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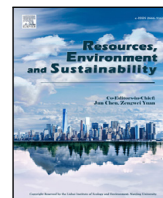
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# Chinese environmental accountability: Ancient beliefs, science and sustainability

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## ABSTRACT

This paper reports on a study into the potential for ancient Chinese belief systems to provide a foundation for environmental accountability in China. The global environmental impact of China is such that there is an urgent need for improved environmental accountability in China. The paper uses a theoretical model based on the work of Michel Foucault on episteme change as well as Systems Theory. Interviews and surveys are analysed using qualitative thematic analysis and descriptive statistics. There is evidence that the Chinese accountants were influenced by the ancient philosophies of Buddhism, Daoism and Confucianism. In turn, this influence results in a deep reverence for Nature and a strong desire for harmony between humans and Nature. The conclusion is that the Chinese accountants do have a strong environmental ethic derived from their beliefs and that this supports their roles in providing environmental accountability and hence sustainability. Conducting research in China was difficult and the number and quality of the interviews are limited because of this. Furthermore there were problems associated with interpretation and translation across languages and cultures. Nonetheless, this research has the potential to help empower Chinese accountants to improve their environmental accountability. Much research has already focused on Chinese business and traditional Chinese philosophy but this study contributes to the knowledge and understanding of the relations between Chinese accountants, environmental accountability and ancient belief systems. As such, the study makes an important contribution to Chinese, and hence global, sustainability.

## 1. Introduction and research question

Research on the accountant's role into environmental accountability for both accounting and reporting has a history going back to such as Hines (1988) who famously argued that "in communicating [accounting] reality, we construct reality". This social constructionist perspective (Birkin, 1996) reveals that accounting is not objective but is interactive with the social context.

Further studies found the accountant's role to be important for widening accountability into social and environmental performance arenas, but that existing practice has been patchy in this regard because of accountants' resistance to change (Bebbington et al., 1994). The objective of this paper is a reversal of Hines' above observation and is to examine whether accounting can be sensitive towards, and hence re-constructed in response to, a reality other than that imposed by accounting itself. The other reality of this paper is that of Chinese accountants who are proposed to possess ancient beliefs that would be supportive of an improved environmental ethic and hence a revised form of environmental accountability. The term "environmental ethic" is used here to indicate an attitude towards the environment that

is likely to lead to "good" behaviours (Mickey, 2007; Nuyen, 2011; Tucker, 2004). Whilst the term "accountability" is used to describe all techniques including accounting and reporting in both calculative and narrative by which an organization gives an account of its activities to those people and groups that have a right to that information (Kamuf, 2007). The ancient beliefs referred to above are the teachings of Confucius, Lao-tzu and Buddha. It is revealed in this study that positive environmental ethics and attitudes derived from ancient beliefs are possessed by Chinese accountants.

The significance of this study is that, China has been heavily criticized in recent years for its poor environmental performance (Economy, 2010) and the recognition of positive environmental ethics and attitudes possessed by Chinese accountants provides an indication of the means to improve China's environmental performance. In addition, this study shows that Chinese accountants may have a significant role to play with regard to the implementation of the Chinese Communist Party's 2007 proposal for a form of development based on an "ecological civilization" (Chamber, British, 2011; CPCCSC, 2015). The success or failure of an "ecological civilization" depends upon

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many factors among which Chinese attitudes towards the environment and Nature, and the forms of environmental accountability thereby generated, are of fundamental importance. This emphasis on environmental accountability is required because it is (1) fundamental to the sustainability tripos of satisfactory social, environmental and economic performances (Elkington, 1997); (2) the accountability area that has been most used in sustainability reporting by Chinese companies (Gao, 2009; Margerison et al., 2019); and (3) of wider sustainability interest since China's environmental performance is important globally (World Bank, 2015).

This study's research question is: Do Chinese accountants hold traditional beliefs that would be supportive of improved environmental accountability? To answer this question, Chinese accountants' traditional beliefs and environmental ethics are examined together with changes in the practice of environmental accountability in China. This study uses empirical, qualitative data derived from interviews with, and surveys of, Chinese accountants relating to the philosophical influences on their attitudes to the environment and how these attitudes influence their environmental accounting work. To further support the findings of this study, Chinese corporate sustainability accountability practice is also reviewed with regard to both internal (environmental management accounting) and external (reporting) practices. The interpretation of the results of this study are further informed by the relations between ancient Chinese belief systems and the emerging worldview of systems science (Capra and Luisi, 2014). The theoretical framework of this study is provided by the epistemic change concept developed by Foucault (1970) in order to further explain and to accommodate the significant, cultural and development implications of findings.

