall quality of the studies included in this review is moderate to low. Most of the meta-analyses were based on cross-sectional studies, and where therefore qualified as level C. Only one meta-analysis was graded level B.

It should be noted that this review came across many studies that used a sample of "CEOs or senior managers estimated as having adequate knowledge of the organizational culture and performance within their companies." In addition, many studies use self-report measures to assess the culture-performance link. This suggests that, in general, the methodological quality of studies on organizational culture and performance tends to be rather low.

6.   Main findings

Question 1a: What is meant by organizational culture?

Finding 1:   There is no consensus of what 'organizational culture' entails

Organizational culture is an anthropological construct to analyze organizations as micro-societies: it sees the organization as a group of people who share ideas, customs, and social behavior. It is related to - but conceptually different from - organizational climate. Culture refers to a pattern of shared underlying norms and assumptions - rooted in history, collectively held, interconnected, and not easily changed - whereas climate refers to employees' perceptions of the organization's policies, practices and procedures and the behaviors they observe getting rewarded (Scott, 2003; Denison, 1996).

Research on organizational culture dates back at least as far as the late 1970s. A search in ABI/INFORM on the term organizational (or 'corporate') culture in the abstract yields more than 5,300 results of peer-reviewed papers published in scholarly journals, spanning a period of five decades. Although references to organizational culture are found in both popular management books and the academic literature, there does not seem to be a sharp, accepted definition of the concept. In fact, despite the large number of academic publications, there is no clear consensus of what 'organizational culture' entails. As a result, there are many definitions of organizational culture available.[1] However, at the risk of oversimplifying, it could be argued that two dominant schools of thought can be identified.

1. Schein's Organizational Culture Model

One of the most widely used definitions is provided by Edgar Schein (2004), who describes organizational culture as "*A pattern of shared basic assumptions learned by an organization as it solved its problems of external adaptation and internal integration, which has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems.*" Schein's model originated in the 1980s and identifies three distinct levels in organizational cultures:
- underlying assumptions and beliefs (that may be conscious or unconscious)
- norms and values about appropriate attitudes and behaviors (that may be espoused or real)
- artifacts that may reflect these (e.g., symbols and language)

2. Culture Traits - Strengths Models

The second school of thought takes a different approach. Rather than defining what organizational culture is, Culture Traits Strengths Models aim to identify separate culture traits (e.g. particular values, beliefs, criteria for success, norms, and shared behavior) that represent a distinctive culture 'profile'. The managerial implications of traits-strengths models are often clear and can be easily communicated: culture profiles that impede performance are 'bad' or 'weak' and need to be changed, whereas culture profiles that enhance performance are 'strong' and need to be fostered. As such it has become the dominant model among practitioners and consulting firms. As a result, a large number of 'strong' culture profiles are available, often accompanied by a specific assessment tool that claims to measure its underlying traits. Some of the most widely used models/tools are

- DOCS - The Denison Organizational Culture Survey, based on the theory of Dan Denison, identifying 'strong' traits such as employee involvement, internal consistency and adaptability.

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[1] For example, already in 1984, Allaire and Firisotu noted more than 160 different definitions.

- OCAI - the Organizational Culture Assessment Instrument, based on Quin and Cameron's Competing Values Framework, differentiating between a clan-, adhocracy-, hierarchy-, or market culture.

- OCI - the Organizational Culture Inventory, based on the Life Styles Inventory developed by Lafferty, differentiating between a constructive-, passive/defensive-, or aggressive/defensive culture.

In addition to these two schools of thought, a wide range of definitions, theories, models and frameworks are available. As will be explained below, the lack of a clear, operational definition has serious methodological consequences for the assumed culture - performance link.

Question 2:   What is the assumed logic model? (How is it supposed to work?)

Finding 2:   **It is unclear how organizational culture enhances performance**

One of the earliest empirical studies that explicitly examined the effect of organizational culture is 'On studying organizational cultures' by Andrew Pettigrew, published in 1979. Since then many popular management books, as well as academic conferences, and special issues of scholarly journals have emphasized the impact of organizational culture on organizational outcomes, claiming that organizations with a strong culture - demonstrating a well-integrated and effective set of specific values, beliefs, and behaviors - will perform at a higher level of productivity. In addition, it is argued that organizational culture creates competitive advantage by defining the boundaries of the organization in terms of individual interactions and information processing capabilities. (Krefting and Frost, 1985).

