Towards A Theory of Ecosystems of Ethical Business Culture in Business Network Organizations and Its Relatedness to Impact Entrepreneurship

Karen Wendt, MBA, Modul University, Vienna, Austria

Abstract

In order to lead company or network members, customers and stakeholders to collectively innovate in a sustainable manner in the face of global challenges and disruption, a supporting ecosystem based on an ethical business or network culture is paramount in order to increase resilience, performance and scale. Approaching challenges using ecosystems thinking and ethical cultural approaches is an under-researched field with great scaling potential for private businesses and networks to address global challenges collectively, which one player cannot handle alone. New ways of organizing using coopetition, networks and ecosystems appears an attractive promise to grow, scale and learn.

Global challenges are of a magnitude that no one institution or organization can address them on its own. They require the pooling and sharing of knowledge and resources. Ecosystems are awarded great potential to address global issues and create the necessary target knowledge[1] and resource allocation required to tackle the issues at hand. Ecosystems are one of the most talked about instruments in addressing challenges by practitioners.[2]

This paper is the beginning of addressing this research gap. The question why and how ecosystem is better placed to create target knowledge appears to have some appeal, but research is missing. There is currently no clear definition of ecosystems for ethical culture, and research is missing on how they instil civil action, create the target knowledge and buy in, mobilize and activate members, how these new ways of organizing provide effective ethical outcomes, how they scale ethical cultures, how success is defined and measured and how they avoid mission drift.[3]

Drawing out the reasoning for the ecosystems approach, its relation to ethical culture and its defining elements, this article investigates ecosystems of ethical business culture through a literature review and a review of articles written by practitioners. It then engages in defining ecosystems of ethical cultures and drawing the demarcation line between networks, platforms, communities of practice and ecosystems. The clarifications draw out some flaws of the

[1] Target knowledge is defined as scope of action and problem-solving measures given by the natural constraints, social laws, norms and values within the system, and the interests of actors and their individual intentions (Jahn, 2008). Therefore, a comprehensive evaluation of desired target states, potential risks and benefits under prevailing uncertainties is needed. Thereby target knowledge determines the plausible system development (ProClim, 1997). http://www.intrepid-cost.eu/target-knowledge/

[2] see for instance Deloitte https://www2.deloitte.com/content/dam/Deloitte/co/Documents/energy-resources/Business_Ecosystems_in_Exploration_Report_EN%20-%20Final.pdf or Bain and company http://www.bain.com/publications/articles/small-business-ecosystems-banks-next-challenge.aspx

[3] The multiples sources of mission drift are described by M. B. Jones see http://journals.sagepub.com/doi/abs/10.1177/0899764007300385

dominant view of ecosystems in science, a term often used interchangeably with platforms, communities of practice and networks.

This paper will address the research gap in science about ecosystems of ethical culture and the gaps identified between literature and practitioners. The findings propose a new theory is needed. The theory conceptualized here represents an attempt to strike a balance between opposing camps in research and practice about ecosystems and in particular ecosystems of ethical culture. Moreover, the article discusses implications of the new theory for both policy makers and entrepreneurs in financial markets.

Key Words: Ecosystems, Ethical Culture, UN Sustainable Development Goals, Problem Knowledge, Target Knowledge, Transformation Knowledge, Entrepreneurial Leadership, Global Challenges

1. Introduction

In the face of global challenges how have some organizations reflected on decision making, values that impact decisions and how have they developed or forged new ways of organizing and paths forward? Ecosystems may be creating solutions to those challenges and are one of the most talked about instruments in addressing those challenges. In a time of disruption and political, economic, societal, technological and organizational change, the answers to - how do companies steer through the maze while creating sustainable competitive edge- is relevant. Conventional business models are under attack by new megatrends and disruptive technologies and most recently also by the creation of the Sustainable Development Goals by the United Nations. So how can business adjust and move in the direction of ethical business culture embracing global trends and reinventing the business. With the internet, the knowledge is readily available and with the Fintech industries companies are built by a mouse click. Grass root movements and business models are growing trying to counterbalance the monopolisation of business using disruptive technology, new business models and support structures. One additional factor which came to awareness in 2008 is systemic risk. Systemic dangers make companies to think about how they can be more resilient, how to connect to other companies and mutually support one another. The benefits of researching ecosystems of ethical business culture might accrue directly to consumers, entrepreneurs, practitioners, or policy makers alike or indirectly through further research.

1.1. Global Challenges and the Rise of Ecosystems

According to the latest Global Risk Report[4] there is no shortage on problem knowledge what constitutes global challenges. They range from poverty, migration, climate change, food and water shortages, decrease in biodiversity, fiduciary malfeasance to economic collapse and institutional corruption. We face the Economy 3.0[5] - where technology dictates how we

[4] According to the 10th edition of the Global Risks Report, the top global risks in terms of likelihood over the coming 10 years are: interstate conflict with regional consequences is the number one global risk in terms of likelihood, followed by the risk of extreme weather events (2), failure of national governance systems (3), state collapse or crisis (4) and high structural unemployment or underemployment (5). In terms of impact, nearly 900 experts that took part in the survey rated water crises as the greatest risk facing the world, followed by infectious diseases (2) weapons (3) and climate adaptation (5). Ten global risks are shown in the picture see http://reports.weforum.org/global-risks-2015/

5 https://de.slideshare.net/doennebrink/2017-1020-presentation-sharing-economy-30?from_action=save for the Bundesministerium für Bildung, Berlin

engage and do business, where Blockchain, Cryptocurrencies, Finance 2.0 become mainstream and disrupt or enhance conventional business models.[6] Global challenges are of a magnitude that no one institution or organization can address them on its own. They require the pooling and sharing of knowledge and resources. Ecosystems are awarded great potential to address global issues and create the necessary target knowledge[7] and resource allocation required to tackle the issues at hand. In the case of target knowledge, the question is what *the multiplicity of social goals* means for research, for society's practice-related problems, and for transdisciplinary collaboration between science and actors in the real world.[8]

There is currently a growing consensus that economic theory, politics and the financial system fall short of addressing these challenge effectively. In the Agenda 2030 – Transforming our World, the United Nations (UN) admits that the 17 Sustainable Development Goals (SDGs) create target knowledge however, the UN also notes that Sustainable Development is a critical skill and the goals provide the "what" (target knowledge), but not the "how" (Transformation Knowledge). [9]

Recent business and policy research has not only focused on global challenges, disruption and systemic risk like the Global Risk Report[10], but also on the megatrends that may have an impact on these global risks. [11] There is growing consensus that the Global Trends shaping future economics can be depicted as follows:

The first is globalization creating a shift of economic activity and political power from the West to the East and the South. This shift is creating a multipolar world. This is changing the pattern of capital flows, with more commercial capital flowing to emerging markets. For example, foreign direct investment to sub-Saharan Africa has grown fivefold in the past decade (Kleiterp, 2015).