## 2. Literature

The literature reviewed in this study is organized as follows: (1) previous studies of ancient Chinese philosophy and its significant relations to business ethics; (2) developments in China regarding the development and implementation of an ecological civilization; and (3) Foucault's concept of episteme change.

There are several studies on Chinese philosophy (notably Confucianism) and its ethical effects (Chung et al., 2008; Chan, 2008; Ip, 2008; Zu and Song, 2009; Wang and Juslin, 2009; Whitcomb et al., 1998; Lam, 2003; Hoivik, 2007; Koehn, 1999; Du, 2016, 2017). Earlier authors (Choudhury, 1988; Koehn, 1999) tended to examine the relevance of Chinese philosophy to business ethics in general and in comparison with other countries.

Chan (2008) looked at the relevance and value of Confucianism in contemporary business ethics and focused on Confucian notions of reciprocity and harmony. Chan (2008) argued that with the growing stature of the Chinese economy and with continuing internationalization, the role of Confucian ethics was likely to grow and influence contemporary business ethics across the globe.

Chung et al. (2008) explored ethical perceptions of business students among East Asian Confucian cultures and compared them with the USA. China formed one of the Confucian cultures in this article and it was noted that on the level of personal relationships and actions, residual Confucian values applied in particular with regard to the importance of personal relationships and saving face.

Ip (2008) focused on Taiwan and looked at the growth of Corporate Social Responsibility (CSR) along with corporate scandals that provided a contradictory scene. He noted that what he called Confucian *familism* – the family as the apex of society – fitted well with the “crony capitalism<sup>1</sup>” that he observed.

Zu and Song (2009) questioned a group of Chinese managers across the whole of China on their values for CSR and the determinants of those values. Surprisingly the article found that firms of smaller size, owned by the State and located in the poorer regions would be more

likely to have managers who valued CSR highly. The business case seemed to be the most likely determinant but correlations and causality were uncertain.

Wang and Juslin (2009) defined CSR in relation to Confucian interpersonal harmony and Daoist harmony between man and Nature. They argued that, in business practice, this could help Chinese corporations to adopt CSR on their own initiative. In particular they argued that the proposed virtues of traditional Chinese wisdom could guide corporations to a new way of improving their CSR performance.

Recent contributions from Du (2016, 2017) have focused on: Confucianism and its negative influence on board gender diversity in China with a key finding that Confucianism has important impacts on business ethics and, looking at Chinese family firms, the influence of religious belief on political involvement of entrepreneurs. As with the other previous research reviewed there has been no attempt to look at Chinese philosophy and its links to ecology and science, but the importance of the ancient philosophies in Chinese business ethics is clearly emphasized.

It has been suggested that China possesses an ecological wisdom of the ages (Pan, 2011) from ancient and modern Chinese philosophy and religion. Ideas such as: Daoist notions of the Dao (the way) reflecting Nature and the harmony between heaven, earth and humans (Miller, 2003; Jackson, 2013; D'Ambrosio, 2013); the Buddhist belief that all living things are equal (Swearer, 1998; Cooper and James, 2017; Darlington, 2018; James, 2017; Darlington, 2017; Woodhouse, 2013) and humans aspiring to oneness with the natural environment (Sponsel and Natadecha-Sponsel, 2003); the Confucian idea of man and nature becoming one (Tu, 1998, 2001) and human flourishing only taking place within the larger matrix of nature (Berthrong, 2003; Kassiola, 2010). These ideas have been developed by modern Confucian thinkers (Tu, 1998) into ideas of *anthropocosmicity* which means that humans are seen as part of a greater universe or cosmos in harmony with Nature, rather than the anthropocentric view that sees humans at the centre of existence with Nature which, in the anthropocentric view, is there to be used for humans' benefit. This critique of the anthropocentric view has been borne out in the more recent contribution of He (2018).

In a Chinese context the influence of traditional Chinese philosophy means going from the mathematically biased reductionism in the West to a more holistic “Tian Xia” (all under heaven) foundation (Zhao, 2005). Birkin and Polesie (2012) have proposed that by using Tian Xia and the Dao it is possible to imagine a future for all human and non-human life sharing one world. What is noticeable about this concept in its modern form is that it seems to draw from both Confucian and Daoist traditions. Clayre (1976) noted that the three beliefs (Confucianism, Daoism and Confucianism) often “flowed into one” at a popular level in China.