To provide a logic model for the culture-performance link, a clear definition and a coherent theoretical framework is needed. Unfortunately, as explained above, both are lacking. As a result, the logic model for the culture-performance link is not based on a single coherent theory, but rather a number of separate, loosely related hypotheses, often pertaining to a particular culture profile and specific performance outcome. For example, it is suggested that an 'adhocracy culture' enhances a company's innovative performance by emphasizing values such as growth, stimulation, variety, and autonomy (Cameron & Quinn, 1999). It is hypothesized that these values encourage employees to take risks and utilize creativity to identify and respond to customer needs (Cameron et al., 2006). A market culture, on the other hand, is assumed to boost profitability by focusing employees' attention to activities that deliver lucrative financial results.

In addition to these hypotheses, a wide range of alternative explanations for the assumed culture-performance link are available.

Question 3:   How can organizational culture be measured?

Finding 3:   **There is no consensus of how organizational culture can be measured. Although many culture assessment tools are available, most of the underlying research is inadequate to establish their reliability and validity. At best, some of these tools show some predictive validity but their construct validity is less clear.**

There are many assessment tools and questionnaires available that claim to measure (elements of) organizational culture. Among scholars studying culture, however, there is a debate on the most appropriate method - qualitative versus quantitative - to assess culture. Proponents of Schein's Organizational Culture Model argue that culture is characterized by implicit beliefs and unconscious assumptions, thus assessing it requires a qualitative approach involving open interviews and

observations by a well-trained assessor, often over several weeks or even months. In contrast, advocates of the Culture Traits Strengths Model argue that culture is something an organization has, not something an organization is. As such, they focus on the espoused values, beliefs, criteria for success, and organizational norms that guide employees' behavior, often using quantitative approaches (survey questionnaires).

Aside from the qualitative-quantitative debate, perhaps the biggest obstacle to developing an integrative theory of culture is that scholars have adopted vastly different construct definitions and measurement approaches (ref paradigm lost). A systematic review by Jung et al. (2009) identified no fewer than 70 culture diagnostic instruments and concluded that the underlying research is "inadequate to establish the reliability and validity of the majority of instruments". Because managers believe culture to be important, it has fueled a large and financially lucrative consulting practice that offers a wide range of diagnostic tools that claim to measure culture - notwithstanding the fact that its meaning remains ambiguous and the tools themselves are proprietary, so the psychometric qualities are often not available. In addition, researchers have developed a limited set of questions that claim to measure culture and, in some cases, have simply relabeled their measures as "culture."   A well-known example is the best-selling book 'Corporate Culture and Performance' by Kotter & Heskett. The authors surveyed 600 respondents from 200+ U.S. companies to assess the "culture strength" of these firms with only three questions:

1. Have managers of competing firms commonly spoken of this company's "style" or way of doing things?
2. Has this firm both made its values known through a creed or credo and made serious attempts to encourage managers to follow them?
3. Has this firm been managed according to long-standing policies and practices other than those of the incumbent CEO?

Each respondent was asked to rate each of the 200+ firms on a scale ranging from (1) a very strong culture to (5) a very weak culture. Not surprisingly, several researchers have identified a number of limitations that seriously affect the reliability of the authors' findings (ref Chatman).

In a recent review by Chatman and O'Reilly (2016) the scientific underpinning and construct validity of the four most prominent quantitative approaches to assessing organizational culture (DOCS, OCAI, OCI, and OCP) are discussed. Although these instruments have often provided good predictive validity and have demonstrated test-retest reliability, there is no evidence of construct validity, meaning that it is unclear what exactly is being measured. Put differently, these tools have been shown to be correlated with some organizational outcomes and predict aspects of organizational behavior, but we don't know what exactly they measure. As Chatman and O'Reilly point out, a possible reason that studies show correlations with organizational effectiveness is that some of these instruments (e.g. OCAI and DOCS) were originally designed to measure, not organizational culture, but organizational effectiveness.