Globalization is shifting the pattern of poverty. Twenty years ago, more than 90 % of the poor lived in low-income countries. Now, less than 30 % of the poor still live there. Low income is defined as countries in which the daily wage is less than 2 USDs. Nigeria and 12 other countries have been listed under the lower middle income countries, MICs, according to a report on industrialisation in Africa issued by the United Nations Industrial Development Organisation (UNIDO) and submitted to the Group of 20 (G20), Development Working Group (DWG) on request.

Two recent low-income countries, Nigeria and Vietnam, are expected to be in the G20 by 2050. (Kleiterp, 2015). It is clear that Official Development Assistance (ODA) has become less significant in the total flows to developing countries. Instead, we see growth in private sector investment and private international foundations as well as tied aid from former developing countries such as China, India and Brazil (Kleiterp, 2015).

6 https://ranking.influencer.world/de/account/finance20ch

7 http://www.transdisciplinarity.ch/td-net/Publikationen/Publikationen-td-net/mainColumnParagraphs/08/text_files/file2/document/knowledgeforms_principles.pdf

8 Pohl, C.Swiss Acedmy of Science and Arts see http://www.transdisciplinarity.ch/td-net/Publikationen/Publikationen-td-net/mainColumnParagraphs/08/text_files/file2/document/knowledgeforms_principles.pdf

9 see United Nations Agenda 2030 https://sustainabledevelopment.un.org/post2015/transformingourworld

10 see http://reports.weforum.org/global-risks-2015/

11 see for instance Price Waterhouse Coopers at https://erm.ncsu.edu/library/article/emerging-risks-global-trends-affects

The global growth with its effects on poverty alleviation has not resolved the sustainability questions as defined by the Brundtland commission: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." According to the World Bank the mismanagement of global public goods, such as carbon emissions, water and fisheries is continuing. The World Bank in its famous publication *"The Road to 2050"* estimates, that "At the forecast growth rates and given the growing middle class in emerging markets, we will need 2.4 planets in 2050 to sustain our lifestyles"[12]. The World Bank has included the four pillars poverty, population, technology and lifestyle into their definition of environmental sustainability. Based on this scenario, resources got into the focus of corporates and countries to get more control in important value chains. This control is important for them to keep access and to improve productivity and sustainability deep in their supply chain (Kleiterp, 2015).

The second trend is **market disruption** through disruptive innovation. In-depth research on the ways technology is transforming business around the world are conducted by MIT on an on-going basis. Technological disruption occurs when faster, simpler, cheaper inventions threaten market leaders (MIT, 2011). From social networks to renewable energy and medical advances, the speed of technological change has never been greater. With the creative destruction of markets, start-ups and established companies are vying to create tomorrow's businesses and shape a better society.[13]

The third trend is the shift in awareness to global challenges. Institutions and organisations have begun to looking into global challenges with a slight shift from global administrative law to global co-creation. The United Nations invoked the 17 Sustainable Development Goals in 2015, The World Bank issued its report on global challenges and local realities 14 other institutions and even private organizations are looking to address global challenges. For example, the global challenges are depicted and registered by the World Intellectual Property Organization WIPO drawing from a global network of scientists and publishing its Global Challenges Report hosting various projects like The Millennium Project, Green funding and Global Risks. The World Wide Universities (WUN) Research Network is addressing global challenges through research and has defined global challenges as "The major issues facing our planet of a magnitude that no one institution or organization can address on its own. They require the pooling and sharing of knowledge across institutions, across disciplines and across continents. Among these issues of global concern are the social trends and the changes in the

12 World Bank : The Road to 2050 - http://siteresources.worldbank.org/ESSDNETWORK/Resources/Roadto2050Part1.pdf

13 Disruption paired with debt and demography can create a considerable compound effect as Empirical Research Partners found out in their ongoing publications: "The U.S. consumer in 3D – Demography, Debt and Disruption. IN INTRODUCING THE 3D CHALLENGE – DEBT, DEMOGRAPHICS AND DISRUPTION Rothko Research Ltd13, establish that the three variables together create compound effects on effects future economic growth.

14 http://documents.worldbank.org/curated/en/798451468321863702/Global-challenges-and-local-realities

natural world which will impact our planet and its many populations in the near future."[15] Research programmes are expected to contribute significantly to addressing issues of global significance."

1.2. Relevance of Topic

Over the past two decades, ecosystems have emerged in order to create solutions for global issues of a magnitude that cannot be solved by one institution alone. Institutions and organisations have begun to looking into global challenges with a different lens, shifting awareness from global administrative law to global co-creation and the purposeful search for target knowledge in a manner that pools resources, research and leadership thoughts.[16]

The question what the building blocks of effective ecosystems are is relevant. First of all, without a scientific answer to that question it is difficult to evaluate success elements of ecosystems and understand how they need to be constructed, what are antecedents for their success and how they can be maintained, expanded and scaled. Secondly, how can one determine whether the contribution ecosystems claim to make for creation of target and transformation knowledge as well as for value creation and decision making is relevant. Relevance in this study will be defined by relatedness to the topic of decision making, whether it is practical and socially applicable and whether applicants find the decision making process transparent and congruent as well as economically feasible.

Based on a gap analysis between literature on ecosystems and practitioners claims a new theory for ecosystems of ethical culture is proposed.[17]

1.3. Research Questions:

The overarching question is how, this process of market disruption, increasing debt, demographic change happens. Under what conditions and in what ways are ecosystems for ethical culture a factor in the solution creation process, and do they help to make better decisions in organizations? How are such ecosystems created and sustained? How do they gain attractiveness, how do they accumulate their social licence, demonstrate and maintain their legitimacy, proliferate into other ecosystems, and how do they create impulses for

---

15 WUN accessed on April23rd 2018 https://wun.ac.uk/wun/globalchallenges

16. For instance the G8 invoked the "ecosystem for impact investing",16 the Worldwide Universities Network (WUN)16 the ecosystem for addressing global challenges. The ecosystems approach has first emerged from biology and found wide spread in 1995 during the Convention on Biological Diversity's second Conference of Parties (COP), as the EsA was introduced as a general principle for the first time for integral biological management and has been taken up by a number of organisations like Continuous Professional Development 16, World Bank16 with creating start-up ecosystems for development, ecosystems of sustainable finance and recently G8 in 2013 with its task force creating an ecosystem for impact investing.