The concept of ecological civilization (sometimes called *ecivilization*) was outlined by senior Chinese Communist Party figures (Pan, 2011) from 2007. This concept included the ideas of a harmonious society (at least with regard to the environment). Oswald (2014) noted that in 2007 at the Seventeenth National Congress of the Communist Party of China (CCP) Party General Secretary Hu Jintao announced a new model of growth incorporating “ecological civilization” to replace the old unsustainable industrial model “industrial civilization”. Whilst industry had created unprecedented levels of material wealth, Oswald argued that the industrial model of development was based on high levels of resource and energy consumption which also entailed serious pollution and ecological degradation (Ma, 2007). He further noted that global capitalism had transferred the most polluting, resource-intensive and high-risk manufacturing industries to developing countries (Ma, 2007). This had allowed developed countries to alleviate the pressure on their own environments without making any changes to their model of growth (Ma, 2007). In this understanding, China developed its industrial economy at the expense of heavy environmental degradation that is seen to be unsustainable (Ma, 2007).

<sup>1</sup> Corruption and misconduct involving family members in firms.

Ecological civilization was eventually enshrined in the 12th five-year plan (2011–2015). The plan argued as follows:

“In transforming the economic development mode, the importance of building a resource-saving and environment-friendly society should be stressed to save energy, reduce greenhouse emissions and actively tackle global climate change. We should develop circular economy (sic) and low carbon technologies. Through striking a balance between economic development and population growth, sustainable development will be enhanced” (Chamber, British, 2011).

In terms of resource conservation and environmental protection, the Plan incorporated targets for: maintaining farmland reserves; cutting water consumption; increasing the water efficiency coefficient in agricultural irrigation; increasing the proportion of non-fossil fuel resources use in primary energy consumption; and, reducing energy consumption and CO<sub>2</sub> emissions per unit of GDP<sup>2</sup> (Chamber, British, 2011).

Further guidance was issued by the Communist Party of China in 2015 (COPCCSC, 2015) that reinforced earlier guidance. It included sections on: (1) optimization of land space development; (2) promoting technological innovation and structural adjustment; (3) increasing efficiency quality; (4) comprehensively promoting resource conservation, recycling and efficiency and the fundamental transformation of resource use; (5) increasing the protection of the natural ecosystem and practically improving the quality of the natural environment; (6) improving the ecological civilization system; (7) strengthening construction of ecological civilization; (8) statistical monitoring and supervision of law enforcement; (9) accelerating the formation of a good social style for promoting the construction of an ecological civilization; and, (10) strengthening the practice of organizational leadership.

The 13th five-year plan (2016–2020) was agreed in March 2016 and although the ecological civilization rhetoric was not used, it instead used the idea of basing growth on a green economy (Liu, 2016). Also it outlined in far greater detail the targets across a broad range of ecological areas such as: energy intensity; carbon intensity; energy consumption; share of non-fossil fuel energy and many others (D’Aprile and Davide, 2016).

The key point about the government policy in China is that environmentalism has been turned into a concrete developmental plan and this is notably different to the generally unhelpful government interventions in the West where democratic pressures have led to, for example, climate change denial at the highest level (Abraham, 2017).

The huge developmental and cultural significance of the transition to the Chinese eco-civilization has been interpreted in this paper by using the Foucault’s work on episteme change (Foucault, 1970; Birkin and Polesie, 2012, 2011; Ma, 2007; Tu, 2013). Foucault argues that in the existent Modern episteme our understanding of reality is flawed and hence there is a *necessity* for change to take place (Birkin and Polesie, 2011). The Modern episteme was created around the year 1800 and Foucault argues that the Modern Human Sciences (such as psychology and economics) are based on abstract, anthropocentric, logical belief systems. This foundation has been argued to have been a significant contributor to unsustainable development (Birkin and Polesie, 2011; Capra and Luisi, 2014). The episteme change postulated by Foucault has received significant support from developments in system sciences whereby the mechanistic and deterministic sciences that underpinned the frameworks of the Modern episteme and its consequences have been challenged and replaced by our new knowledge of interactive, interdependent and self-regulating, autopoietic systems (Birkin and Polesie, 2011) in such as thermodynamic dissipative structures (Hammond, 2004), chaos theory (Gleick, 1988) and complexity mathematics. These developments in science resound well with aspects of ancient Chinese

beliefs (Capra and Luisi, 2014; Birkin and Polesie, 2011; Kauffman, 1995; Prigogine and Stenger, 1985; Gleick, 1988).

Foucault’s understanding and analyses of epistemes allows for significant change in cultural and formal Human Science knowledge including accounting. The emerging systems sciences identified above provide the empirical evidence and theoretical understanding for such a major change in the Human Sciences to be underway at the present time (Capra and Luisi, 2014). In accordance with the Systems Science world-view, the traditions and cultures of ancient China contribute interactively and interdependently to this milieu.