Question 4:   What is known about the link between organizational culture and performance?

Finding 4:   The scientific evidence does not consistently show that organizational culture is linked to performance (level A)

Several well conducted meta-analyses have demonstrated that the correlations between culture and performance outcomes are evenly split as either positive, close to zero, or non-significant (see for example Scott, 2003; Taras, 2010; Brand, 2012; Hartnell, 2011; Hunt, 2012; Hartnell, 2019). This finding is consistent with the outcome of controlled and/or longitudinal studies (e.g. Kline,

2000; Jacobs, 2013; Kim, 2019). A possible explanation for this finding is that organizational culture is a multidimensional construct that can be measured in a many different ways. It is therefore likely that some culture elements/traits may be relevant in some circumstances and irrelevant in others, resulting in mixed and inconsistent findings when the culture-performance link is measured.

Finding 5: **The association between organizational culture and performance is moderate to low (level A)**

The overall correlation between (aspects of) organizational culture and performance outcomes in general reported by meta-analyses is moderate to low - varying from zero (Brand, 2012) to .2 (Eisend, 2012) and .4 (Hartnell, 2019). This finding was confirmed by the MetaBUS database - an online repository of meta-analytic effect sizes from the field of applied psychology - the over-all mean correlation found based on 60 studies is .16

Finding 6: **The association between organizational culture and performance is substantially lower when hard/objective outcome measures are used (level A)**

Several meta-analyses and longitudinal studies report that when performance outcomes are measured objectively, the correlation with organizational culture is low (e.g. Hartnell, 2019; Kline, 2000). For example, a meta-analysis of 84 studies representing 880 correlations (Hartnell, 2011) found that the association between culture profiles and hard/objective performance outcomes (e.g. increase in revenue and/or number of employees and profitability) are substantially lower than when subjective performance measures are used (r =.1 versus r =.4).

Finding 7: **Organizational culture is a weak predictor for performance when compared to other factors (level C)**

Several meta-analyses report that organizational culture is a rather weak performance indicator when compared to the direct effect of several other factors. For example, a meta-analysis based on 598 studies found that culture was the weakest predictor of performance with the direct effect of cultural values being close to zero ($\rho=0.03$), whereas other factors such as demographics, and personality traits showed stronger links, and general mental ability stood out as a remarkably good predictor ($\rho= .54$) of performance (Taras, 2010). This finding was confirmed in a recent meta-analysis including 149 studies, demonstrating that some culture dimensions do not have unique predictive utility when controlling for factors such as leadership and performance management (Hartnell, 2019).

Question 5: What culture elements in particular are linked with performance (is there a difference in impact)?

Question 6: Is there a different impact on specific performance outcomes?

Finding 8: **The strength of the association between organizational culture and performance varies depending on the culture profile and the type of performance that is measured (level A)**

The correlation coefficients reported in both meta-analyses and controlled/longitudinal studies vary depending on the culture profile and the type of performance that is measured (e.g. Kim, 2019; Eisend, 2016). For example, a recent meta-analysis based on 48 independent samples representing 26,196 organizations demonstrate that the correlation between a 'clan culture' and

organizational level innovation outcomes (e.g. the development and/or introduction of new and improved procedures, practices, or products) is moderate (.43) whereas the correlation with financial performance is low (.13) (Hartell, 2019). However, this review did not find reliable and conclusive evidence that some culture elements have a consistent, larger impact on performance than others, nor did this review find reliable and conclusive evidence that specific outcomes are more sensitive to (aspects of) organizational culture.

Question 7: What is known about the effectiveness of strategies to change organizational culture?

Finding 9: It is not possible to draw any conclusions about the effectiveness of interventions to change organizational culture (level AA)

This REA did not find any studies in which the effectiveness of interventions to change an organization's culture was assessed in a valid and reliable way. This finding is consistent with a Cochrane review published in 2011 in which no rigorous evidence was found to demonstrate the effect of strategies to change organizational culture on (healthcare) performance (Parmelli, 2011).