17 please note that the second paper will do a qualitative study depicts the defining elements of newly and purposely created ecosystems, and their defining elements are researched using qualitative analysis in interviews, participant observation and semantic analysis.

transitions into business concepts that contribute to the 17 UN Sustainable Development Goals and provide solutions to global challenges? This broad question triggers a number of defining questions and requires an own research agenda.

This study examines existing literature on the new phenomenon of ecosystems creation for sustainability and the claims made by practitioners for its effectiveness. The article is also investigating preliminaries for ecosystem creation for ethical culture and to what extend they are represented in the current ecosystems approaches used by practitioners and researchers.

The theory represents an attempt to strike a balance between opposing camps in contemporary ecosystems and business ethics research. Moreover, the article discusses implications of the new theory for both policy makers and entrepreneurs in financial markets.

The following research questions will be addressed:

Research Question *1:*

How can an ecosystem of ethical business culture be defined?

Research Question 2:

How can a theory of creating ecosystems of ethical business or network culture be constructed?

1.4. Research Approach

The definitions and circumscriptions of ecosystems and for ethical culture in business and network organizations are analysed using a qualitative approach in order to find out how to define ecosystems of ethical culture and what the constructing elements of an ecosystems are.

RQ2: “How can a theory of creating ecosystems of ethical business or network culture be constructed?”

In order to identify all relevant studies a systematic narrative literature review was undertaken. The aim of such literature review is to comprehensively identify all relevant studies to answer a particular question” (Petticrew & Roberts, 2006, p.39). In a next step, the studies were extracted, checked and narratively summarized (Petticrew & Roberts, 2006). So far, there is no societal consensus on what ecosystems and ethical culture actually means and how they are constructed, various definitions exist which view ecosystems through different lenses, and as a result, conducting a systematic narrative review seemed a necessary starting point for this analysis.

Ecosystems are the most talked about instrument in practice, in particular in industries like finance, insurance, fintech, digitalization and social entrepreneurship. These new phenomena are used by practitioners to find answers to pressing problems, therefore the content is contextualized to the industries. A literature review about a topic which is most talked about by practitioners but not researched so much in context – except for learning - it appears interesting and relevant to understand both practitioners and scientist. In particular, it is relevant whether practitioners and scientist share the meaning of ecosystems or whether hose are different entities

for them. science and what practitioners understand to be ecosystems, both with regard to definition as well as to construction. A literature review is an appropriate way to start looking into this issue as it avoids selection bias. In particular, it can later be contrasted to expert interviews, focus groups observation, interviews or surveys in order to gained refined knowledge in context. Sources from different time points and cultures can be analyzed in lieu of collecting an expert opinion or some interviews at just one point in time or one location.

All material available were considered through searches of stems and combinations of keywords like 'ethical', 'culture', 'ecosystem', 'network' and 'sustainability' using the search engine 'Google', Google Scholar and the scientific database 'Science Direct'. The author reviewed 80 pieces of academic literature (journal articles, book chapters and publications by practitioners in their associations' reports and communications). Bibliographies of the initial literature provided further sources ('snowballing procedure'). The material, provided various explicit definition of 'ecosystems" and "ethical culture". The final sample consisted of 10 definitions. The time range of the definitions is 2000 to 2015- There was no time restriction imposed on the initial search, so the time range provides an indication that "ecosystems" and "ethical culture" is a relatively recent phenomenon.

Categories were derived from an existing theoretical framework using directed content analysis (Hsieh & Shannon, 2005). The author did select a theory and coded accordingly Afterwards, a directed content analysis of the definitions was conducted (Hsieh & Shannon, 2005). The material was coded according to a theory the author had selected a priori as an appropriate approximation and coded the material accordingly.[18] . the advantage of this method is that the results deliver an indication on whether there is support for the initial theoretical framework chosen (Hsieh & Shannon, 2005).

Model choices

Various theoretical frameworks are provided to take into account the context factors, antecedents and network effects of ethical culture.

One of the first frameworks used was the one developed by Hofstede which provides a input process output model. Hofstede argues that societies differ along four major cultural dimensions: power distance, individualism, masculinity, and uncertainty- avoidance. The model provides for input, process and output variables.

The definitions of ecosystems and of ethical culture were extracted from the sample studies. The author created a framework to code the input (values, assumptions), the process and the consequences according to the chosen theory. No interpretation of the meaning of the text was undertaken (Moldavska & Welo, 2017). The coding of the material was done manually to avoid misspecifications which may arise in computer assisted coding and in order to get an in-depth understanding of the issues.

The theoretical framework chosen to circumscribe practitioner ecosystems, was a recent framework published by the digital Economy.org, which is comprehensive in nature, however is not tested by theory.

[18] This type of analysis "is recommended when the purpose of the study is to test a theory" (Moldavska & Welo, 2017, p. 745).

This was an appropriate move as a holistic scientific model to depict ecosystems is currently missing. The best approximation approach has provided by Capra et al. (2017), an approximation to ecosystems has been found by the author in Capra's principles for ecological economics based on systems principles of life and philosophy of organism. Capra distils four fundamental principles. The four principles are; **nested systems, self-generating networks, open systems, and cognitive interactions**. This model does not define outcomes. A discussion on how these principles can be applied to design an ecological economic system that is life-enhancing on individual, social and ecological levels can be derived from such input process outcome (consequences) models. The framework Capra with four meta-categories identified was used in this study to depict the elements of ecosystems. Consequently, the texts of the definitions were coded using this four-pillar concept

1.5. Results

In order to answer the research question, the definitions were systematically analysed focusing on the respective sustainability dimension. In addition, the results were contextualized taking a business enhancing perspective. Where appropriate, links were drawn to wider socio-economic theory. The definitions' content is reviewed below. After the content analysis, the number of definitions that included certain dimensions were counted and served as a first indicator for their importance.