### 3. Methodology and methods

The research on which this paper is based used an interpretivist philosophy in that it has analysed signs from a variety of sources. Myers (2013) argues that an interpretivist approach involves gaining access to reality through social constructions such as language, shared meanings, and instruments. Chowdhury (2014) developed this understanding of an interpretivist approach to mean the study of the world through subjective thoughts and ideas; seeing the world through the eyes of the people being studied and therefore allowing multiple perspectives of reality. Consequently, a relativist ontology has been used, in that the researchers observed the contextual development of organizational accountability for sustainability (particularly environmental) in China and how the philosophical attitudes of accountants and other actors are influencing those developments.

The methods of data gathering used in this study were a mix of interviews and surveys. Analyses are based mainly on qualitative research methods supported by some limited quantitative analysis of responses from the interviews and surveys. It should be stressed that the quantitative analysis is not meant to arrive at generalizable statistical relationships — rather it is using descriptive statistics so as to summarize modes and simple relationships within survey responses and to assist in interpretation of themes using qualitative analysis based around ideas of a metaphysical continuum discussed above.

The sampling method used was purposive (Bryman and Bell, 2011). Items were not sampled on a random basis; rather the sampling was carried out in a strategic way (Bryman and Bell, 2011). This means that the researcher takes samples with certain research goals in mind (Bryman and Bell, 2011). Hence it is a non-probability sampling approach where it is not possible to generalize to a population. The sample group for the interviews (24 interviewees in 15 organizations) was made up of Chinese accountants who were interviewed in 2010 or 2011. The sample was selected by two Chinese academics who were briefed on the aims and objectives of the research. Based on the brief, the two academics selected company accountants in their region (Liaoning Province and Shanghai and Zhejiang Province) who were known to them and who could be involved in environmental accounting initiatives. Background details of the companies visited are in Table 1:

The sample groups for the 2014/15 surveys (104 valid responses in total from a sample size of 275) were again selected in a purposive way: (1) Chinese accounting academics who were members of the Chinese committee of the Centre for Social and Environmental Accounting Research (CSEAR) (13 valid responses from sample of 57); (2) Chinese accountants in a variety of positions in China and overseas based on the researchers’ professional networks (10 valid responses from sample of 47); and, (3) Chinese accounting students at De Montfort University and the University of Sheffield (both in the UK) (81 valid responses from sample of 171). All the sampled individuals were likely to help in the answering of the research questions and to that extent were selected purposively.

In essence the questions at both interviews and in surveys were to establish: (1) whether Chinese accountants were influenced by ancient Chinese philosophies; (2) whether their thinking about the environment

<sup>2</sup> Energy and CO<sub>2</sub> intensity.

**Table 1**  
Summary of organizations from which data gathered via interviews.

Number	Location	Ownership	Industry	Employees in china
1	Shenyang	Chinese company — part of German multinational	Engineering	200
2	Shenyang	Chinese owned	Automobile parts	65
3	Shenyang	Chinese owned	Animal feedstuffs	5000
4	Shenyang	Provincial government department	Finance	9
5	Shanghai	Chinese owned	Building	500
6	Shanghai	American owned enterprise	Engineering	100
7	Shanghai	Chinese quoted	Dairy products	20,000
8	Shanghai	Chinese quoted	Electronics	4000
9	Shenyang (Fushun)	State owned enterprise	Mining safety	1200
10	Shenyang	State owned enterprise	Electronics	470
11	Shenyang	State owned enterprise	Waste management	100
12	Shenyang	State owned enterprise	Engineering materials	300
13	Shanghai	Chinese quoted	Steel producer	130,000
14	Shanghai (Zhejiang province)	Chinese unquoted	Metal products manufacturer	75
15	Shanghai (Zhejiang Province)	Chinese quoted	Cigarette producer	7750

was in accordance with the ecological and systems science interpretations of ancient Chinese philosophies; and (3) whether these philosophical influences fed through into their environmental sustainability accounting work (for interviews only).

Some methodological issues arose during the research affect the findings of this study and they are: (1) Different interpreters were used: three academics who were fully conversant with the project; and in-house interpreters at two companies. The notes of the interviews based on the interpretation were fed back to the interpreters to ensure that they were an accurate representation. (2) English language survey instruments were used and this privileged the samples to those respondents who could deal with English. This was partly overcome by translating the interview instrument into Chinese and circulating it to the interviewees prior to the interview date. Also the key attitudinal questions came from English language scholarship on Chinese philosophy. This skewed the work in this direction and did not allow for the much greater richness of the actual Chinese texts. (3) The Chinese “accountants” for the surveys came from groups of Chinese accounting academics and Chinese accounting students in UK universities, as well as from practising Chinese accountants. This means that the findings must be seen as exploratory and that an opportunity presents itself for this research to be continued using much larger samples of Chinese accountants, possibly in Chinese language.