7. Conclusion

Empirical research on the link between organizational culture and performance has been hampered by a number of conceptual and methodological challenges including disagreements about defining and assessing culture. As a result, the studies included in this review are hard to compare and lack the methodological rigor necessary to demonstrate a causal link. As explained, to demonstrate a causal relationship between culture and performance three conditions must be met. Most studies meet only one, that is: demonstrating a correlation.

However, this does not mean that the findings of this REA are inconclusive. On the contrary, the findings are very clear: there is little evidence consistently linking organizational culture to performance, but if such a link should exist, it is very weak and too small to be practically meaningful. As such, organizations and practitioners should be careful spending time and money on company-wide culture change programs as they are not likely to increase performance.

8. Limitations

This REA aims to provide a balanced assessment of what is known in the scientific literature about the link between organizational culture and performance by using the systematic review method to search and critically appraise empirical studies. However, in order to be 'rapid', concessions were made in relation to the breadth and depth of the search process, such as the exclusion of unpublished studies, the use of a limited number of databases and a focus on empirical research published in the period 1980 to 2019 for meta-analyses and the period 2000 to 2019 for primary studies. In addition, the search for empirical studies was based only on combinations of different search terms, such as 'culture', and 'performance', and 'workplace', and a search for studies that used the four most prominent quantitative approaches to assessing organizational culture. As a consequence, some relevant studies may have been missed.

A second limitation concerns the critical appraisal of the studies included, which did not incorporate a comprehensive review of the psychometric properties of the tests, scales and questionnaires used.

Finally, this REA focused only on high-quality primary studies, i.e. studies with a control group and/or a before- and after-measurement. For this reason, a large number of cross-sectional studies were excluded. As a consequence, new, promising findings that are relevant for practice may have been missed.

Given these limitations, care must be taken not to present the findings presented in this REA as conclusive.

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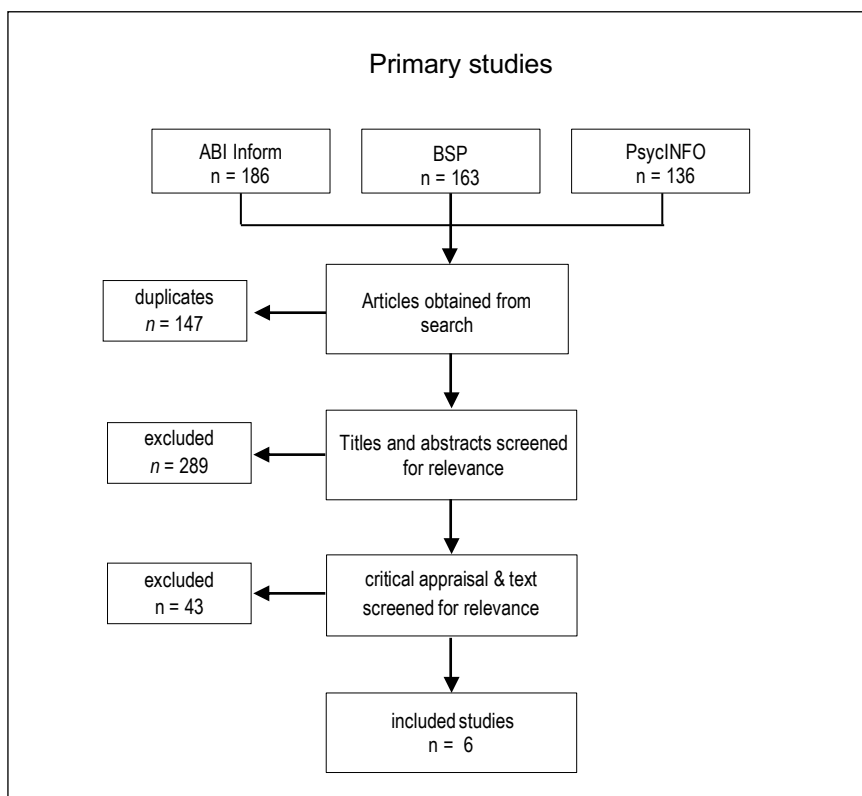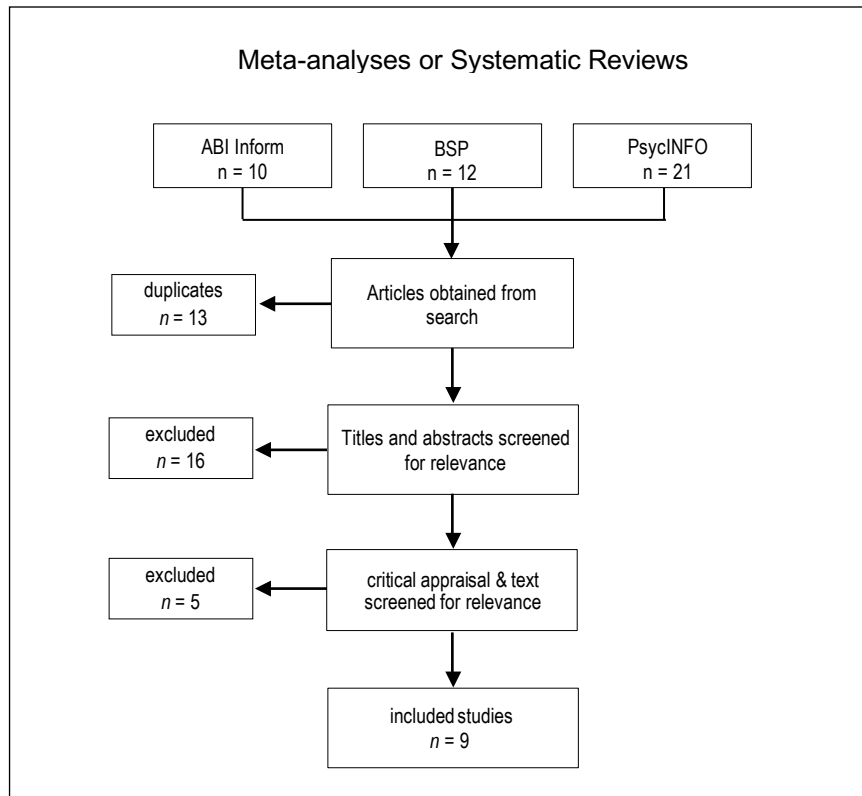
Annex I
Search terms & hits