Ecosystem in the view of practitioners are a biological metaphor that highlights the interdependence of all actors in the business environment, who "coevolve their capabilities and roles" (Moore, 1996) and provide an isomorphic model between biological behaviour and the behaviour of the organizations or players in the field so ware, based on economic implications and leading to an evolutionary, self-organising, and self-optimising environment).

Ecosystems in the view of science are associated with complex systems thinking, adaptive management and transdisciplinary (Forget & Lebel, 2001; Kay et al., 1999; Waltner-Toews, Kay, & Lister, 2008). They elaborate in deriving transdisciplinary concepts and methods by means of a continuous learning process (Checkland, 1976) and mitigating policies to increase resilient system capacity. The definitions show material discrepancy: in categories and depths. For practitioners an ecosystem has the following promises:

- support economic activities, which contains the socially- constructed representations of the business ecosystem2
- restore or strengthen the self-sustaining capacity of human–natural relationships.
- is holistic and resilient
- is self-organized: through structure and relatedness it enhances profitability
- is self-constructed: expresses different socially-constructed partial interpretations and views of the economy (beliefs, interests, expertise)
- creates its own language: and which is represented through a variety of continuously evolving (natural and formal) languages and protocols.
- Is autopoietic and expresses itself in persistent knowledge: the architectural infrastructure that enables the desired "autopoietic" mechanisms and manages the distributed and pervasive storage of such knowledge, as well as the tools enacting the formalisation and the "processing" of this persistent knowledge.

Danger: Can become rigid, and vulnerable to collapse

For scientists an ecosystem is characterized by a

- continuous knowledge generation process,
- contextualization through reflexive dialog with stakeholders representing various perspectives within the social–ecological system of interest.
- a process that allows and incentivizes information sharing, open discussions and constructive resolution of disputes.
- being adaptive to changing environment
- has mitigating policies to increase resilient system capacity.
- a cyclic process of learning about system states and dynamics and adjusting management action according to observable behaviour changes. the leadership capabilities to moderate such multi-directional dialogs. In addition to the procedural setup of iterative learning and action
- governing concepts
- explicit utilization of collaboration and social learning to minimize conflict potentials and help building mutual trust
- detecting and correcting errors without necessarily challenging underlying beliefs and assumptions.
- Transcendence: Generative learning, characterized by intuition, creativity and a fundamental shift of mind.
- A share vision based on diverse beliefs, expertise and interests.

For both scientists and practitioners, ecosystems are rooted in system theory.

The results of scientific literature and practitioner sources have been compared using comparative analysis in order to understand the philosophy, how they approach their introduction, how they sustain them, with what motivation and what philosophy.

.1.6. Roadmap of this article:

Ecosystems are often associated with complex systems thinking, adaptive management and transdisciplinary. This article draws out the reasoning for the ecosystems approach in addressing global challenges and the elements that are seen as constituting and defining ecosystems through a literature review and comparison to practitioner's views based on secondary literature. It then engages in defining the demarcation line between networks, platforms, communities of practice and ecosystems. The literature review is distilling the building blocks or ecosystems according to the existing research directions and contrast it with the views and arguments for ecosystems used by practitioners. The review methodology is described. The results of the review are presented and contextualized. To address the gaps between literature and findings a new theory is proposed. The theory represents an attempt to strike a balance between opposing camps in contemporary camps in research and practice about ecosystems and in particular ecosystems of ethical culture. Moreover, the article discusses implications of the new theory for both policy makers and entrepreneurs in financial markets.[19]

2.0. Literature Review

[19] Against this background, this article conducts a systematic literature review to provide an overview of existing definitions of ecosystems, ethics in business and researches the role of target knowledge and transformation knowledge in creating ecosystems. A holistic definition of the concept in the business context is provided

2.1. Practitioners Perspective on Ecosystems

2.1.1. Why do practitioners focus on Ecosystems Approaches?

Wal-Mart's and Microsoft's dominance in modern business has been attributed to any number of factors, ranging from the vision and drive of their founders to the companies' aggressive competitive practices according to Professor Marco Iansiti and consultant Roy Levien. In A Harvard Business Review excerpt it is argued that the performance of these two very different firms derives from something that is much larger than the companies themselves: the success of their respective business ecosystems. These loose networks—of suppliers, distributors, outsourcing firms, makers of related products or services, technology providers, and a host of other organizations—affect, and are affected by, the creation and delivery of a company's own offerings.

Like an individual species in a biological ecosystem, each member of a business ecosystem ultimately shares the fate of the network as a whole, regardless of that member's apparent strength. Those two companies therefore pursued strategies that not only aggressively further their own interests but also promote their ecosystems' overall health. The metaphors of keystones and ecology help you think about your business environment.

Ecosystem approaches aim to restore or strengthen the self-sustaining capacity of human–natural relationships. During the last few decades three distinct methodologies, namely transdisciplinary, adaptive management, and generative learning have emerged from different schools of thought.

From the very beginning, the development of the concept of ecosystems (Tansley, 1935) has represented a holistic approach to coping with the complexity of nature by recognizing organisms and their environments at different scales of magnitude as self-contained entities connected through interchanges20. Koestler (1978) termed such system entities with contextual relationships ‘‘holons’’ and nested networks of holons a ‘‘holarchy’’, and Allen and Starr (Allen & Starr, 1982) emphasized the necessity to consider the dynamics and relationships among multiple scales within ecosystems. Accordingly, Kay, Regier, Boyle, and Francis (1999) appealed to ecosystem managers that complex systems thinking is an essential concept for understanding the dynamic and partially unpredictable nature of ecosystems.

Aldo Leopold was the first to apply the idea to problems arising from the continuous co-existence of humans and nature. This was implicit in his description of his ‘‘land ethic’’ as a basis for the concept of land health which views humans and nature as a complicated, interconnected, functional system (Leopold, 1949). Land health thereby translates to the capacity for self-renewal, i.e. the ecosystem’s capacity to continually recover and thus maintain a state of functional integrity and stability in the face of disturbance (Leopold, 1991). The concept of land health arguably resurfaced with the term ecosystem health decades later (Haskell, Norton, & Costanza, 1992), though contrary to Leopold’s inclusive view of

[20] C.H. et al. / Futures 67 (2015) 40–51 45 http://www.globalhealthasia.org/wp-content/uploads/2016/06/1-s2.0-S0016328714001967-main.pdf

humans in nature, the new concept placed human society outside the ecosystem (Wilcox, Aguirre, & Horwitz, 2012).