**4. Results**

The results are presented below in accordance with the two prime data sources of surveys and interviews.

**4.1. Survey results**

The responses to the surveys were recorded using a five-point Lickert scale as follows: (1) strongly agree, (2) agree, (3) neither agree nor disagree, (4) disagree, (5) strongly disagree. The numbers (1–5) have been used to score each response and to calculate mean scores. In this research for illustrative purposes means and in some cases Pearson correlations can provide interesting observations about the responses to the statements. A second quantitative analysis of the survey responses was to identify what percentage of respondents answered (1) strongly agree or (2) agree in answer to a particular question. In no way do

**Table 2**  
Summary of responses to Question 1.

Statements about attitude towards natural environment	% 1 (strongly agree) or 2 (agree)	Mean
(R1) Humans should be one with the natural environment (Buddhist philosophy) (Sponsel and Natadecha-Sponsel, 2003)	87%	1.82
(R2) There should be harmony between heaven, earth and humans (Daoist philosophy) (Miller, 2003)	80%	1.84
(R3) Human flourishing can only take place within the larger matrix of nature (Confucian philosophy) (Berthrong, 2003)	62%	2.26
(R4) Human technological ingenuity will find the solution to all environmental problems (Homer-Dixon, 2001)	26%	3.18
(R5) Careful use of natural resources will enable future generations to enjoy the same benefits from the earth that we have enjoyed (Solow, 1992)	82%	1.85
(R6) Current patterns of consumption, economic growth and population growth are unsustainable (Meadows et al., 1972)	73%	2.10
(R7) Radical change is needed to avoid severe, negative effects on future generations (Stern, 2007)	68%	2.21
(R8) Attitudes in society are changing that could lead to a sustainable future (Bonnett, 2002)	78%	2.02
(R9) China can take a global lead in sustainability based on new science (Bebbington and Larrinaga, 2014)	43%	2.63

these percentages provide any measure of statistical significance; rather they enable the analysis to compare typical responses across the various questions.

The two questions that were common to the three surveys were: *Question 1 - Please indicate the extent to which you agree or disagree with each statement about your attitude towards the natural environment.* *Question 2 - Do any of the following religions and political philosophies have any value or significance to you personally in your attitude to sustainability and the natural environment?*

The answers to these two common questions are summarized in tabular form in Tables 2 and 3:

This table concentrates on the responses “Strongly Agree” and “Agree” showing what percentage of respondents answered either response. The means are arrived at by scoring responses strongly agree with 1 through to strongly disagree with 5. The higher the mean figure, the less strong is the agreement with the statement. In terms of the first three statements that come from modern interpretations of each of the three ancient Chinese philosophies: the Buddhist and Daoist statements resonate strongly. The Confucian statement resonates less strongly but is still strongly agreed or agreed with by 62% of respondents. The other statements show that (R4) a technological solution is not seen as the way to solve environmental problems and that (R9) the respondents tend not to see China as taking a lead in sustainability. The other responses – particularly R6 on sustainability and R7 on the need for radical change – show a keen awareness and agreement on the issues that would most likely see the successful transition to ecological civilization.

Table 3 summarizes the responses to Question 2:

The key observation from this set of responses is that the three ancient Chinese religions or philosophies resonate much more strongly than any of the others, but not as strongly as the agreement with the statements derived from the religions in Table 2. This suggests that many of the respondents who strongly agree or agree with a statement do not necessarily link it to a particular philosophy or religion. So the ancient philosophies are often not overtly referred to, but their teachings are deeply embedded in the accountant group, indicative of an intrinsic ethic. This is supported by the philosophical work by Kymlicka (2011) on multiculturalism within multinational states such as China, where deep beliefs are embedded in the cultures represented and by the work of Honneth (van Leeuwen, 2007) on recognition where

**Table 3**

Summary of responses to Question 2. Religions and political philosophies that have any value or significance to you personally in your attitude to sustainability and the natural environment (1 and 2 are strongly agree and agree):

	% (1 & 2)	Mean
(1) Buddhism	43%	2.81
(2) Daoism (+ Feng Shui)	45%	2.96
(3) Confucianism	55%	3.01
(4) Christianity	23%	3.42
(5) Islam	8%	3.85
(6) Judaism	10%	3.95
(7) Capitalism	21%	3.36
(8) Communism	20%	3.44
(9) Socialism	31%	3.10

**Table 4**

Relationships between (1) attitudes towards the sustainability and the natural environment and (2) religions/philosophies.