ABI/Inform Global, Business Source Elite, PsycINFO peer reviewed, scholarly journals, May 2019			
Search terms	**ABI**	**BSP**	**PSY**
S1: ti(cultur*) AND ti(organi?tion*)	361	2,926	4,559
S2: ti(cultur*) AND ti(corporat*)	698	880	589
S3: ab("organi?ational culture") OR ab(corporate culture")	5,915	4,613	2,762
S4: S1 OR S2 OR S3	6,375	6,564	6,522
S5: ti(perform*) OR ab(performance)	214,692	330,493	361,335
S6: S4 AND S5	1,468	1,299	900
S7: ti(perform*) AND ti(culture)	576	566	475
S8: S6 OR S7	1,790	1,578	1,223
S9: filter meta-analyses or systematic reviews	**10**	**12**	**21**

ABI/Inform Global, Business Source Elite, PsycINFO peer reviewed, scholarly journals, May 2019			
Search terms	**ABI**	**BSP**	**PSY**
S11: S8 and filter longitudinal or controlled studies	82	75	49
S12: ti("competing values") OR ab("competing values")	351	302	210
S13: ti("organi?ational culture assessment") OR ti("organi?ational culture assessment")	34	38	12
S14: ti(OCAI) OR ab(OCAI)	15	17	7
S15: ti("organi?ational culture inventory") OR ab("organi?ational culture inventory")	13	10	44
S16: ti(OCI) OR ab(OCI)	57	99	244
S17: ti("organi?ational culture survey") OR ab("organi?ational culture survey")	24	18	125
S18: ti("organi?ational culture profile") OR ab("organi?ational culture profile")	24	22	45
S19: S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 Or S18	495	559	658
S20: ti(perform*) OR ab(performance)	214,692	330,493	361,335
S21: S19 AND S120	**186**	**163**	**136**