The idea of ecosystem health is related to that of resilience (Holling, 1973), a system's capacity to adapt to changes in its environment, while maintaining its structure and patterns of behaviour. A natural ecosystem's resilience is a property collectively determined by the structure and connectedness of individual holons, which operate on different scales of space and speeds depending on their relative position within their holarchy. But structure and connectedness, which positively correlate with productivity, are not static. Instead, a reoccurring sequence of events can be observed in self-organizing systems leading to an increasingly rigid behaviour and vulnerability toward surprise, followed by an eventual organizational collapse and a period of renewal (Gunderson, Holling, & Light, 1995).

Managing for sustainable development thus means to manage this vulnerability. Natural ecosystems provide human systems with a great diversity of tangible and intangible benefits (ecosystem goods and services), all of which are the result of ecosystem functions (De Groot, 2006). As the self-organizing process of natural ecosystems proceeds, it increasingly builds and maintains structure by incorporating resources and continuously enhancing resource efficiency (Kay et al., 1999). Ecosystem services can be conceived as merely incidental emergent phenomena of a sum of interrelated dynamics within this holarchical structure.

As ecosystem services such as flood control or the regulation of pathogens constitute essential benefits to human well- being, their decline can create existential problems within the interrelated human system (Millenium Ecosystem Assessment, 2005). Such problems deriving from a context of complexity, uncertainty and interdependencies are called wicked problems (Churchman, 1967). Their management must be sensitive to the possibility of the emergence of new problems due to an intentional interference in structure or dynamics of the natural ecosystem.

2.1.2. How Practitioners circumscribe and construct Ecosystems:

One of the most recent and most comprehensive approaches to ecosystems in practice has been the working paper of The digital Economy.org.

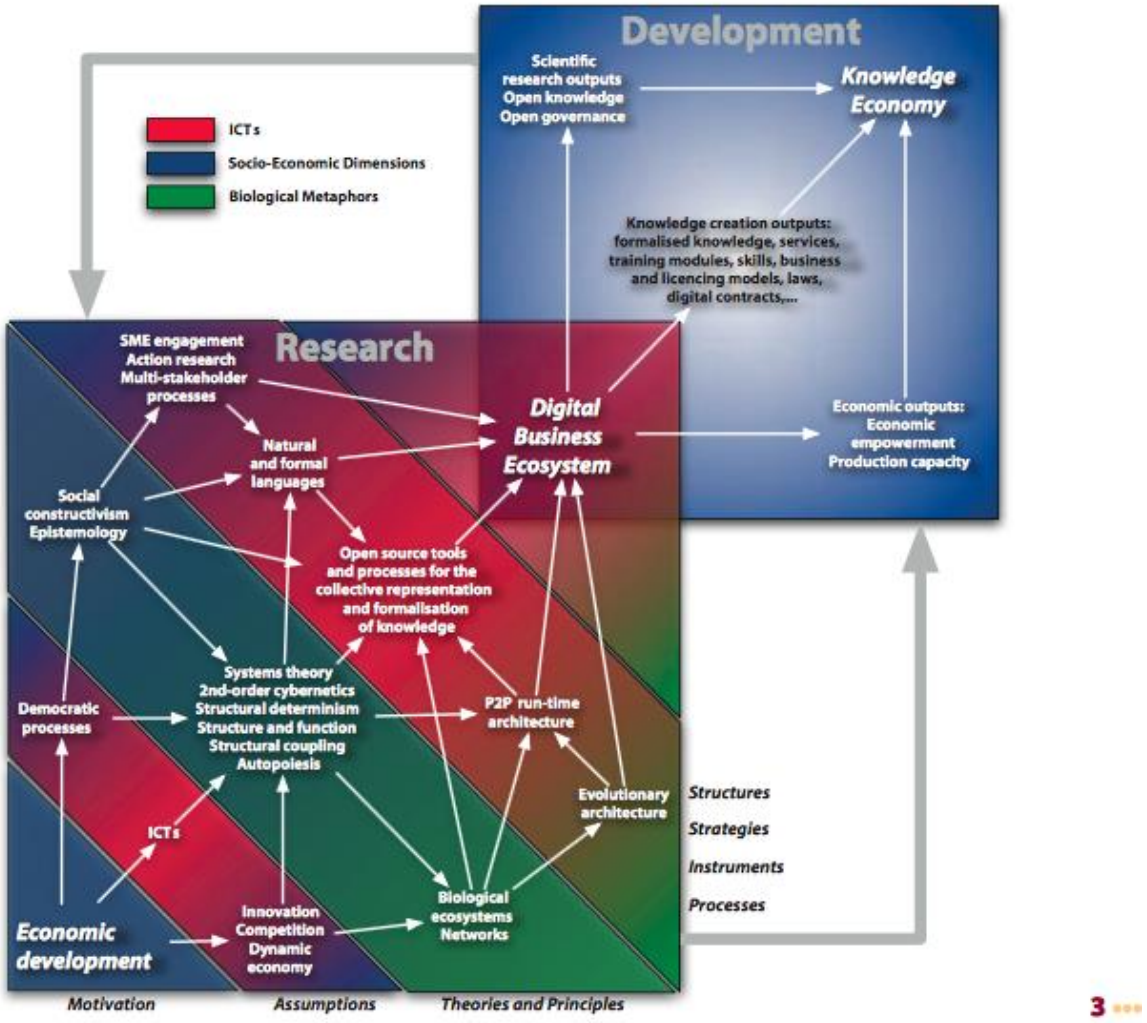

Figure 1: Ecosystems Conceptualization Source Digital Economy.org[21]

The authors of the Digital Economy paper provide an ecosystem construction process depicted in Figure 1. They acknowledge the needs and the processes that have led to the concept of digital business ecosystem (DBE), the impact that this area of research aims to achieve, and the scientific and conceptual perspectives that have been uncovered by this approach. The authors define ecosystem is an area of research and policy development, which is still in its infancy. According to the authors interaction between research strands in philosophy of science, epistemology, cybernetics, information theory, linguistics, and communication theory brought to a revolution in the studies of human behaviour, interaction, and communications, led by the Palo Alto school (Watzlawick et al., 1967; Bateson, 1972). We do not know whether the DBE research effort will lead to a new science of the interaction and communications between economic and digital actors. For a new science similar to the development of the general systems theory (Bertalanffy, 1969), the path still has to be forged.