	Percentage scoring 1/2 for both attitude and religion/philosophy	Pearson correlation coefficient
(1) Humans should be one with the natural environment/(2) Buddhism	40%	+0.21
(1) There should be harmony between heaven, earth and humans/(2) Daoism	37%	+0.28
(1) Human flourishing can only take place within the larger matrix of nature/(2) Confucianism	29%	+0.22

**Table 5**

Respondents for whom more than one from Buddhism, Daoism and confucianism have significance in their attitude to sustainability and the natural environment (i.e. strongly agree or agree) (from Table 3) and more than one attitude to the natural environment R1–R3 (Table 2) (Buddhist, Daoist and Confucian).

	More than one score 1/2
Religions/philosophies Buddhism, Daoism, Confucianism	36%
Attitudes to natural environment	83%

social esteem is recognized in individuals from different social groups in society.

The next table (Table 4) tests this linkage of an attitude to a particular Chinese religion or philosophy by looking at the correlation between those who agree or strongly agree with an attitude statement and who also agree or strongly agree with the relevant philosophy or religion:

This table supports the previous observation that there is only a limited linkage between statements and philosophies or religions, with, in each case, less than or equal to 40% of respondents scoring 1 or 2 for both the attitude and the religion or philosophy. The Pearson Correlation Coefficients also show a weak positive relationship in each case (below +0.30). From Tables 2–4 the inference is that statements from religions or philosophies resonate in a way that the actual religions or philosophies do not.

Table 5 tests the suggestion from the literature that in China the three ancient philosophies flow into one (Clayre, 1976). This would suggest that the respondents would have an agreement with more than one statement and religion or philosophy:

Table 5 shows that the majority of respondents only scored highly for one religion or philosophy. However, a high proportion of respondents agreed with more than one of the attitude statements derived from different religions or philosophies. Hence, although respondents do not identify specifically with more than one religion or philosophy, they do tend to agree with statements from more than one religion or philosophy.

#### 4.2. Interview results

The findings from the interviews relevant to this paper are focused on: (1) environmental accounting in the interviewees’ organizations and the accountants’ role in this; and (2) accountants’ personal philosophical stance regarding environmental matters.

Interviews revealed that a common feature of environmental accounting in most of the organizations was the accounting reports provided to the government, represented in China by the Provincial or State Environmental Protection Agency (SEPA now Ministry of Environmental Protection (MEP)). A report had to be made annually on environmental aspects and the relevant levy paid to the government. In the case of the animal feedstuff manufacturer the annual levy or taxation was in the region of 100,000RMB (approximately £10,000) for a small part of the business involved with pigs. The electronics company paid fees of 130,000RMB in 2010 and 110,000RMB in 2009.

A number of other environmental accounting activities were described by the interviewees such as: (1) information on costs involved with waste water treatment; (2) measurement of pollution related costs of new factories in business planning; (3) identification of costs of equipment recycling; (4) estimates of remediation costs associated with incineration plants with associated liabilities; (5) accounting and reporting on bottle recycling projects; (6) measurement of energy reduction initiatives and the reporting thereon based on tonnes of coal saved per annum; (7) detailed data generated on energy usage and pollutants; (8) accounting for planned introduction of thermal pumping and associated reduction in coal burned annually; (9) costing of tree planting programmes; (10) costing of energy saving and emissions treatment programmes; (11) costing of dust control measures; (12) measuring carbon dioxide emissions of the company for a year in terms of how many second’s worth of the emissions by all the earth’s human activity in a year it represents; and (13) a life-cycle assessment project and reporting by a major steel producer together with full reporting on environmental initiatives.

In most of the interviews, the accountant interviewed could identify environmental accounting activities in addition to the reporting around the MEP levy. In two companies, the dairy company and the steel producer, public reporting of the environmental accounting information did take place in newspaper reports and CSR reports but with minimal quantitative information disclosed. When the accountants were asked about their role in relation to environmental accounting and whether they saw themselves as being champions in the environmental accounting carried out by the company, 56% replied that they were involved in the activity with 38% considering that they were champions of such initiatives.

Next questions ascertained the philosophies of the accountants interviewed and the extent to which their personal philosophies appeared to be influential in the organizations’ policies and environmental accounting activities. Personal philosophies were for example: (1) “a strong desire to keep the earth beautiful”; (2) “if you want to do things, do good deeds”; (3) “the environment is important to everybody and needs protecting”; (4) “human beings should live harmoniously with Nature”; (5) “Nature will punish mankind if yin and yang are not kept in harmony”; (6) “we must preserve the environment for our children”; (7) “Nature must be respected”; (8) “I would stress the harmony between humans and Nature from ancient times”; (9) “Confucian notions of harmony so that workers work in a safe and green environment”; (10) “Save water, save electricity, do something useful for society, love China”; (11) “Do our best to save energy, lessen CO2 emissions, avoid pollution and do not waste anything, save as much as possible”; (12) “It is very important that everyone protects the environment”; (13) “We should all minimize our effect on the environment”. There are strong parallels in these statements with modern interpretations of ancient philosophy and also of the recent CCP policy move towards ecological civilization.