ANNEX II   STUDY SELECTION

Meta-analyses or Systematic Reviews

| ABI Inform n = 10 | BSP n = 12 | PsycINFO n = 21 |

Articles obtained from search

duplicates *n* = 13

Titles and abstracts screened for relevance

excluded *n* = 16

critical appraisal & text screened for relevance

excluded *n* = 5

included studies *n* = 9

Primary studies

| ABI Inform n = 186 | BSP n = 163 | PsycINFO n = 136 |

Articles obtained from search

duplicates *n* = 147

Titles and abstracts screened for relevance

excluded *n* = 289

critical appraisal & text screened for relevance

excluded n = 43

included studies n = 6

Annex III Included meta-analyses

Author & year	Design & sample size	Sector / Population	Culture (type / definition)	Measurement tool	Performance (type)	Effect sizes	Limitations	Level
Brand, 2012	systematic review of controlled and uncontrolled studies k = 57	hospitals	not specified	not specified	financial, operational and clinical outcomes	no (valid and reliable) effect sizes found	no serious limitations	AA
Eisend, 2016	meta-analysis k = 123	not specified (mixed)	Quinn: market-, clan-, hierarchy- and adhocracy culture	OCAI	new products	clan r = .31 adh r = .23 market r = .46 hier r = .104 moderated by low/high individualism, uncertainty avoidance, power distance, etc.	poor search strategy, design of studies included not specified	D
Harding, 2017	systematic review of controlled and uncontrolled studies k = 51	health care organisations	Research culture = research activities	not specified	organizational efficiency (not specified)	no difference (k = 1 controlled study)	small sample size	B
Hartnell, 2011	meta-analysis k = 84	not specified (mixed)	Quinn: market-, clan-, hierarchy- and adhocracy culture	OCAI	innovation (new products, services or processes), financial performance	subj innovation clan ρ = .41; adh ρ = .48; market ρ = .59 0bj profit clan ρ = .00; adh ρ = .13; market ρ = .14 Obj growth clan ρ = .05; adh ρ = .15 market ρ = .18 Note: Moderated by industry and national culture.	design of studies included not specified	C

Hartnell, 2019	meta-analysis k= 148 (N = 26,196 organisations and 556,945 informants)	not specified (mixed)	Quinn: market-, clan-, hierarchy- and adhocracy culture	OCAI	task performance, organizational citizenship behaviors, organizational innovativeness, technical and administrative innovations, process innovations, financial performance	innovation outcomes clan ρ = .43; adh ρ = .43 market ρ = .41; hierar ρ = .27 operational outcomes clan ρ = .25; adh ρ = .34 market ρ = .38; hierar ρ = .31 financial outcomes clan ρ = .13; adh ρ = .14 market ρ = .23; hierar ρ = .22 NOTE: Results demonstrate that some culture dimensions do not have unique predictive utility when controlling for the CVF's other culture dimensions as well as leadership and HPWPs. For example, clan culture did not explain incremental variance in operational outcomes; hierarchy culture did not explain additional variance in customer outcomes; market culture did not explain significant variance in employee outcomes; and adhocracy and market cultures failed to explain additional variance in financial outcomes.	design of studies included not specified	C
Hunt, 2012	systematic review k = 20	not specified (mixed)	Schein	Mainly OCAI	mix of subj & objective clinical and organisational perf measures	not reported In terms of outcomes, none of the studies reviewed found evidence of a relationship between culture and performance. It is clear that any relationship between culture and performance is highly unlikely to be simple: such relationships are more likely to be multiple, complex, contingent and dynamic.	design of studies included not specified	C