[21] Ditigal Economy.org

Ecosystems provide the infrastructure designed to support economic activities, which contain the socially- constructed representations of the business ecosystem2□; it is essentially composed by the knowledge that expresses different socially-constructed partial interpretations and views of the economy and which is represented through a variety of continuously evolving (natural and formal) languages and protocols.
It is the architectural infrastructure that enables the desired "autopoietic" mechanisms and manages the distributed and pervasive storage of such knowledge, as well as the tools enacting the formalisation and the "processing" of this persistent knowledge

2. Review of Scientific literature

Taking an ecosystem approach has been associated with complex systems thinking, adaptive management and transdisciplinary (Forget & Lebel, 2001; Kay et al., 1999; Waltner-Toews, Kay, & Lister, 2008). They elaborate in deriving transdisciplinary concepts and methods by means of a continuous learning process (Checkland, 1976).

2.1. The Transdisciplinary View on Ecosystems

Transdisciplinary is the inclusive yet confrontational transition between different realities and paradoxes in an effort to overcome the disciplinary compartmentalization of knowledge (Ramadier, 2004). This concept has been embraced as a new way of generating knowledge necessary to solve the problems of today's complex world (Kleiber, 2001); a knowledge that due to its integrative and collaborative way of synthesis is socially robust (Nowotny, 2004) yet challengeable by new ideas in a constant dialog of all involved (Kleiber, 2001).

But transdisciplinary is not achieved by the mere aggregation of multiple disciplines within teams working on solving wicked problems. Scientific concepts and methods are an important contribution to a continuous knowledge generation process, but they need to be contextualized through reflexive dialog with stakeholders representing various perspectives within the social–ecological system of interest (Becker, 1999; Forget & Lebel, 2001; Fry & Jurt, 2000). Participation and accountability of representative or influential actors thus becomes intrinsic to the process of transformation toward sustainable development (Peden, 1999). Community-based participatory research is a promising approach to realizing integrative and equitable collaboration within partnerships of researchers and communities (Minkler & Wallerstein, 2008).

Furthermore, independent of individual believe, expertise and interest of the participants of a transdisciplinary endeavor, achieving a truly shared vision depends on the individual members' capability to approach given problems holistically and in a systemic way (Max-Neef, 2005). This requires a process that allows and incentivizes information sharing, open discussions and constructive resolution of disputes (Kaplan, Norton, & Rugelsjoen, 2010). Interactive techniques, such as scenario planning, a creative process of envisioning a diversity of alternative transformations plausible under various assumptions, can facilitate the exchange of views and information and thus support social learning and integrated decision processes toward more sustainable futures (Duinker & Greig, 2007; Peterson, Cumming, & Carpenter, 2003; Wollenberg, Edmunds, & Buck, 2000). This further requires higher education curricula to equip future researchers with respective knowledge, skills, values and dispositions for an open, curious, critical and socially responsible contribution (Hyun, 2011),

With transdisciplinary creating models, identifying problems and formulating objectives, the question remains how to institute control over the system. While controls are tools and

methods that enable the targeted manipulation of a system (Walters & Hilborn, 1978), management control has been described as a process of influencing people toward the implementation of a strategy (Anthony & Govindarajan, 2004). Consequently, competent management is recognized as essential for any attempt of forming a highly heterogeneous group of people and facilitating their collaboration (Ha¨berli et al., 2001).

2.2. The Adaptive Management View on Ecosystems

Regarding the guidance of management decisions, Janssen (2002) recommends a mix of three types of mitigating policies to increase resilient system capacity: precautionary policies that limit harmful surprises, adaptive policies that reduce system vulnerability to gradual change and reactive policies for quick responses to extreme events. While both, transition management and adaptive management acknowledge that the behaviour of complex systems cannot be accurately predicted over time, transition management is concerned with long-term changes (at least 25 years) in system functions (Foxon, Reed, & Stringer, 2009) and thus with precautionary policies. Adaptive management on the other hand is a cyclic process of learning about system states and dynamics and adjusting management action according to observable behaviour changes. The leadership capabilities to moderate such multi-directional dialogs are crucial. In addition to the procedural setup of iterative learning and action, adaptive social–ecological management fundamentally depends on the involvement of respective stakeholders and power structures (Kofinas, 2009). A gradient of models with various levels of participation has developed over the years, ranging from top-down citizen manipulation to full management control of those affected (Arnstein, 1969). At the participative end of this gradient, co-managing partnerships are integrative governing concepts that recognize the diversity of interests and the power distribution among communities and policy makers. These concepts explicitly utilize collaboration and social learning to minimize conflict potentials and help building mutual trust. Consequently, adaptive co-management (Armitage et al., 2009) is a governance approach that complements analytic transdisciplinary with socially robust sequential interventions shaped by a continuous process of social–ecological learning.

2.3. The Emergent Learning Perspective on Ecosystems

Controlling a system by means of adaptive management implies an adaptive learning process. This involves detecting and correcting errors without necessarily challenging underlying beliefs and assumptions. Generative learning, on the other hand, is characterized by intuition, creativity and a fundamental shift of mind. This self-transcendence is associated with innovations in theories, models and paradigms and with modifications of underlying norms, policies and objectives. Thus, while transdisciplinary pools knowledge and perspectives, and adaptive management rationally acts upon knowledge and improves it, generative learning develops new perspectives and insights beyond accumulated knowledge (Argyris & Schon, 1974; Chiva, Grandı´o, & Alegre, 2010; Kang, Morris, & Snell, 2007; Krishnamurti, 1994; Senge & Carstedt, 2001).