Only three of the interviewees could be drawn into identifying an ancient Chinese philosophy, one for Buddhism and two Daoism.

Another interviewee mentioned the influence of the Feng Shui that he had learned from his father, particularly in terms of humans' position on the Earth. When asked, almost all the interviewees acknowledged ancient roots to their philosophies, but they were not able to identify the roots in any particular philosophy. It can be concluded that the accountants tended to exhibit personal philosophical values on environmental matters and that these were almost all subliminally rooted in modern interpretations of ancient Chinese philosophies.

## 5. Discussion

In summary, the interviewees tended to have personal philosophies that had strong links to ancient Chinese philosophies. These personal views appeared to be influencing their behaviour in their companies along with many other factors such as: government influence via local offices of the Ministry of Environmental Protection; sector scandals; market pressures to keep up with competitors and satisfy suppliers and customers; and the imposition of Western parent-company values.

Evidence of the possibility of Foucauldian episteme change in the findings are taken to be the strong philosophical orientation of the interviewees, along with the good progress in Environmental Management Accounting (EMA) in all the interviewee organizations and some progress in the more sophisticated external Sustainability Accounting and Reporting (SAR). All these pointed to change in China away from Modern anthropocentric thinking towards the complex relations revealed by systems science and summarized by ecological thinking.

The surveys used in this study were to find out about the respondents' existing engagement with and about their attitudes to the environment, sustainability and its accountability. In terms of episteme change, the focus for this study was the possibility of a correspondence of the emerging systems science knowledge and understanding with Chinese philosophical traditions. A positive correspondence would at least be indicative of deep cultural-roots of an alternative understanding that could be supportive of an epistemic change towards a culture grounded in systems science. Such a finding would be of immense significance for motivating and disseminating, among at least eastern societies, the new logics, knowledge and understandings required for sustainability in a world working in accordance with systems science.

In the surveys the key statement looking at viability of the dominant but out-dated Modern episteme was the question on attitude to the natural environment: "Current patterns of consumption, economic growth and population growth are unsustainable". 73% of respondents scored 1 or 2 (Strongly agree or Agree). This shows that there was a serious questioning of viability of the Modern episteme.

Similarly the statement "Human technological ingenuity will find the solution to all environmental problems" scored very low in this group of respondents — only 26% scored 1 or 2. Hence this typical Modern anthropocentric-orientated statement that humans can control nature, has been significantly rejected by the respondents.

In terms of the possibility of a change to a new episteme, there were two key statements directly related to change: (1) "Radical change is needed to avoid severe, negative effects on future generations" and (2) "Attitudes in society are changing that could lead to a sustainable future". The respondents scoring 1 or 2 (Strongly agree or Agree) for these questions were (1) 68% and (2) 78%. These results showed that a sizeable majority of respondents saw the need for radical change in attitudes if sustainability is to be achieved.

With regard to attitudes towards the natural environment revealed in the respondent groups, the statements about the environment as derived from ancient philosophies resonated most strongly. In addition the respondent groups were asked if particular religions or philosophies had any value or significance to them personally in their attitude to sustainability and the natural environment. The only religions or philosophies where a score of 1 or 2 (Strongly agree and Agree) was given by the respondents in 40% or more of the responses, were Buddhism (43%), Daoism (45%) and Confucianism (55%). This shows

that for large numbers of respondents, statements derived from ancient philosophies were influential in their attitudes on environment and sustainability.

Another analysis looked at those scoring 1 (Strongly Agree) or 2 (Agree) for Buddhist (B), Daoist (D) or Confucian (C) attitudes to the environment to see how many of these respondents also scored 1 or 2 for the actual religion or philosophy (B, D or C). Here the scores for Buddhism were 40% showing that, in particular, many of those with Buddhist attitudes from ancient philosophy could identify with that particular religion or philosophy. For Buddhism the correlation between these two sets of scores was +0.21. This correlation was only weakly positive, showing that attitudes and the religion that the attitude comes from were in some cases closely related in the minds of the respondents. The score for Daoism was 37% with correlation of +0.28, also weakly positive and lower than Buddhism. The scores and correlations for Confucianism were lower than the other two religions and philosophies. Overall these results indicate that there were a number of respondents who could link statements of attitudes to particular religions and philosophies, both the attitude and the religion it comes from being influential, but the attitudes were more pervasive than the religions or philosophies themselves.