Radakovich, 2017	meta-analysis k =3	not specified (mixed)	Schein		unclear	work quality, in-role performance, job performance, overall performance, work performance, innovative job performance,	r = .03 (fully mediated by intrinsic motivation, r = .49)	design of studies included not specified, no differentiation between climate and culture small sample	C
Scott, 2003	meta-analysis k=10	health care organisations	Schein		mixed, OCAI, participative observation, self-constructed questionnaires	a wide range, including clinical and attitudinal outcomes	No ES reported Four of the ten studies reviewed in detail claimed to have uncovered supportive evidence for the hypothesis that culture and performance are linked. All the other studies failed to find a link, though none provided strong evidence against the hypothesis.	design of studies included not specified, small sample Most of the studies measured culture only at the level of artefacts and behaviours, rather than assumptions	C
Taras, 2010	meta-analysis k=598	not specified (mixed)	Hofstede's 4 dimensions		Various versions of Hofstede"s original Values Survey Module (VSM).	job performance	Culture was found to be the weakest predictor of performance with the direct effect of cultural values being close to zero (ρ=0.03). Demographics and personality showed comparatively better results (ρ=0.12 and ρ=0.09 respectively) and general mental ability stood out as a remarkably good predictor (ρ=0.54) of performance.	design of studies included not specified	C
metaBUS 2019	meta-analysis k = 21	not specified	Varies		OCI, OCAI, DOCS and self-construed measurements	Task-, Job-, individual-, team-, group-, financial-, market-, and innovative performance	r = .16 (95% CI = .08 - .24)	design of studies included not specified	C

Excluded studies

Author & year	Reason for exclusion
Ng, 2009	Concerns the moderating effect of culture on the satisfaction - performance relation, no zero-order correlations are reported
Parker, 2003	IV is psychological climate perceptions, organisational culture is mentioned but not measured
Slater, 2014	Traditional literature review, no quantitative outcomes are reported
Whiterspoon, 2013	Culture is defined as a set of sub-constructs, such as communication, participation, subjective norms, social trust, and organizational commitment, etc.
Yaghoubi, 2017	Culture is defined as goal setting, team orientation, integration, performance emphasis, innovation orientation, members' participation, and reward orientation. In addition, no quantitative findings are presented.

Annex IV Included primary studies

Author & year	Design & sample size	Sector / Population	Culture (type / definition)	Measurement tool	Performance (type)	Effect size	Limitations	Level
Boyce, 2015	longitudinal study (6 years, 4 measurement points for culture, 6 for outcomes) Sample: sales and service departments in 95 dealerships	franchise automobile dealerships in the USA	Culture was conceptualized as a shared phenomenon at the department level.	DOCS	New vehicle sale	In Sales departments, Culture at time 3 r= .07 In Sales departments, Culture at time 6 r= .11		B
Jacobs, 2013	Cross-sectional study with repeated (3) measures	NHS hospitals	Competing Values Framework	OCAI	Unclear: "Performance data comes from a variety of routinely collected sources and is held in a longitudinal database of NHS hospitals."	Mixed: some small hospitals with a clan culture show a negative correlation with performance, some large hospitals with a developmental culture show a positive correlation. Overall though, the changes over time across all performance measures are towards a more blended culture, with a single dominant culture becoming less prominent.	Cross-sectional study, the repeated measures don't affect the risk of bias	D

Kim, 2019	longitudinal study (4 years, 3 measurement points) Sample: employees from 411+ organizations	business corporations operating in Korea	Competing Values Framework	A 12-item instrument based on the OCAI	Self-report measure by managers of the company's: - HR performance - Customer performance - Process performance	HR performance: β between -.04 (Hierarchy culture) and .59 (Clan culture) Process performance: β between -.07 (Hierarchy culture) and .50 (Adhocracy culture) Customer performance: β between .002 (Hierarchy culture) and .50 (Adhocracy culture)	no serious limitations	B
Kline, 2000	time lagged study (from 1 to 5 years between predictor and outcome measures) Sample: 100 companies	Fortune's "America's most admired corporations" 1989, comprising the ten largest from the Fortune 500 in each industry in the USA	Six cultural attributes valuable to strategic competitiveness (Hall, 1993): perceptions of quality, perceptions of customer service, ability to manage change, ability to innovate, team-working ability, and participative management style.	Content analysis of the annual reports of the companies.	Financial performance, measured as Relative (to the industry median) return on shareholders' equity	r= -.18 β= -.20	The sentences used to code the cultural attributes expressed something the company was aspiring to possess, not its current characteristics.	C
Nold, 2012	matched samples controlled study Sample: 56 companies (28 listed in "Great Places to Work" and 28 who weren't listed)	companies in the USA	A "great place to work" culture is where employees trust the people they work for, have pride in what they do, and enjoy the people they work with. Note: not really a measure of culture	The Great Places To Work survey: 58 statements grouped into key dimensions of organizational culture: • credibility; • respect; • fairness; • pride; • camaraderie.	Firm value: • Price/earnings ratio • Tobin's q Operating performance measures and growth rate: • Operating margins • Operating income per employee • Return on assets • Average annual growth	Firm value: • Price/earnings: Wilcoxon's Z= 0.66 • Tobin's q: Z= 0.30 Operating performance: • Operating margins: Z= 1.96 • Income/employee: Z= 2.48 • ROA: Z= 2.12 • Growth: Z= 2.37	Selecting the "Great place to work" sample restricted the pool to companies listed on the stock exchange in the USA.	C