2.4. Ethical Cultures

We know from the discipline of Innovation, the successful implementation of creative ideas depends on a supportive environment for the expression and recognition of novel and useful thoughts (Amabile, 1996). According to research, it is inseparable from an organization's culture (Lemon & Sahota, 2004), the sum of an organization's cognitive, affective and behaviour characteristics (Senior & Fleming, 2006). While norms, assumptions and beliefs

that are supportive of the culture should be equally shared by all members of an organization, they become enacted in the form of respective structures, activities, policies, practices and procedures (Tesluk, Faar, & Klein, 1997). Corporate culture is assumed to have three layers: assumptions about "how things work around here", values that are created based on the assumptions and the test how they fit into the organisations' system and manifestations in form of artefacts like policies, products and management systems (Edgar Schein 2010). Constructive behavior can further be strengthened through socialization processes (Chatman, 1989). Most famous examples are social identity theory (van Hook 2004), identity processes (van Knippenberg 2004) shaping follower's behaviour, empirical research on the role of follower self-conception in leadership effectiveness (Van Knippenberg et al 2004) and rewards (Martins & Terblanche, 2003). However, individuals whose individual preference for organizational culture crucially deviates from the cultural characteristics of the organization are likely to promptly explore engagement opportunities with a better person-cultural fit (O'Reilly, Chatman, & Caldwell, 1991).

One of the first theoretical models used to circumscribe ethical culture is the model developed by Hofestede using an Input, Process Outcome Model depicted in Figure 2.

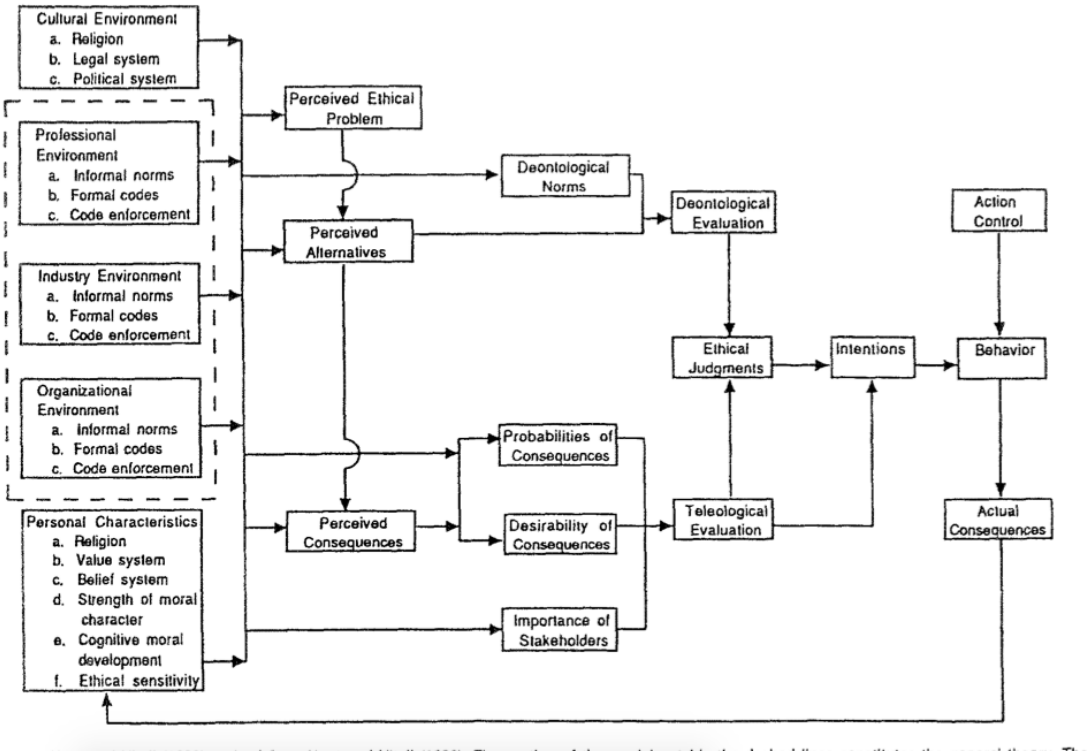

Figure 2: Hofstede's Cultural Model (1996)

Hofstede's Cultural Model (1996) is using five categories to circumscribe the formation of culture, whereas it remains unclear, whether the categories are independent of each other. The focus of this research is to distil the building elements of ethical cultures and what drives participants to engage. The input-process-output model is highly relevant.

Integrating Edgar Scheins Culture approach[22](Schein 2010) which is characterized through the three categories (1) assumptions, (2) values and (3) artefacts in building cultures, these inner dimensions of assumptions and values are included in Wilbers interior dimensions while the artifact is manifested in the exterior dimension behaviour and systems. So, if the organizational culture represents "how we do things around here," the ethical culture represents "how we do things around here in relation to ethics and ethical behaviour in the organization."[23]

Ethical culture is characterized by the following key elements:

- create a **promise** which is attractive and shared by a community of people or organizations, so it becomes an assumption on "how things are done around here" and addresses one or more global challenge or Sustainable Development Goal and related UN targets (strategic intent)

- Co-creating and maintaining a **cultural code** by aligning values to that promise in order to pass the fitness test between assumptions and values so that decisions are made in a coherent and congruent manner and members continue to keep the promises and honour commitments (values: self-construction and social identity)
- Create transparency and dialogue and make explicit how the promise is **embedded** into the culture as a compass to avoid mission drift (Manifestation: explicit values)
- Understand and **align interests and needs** of the members, the organisation, the markets and the world (Manifestation Management System)
- Integrate stakeholder engagement (**social contagion**)
- Be explicit about conflicts of interest and have **collaborative conflict resolution** models institutionalized[24] (Manifestation: Conflict Resolution Mechanism)
- Create projects, products and services that address the UN Sustainable Development Goals (**transformative project-network** manifestations)

3. Towards an integrated Theory of Ecosystems of Ethical Culture

Integrating the elements from the dimensions found in the comparison of practitioners approaches and scientific approaches, the following theory has been sketched integrating the components from both camps.