The final analysis on systems science to philosophies correspondence looked at those respondents who scored more than one attitude from B, D and C at 1 or 2 and more than one actual religion or philosophy from B, C and D at 1 or 2. The results showed that of those scoring 1 or 2 for one attitude 83% scored at least 1 or 2 for another attitude. The results for actual religions where more than one is scored highly was 36%. This further supports the existence of a systems science to philosophy correspondence underpinning Chinese accountant's attitudes to sustainability and the environment.

## 6. Conclusions and avenues for further research

The first research question in this study is: Do Chinese accountants have an environmental ethic that is leading to changes in accountability for sustainability? To answer this question, this study revealed a key feature of an emerging Foucauldian episteme change as indications of a correspondence between systems science and ancient Chinese philosophies, a correspondence which would not be possible in the dominant Modern episteme. It has also been argued that in the Modern episteme there have been and are serious problems caused by attitudes towards sustainability and, in particular, climate change denial. This has caused and maintained un-sustainability on a grand scale with multiplying environmental problems and resource shortages. Consequently the sort of accounting for sustainability that has been carried out mainly by Western multinationals working within the Modern episteme has been anything but true accountability for sustainability (Gray, 2010).

So, the argument is that in China things are different and that the emerging system science could be more easily understood and disseminated by promotions and careful interpretations of her ancient philosophies. As part of a transition to a new episteme, as evidenced in China by recent CCP pronouncements on ecological civilization and green economy, this research has sought to test empirically the notion of a correspondence between emerging systems science and ancient philosophies in the minds of Chinese accountants. It did this by interviewing and surveying Chinese accountants about their attitudes to the environment and the philosophies that underpinned these attitudes.

The results indicate that among the Chinese accountants interviewed and sampled, a large proportion identified with attitudes towards the environment that would resonate well with emerging systems science. These attitudes are very different from the dominant Modern episteme's anthropocentric Western view that the Earth and its resources are there for the benefit of humans, with little regard for any sense of harmony or oneness with Nature. They are also at odds with Mao Zedong's so called "war against nature" (Shapiro, 2001) where,

famously, rural villages were encouraged to kill all birds with the effect that insect populations caused the ruination of harvests.

In terms of accountability, it is clear that the personal philosophical orientation of Chinese accountants is influencing their sustainability accounting and reporting work. The existing Sustainability Accounting and Reporting (SAR) responses are mainly as internal accountability in the form of environmental management accounting and external accountability to government. The accountants of this study were involved in and championing SAR work in many cases. This study indicates that there is some influence of ancient Chinese philosophy on Chinese accountants and that such influences support new accountability responses which in turn are indicative of an emerging episteme which in China is highlighted by the ecological civilization or green economy. Also, it was discovered on visiting Chinese companies that only those with major competitors internationally had any interest in external reporting on sustainability matters. This emphasis on internal accountability is very different from the Western tendency to report as a way of enhancing and maintaining reputation (Bebbington et al., 2008). This absence of external reporting has been discussed by Choudhury (1988) who suggests a different accountability relationship of Chinese companies to their stakeholders. So, corporate accountability for sustainability in China is already very different from that in the West and in future, given the philosophical orientation of Chinese accountants, will continue to develop in novel ways.

Reflecting on further contributions of this study, an important impact would be to changing perceptions about China and to create a more positive impression of its accountants and their attitudes towards the environment. Furthermore, the ecological civilization policy, now the green economy policy, is one that needs to be more widely disseminated globally and may form the basis of other countries' attempts to move to a more sustainable future such as Ethiopia's Green Development Plan.

It should be noted as a limitation that research in China is difficult in that a culture based on privacy is reluctant to open its doors to researchers. Because of the foregoing comment the number and quality of the interviews was limited. Furthermore, the problems associated with different languages, interpreting and translating, were in evidence with a number of interpreters used and translations from Chinese sometimes being scant during interviews.

For further research, there is an opportunity for much greater involvement by Chinese academics in this kind of research so that the nuances of language can be dealt with and their greater access to companies through their networks in China may be utilized. In addition, other examinations of accountability responses in other countries using the Foucauldian epistemic change and the emergence of systems science. Other economies such as India could be compared with China and interdisciplinary studies could be conducted including, in particular, scholars of Chinese philosophy. Resonance with such changes in China could be sought and exemplified in other Asian countries such as Vietnam: "Vietnamese people already hold a system of religious and philosophical traditions that advocate ways of thinking, ways of living towards the sustainable target (Monhouse, 2018)".

#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### Ethical approval

"All procedures performed in studies involving human participants were in accordance with the institutional research committee (reviewed and approved according to the human research ethics process of De Montfort University Regulations on the 26 January 2010) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards".

#### Informed consent

"Informed consent was obtained from all individual participants included in the study".

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