| Ramella, 2017 | time-lagged study (1 year)

Sample: 93 companies | Italian companies in the mechanical engineering and high-technology fields which had European patents granted to them. | Collaborative corporate culture: building cooperative relationships internally, through a 'strategic integration' approach that valorizes human capital and organizational flexibility. | Custom-built questionnaire to measure the "strategic integration index". | Increase in the number of employees during the financial crisis (2010-2012) | Odds Ratio= 6.85 | Unclear who were the respondents for each company. | C |

Excluded studies

Author & year	Reason for exclusion
Agbejule, 2011	Cross-sectional study
Balthazard, 2006	Cross-sectional study, large sample size but derived from the company that commercially exploits the OCI
Braunscheidel, 2010	Cross-sectional study
Brouthers, 2012	Not relevant – the study looks at national culture differences, not organizational culture
Buch, 2001	Not relevant – doesn't provide a measure of effect size between culture and performance
Cadden, 2013	Not relevant – doesn't provide a measure of effect size between culture and performance
Calciolari, 2018	Cross-sectional study
Corbett, 2000	Cross-sectional study
Davies, 2007	Cross-sectional study
De Luca, 2018	Cross-sectional study
Deshpande, 2004-a	Reports on many single studies, but not enough data is available for any of them to identify an effect size

Deshpande, 2004-b	Cross-sectional study, most measures are self-report
Deshpande, 2007	Cross-sectional study
Gambi, 2015	Cross-sectional study
Gillett, 2003	Cross-sectional study
Goodman, 1999	Cross-sectional study
Islam, 2019	Expert panel
Kagaari, 2011	Cross-sectional survey and mixed-methods
Kairisia, 2017	Cross-sectional study
Kalyar, 2013	Cross-sectional study
Klein, 1995	Cross-sectional study
Kotrba, 2012	Cross-sectional study, large sample size but only public traded companies with financial records listed in S&P's Compustat database were included. Overall R2's are rather low (.04 to .11)
Lee, 2004	Cross-sectional study. Note: Type of industry accounted for 53.3 percent of the variance.
Lewis, 1994	Not relevant – doesn't provide a measure of effect size between culture and performance

Nazir, 2008	Cross-sectional study (involving only 3 organizations).
O Reily, 2014	Cross-sectional study
Pobkeeree, 2015	Not relevant – doesn't report data on the effect size between culture and performance
Polychroniou, 2017	Cross-sectional study
Prajogo, 2011	Cross-sectional study
Prenestini, 2013	Cross-sectional study
Ritchie, 2013	Not relevant - concerns a study conducted as part of a classroom exercise designed to help undergraduate students participating in a business strategy simulation to understand better the relationship between culture and organization performance.
Skerlavaj, 2007	Cross-sectional study
Song, 2009	Cross-sectional study
Ukawa, 2014	Cross-sectional study
Van Beek, 2010	Cross-sectional study
Valmohammadi, 2015	No effect sizes reported
Van Dyck, 2005	Cross-sectional study

Yarbrough, 2011	Cross-sectional study
Yiing, 2008	Cross-sectional study
Wali, 2011	Not relevant – doesn't report data on the effect size between culture and performance
Zbieg, 2017	Cross-sectional study
Zhang, 2008	Cross-sectional study