[22] – Edgar Schein. Organizational Culture and Leadership 4TH Edition: Artifacts and Behaviors. Espoused Values. Assumptions. Broader Culture. Professional Culture. Personal Experience https://www.corporatecompliance.org/Portals/1/PDF/Resources/past_handouts/WebConferences/october25attendeecopy.pdf?ver=2017-10-23-091459-500

[23] http://www.ethicalsystems.org/content/corporate-culture

[24] see Schein 2010

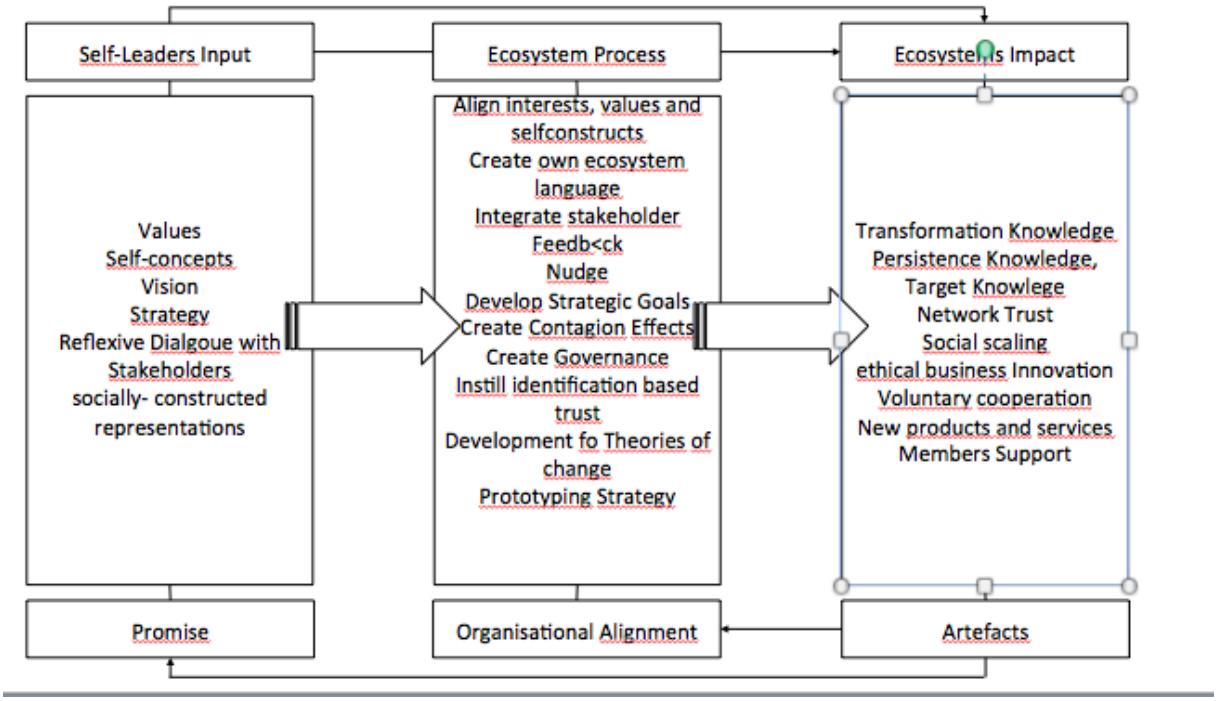

Figure 3: Describing Ecosystems conceptualisation

5. Summary of the analysis:

From this review of the definitions, it can be concluded that ecosystems are complex and with respect to ethical culture in their nascent stage. The requirements for ecosystems to succeed are high and to be considered ethical cultures compounding to the requirements. Furthermore, the Capra's four principles for ecological economics - nested systems, self-generating networks, open systems, and cognitive interactions. based on systems principles of life and philosophy of organism did stand the empirical and the practical test. Cultural aspects do enhance and support the ecological economics. Furthermore, only a minority of definitions provide concrete recommendations on the qualities of ecosystems or ethical culture.

If at all, the definitions are derived without reference to particular research methods. This highlights that ecosystem of ethical culture is a concept largely arising out of practical necessity. Furthermore, a high homogeneity within the dimensions was found, and only the cultural dimension shows some divergence in accentuation. A further finding is that the definitions or ecosystems promote an open access platform and shared learning oriented approach which makes them easy to implement and may moderate the high standards for ethical cultures. Pointing into the same direction, there is limited consideration in the scientific definitions of the interactions between the meta-categories and their possible relationship.

With respect to these findings and taking into account the role of ecosystems of ethical culture, it is possible to provide the following holistic definition of ecosystems of ethical culture:
Ecosystems of Ethical Culture are a biological metaphor that highlights the interdependence of all actors in the business environment, to address a need that no single player can address alone. The ecosystem of ethical culture is constructed based on a promise to address the need together in a collaborative manner with integrated renewal capacity in consideration of

economic, ethical and cultural implications and leading to an evolutionary, self-organising, and self-optimising transformation knowledge creation system creating an own language, a shared vision and applying and scaling transdisciplinary and emergent learning approaches.

5. Conclusions

This research based on codes that reflect the dimensions of the relevant input-process and output variables has shown that ecosystems have a particular role in addressing global challenges and creating shared solutions while maintaining ethical codes. Instead of zero sum games and "survival of the fittest", they allow members to gather around a shared vision and address challenges in an organized structure, that enhances productivity, agility and adaptation. As ecosystems emerge out of context factors such as economy 3.0., disruption and global challenges, ecosystems allow for a focal point and centre where new solutions and innovation are created while at the same time social goods are scaled. This is enhancing transformation knowledge and is aligned with a shared vision. It can be hypothesized that especially start-ups, social entrepreneurs and impact investors are intrigued by the concept. Ecosystems due to their transdisciplinary have the potential to eliminate intermediaries and allow the members to communicate and create directly together.

It can be concluded that there exists considerable and increasing pressure to implement ecosystems as the pressure from the market and global challenges are mounting, a situation which no player alone can solve. Future empirical studies about ecosystems of ethical culture may show how they address global challenges. This additional research may be needed to enhance the implementation of the concept of ecosystems as a natural ally to the Sustainable Development Goals, as well as production of target knowledge, transformation knowledge and knowledge transfer.

Management Implications

The concept of ecosystems of ethical culture through its transdisciplinary, the creation of an own ecosystem language based on self-constructs and shared values is able to address multiple management challenges, is blurring conventional concepts of the firm and may even lead to abandoning traditional intermediary approaches, as the ecosystem is able for cater all the intermediation needs. It makes ecosystem members more resilient and anti- fragile to disruptive changes and global challenges alike and established the relevant transformation and target knowledge. Nonetheless, the bottom line impacts of the requirements of the concept of ecosystems of ethical culture are of major importance. In this respect, it was shown that there exists a strong longing for shared vision, values, knowledge persistence and transdisciplinary. The enhanced trust may increase motivation and self-effectiveness. The same can be true for environmental achievement that can be better found with network support, knowledge transfer and contagion of innovation.

Therefore, a reasonable strategy for business organization could be to link themselves to an ecosystem with wider business objectives. In particular, improved communication on the benefits and constituting elements of ecosystems are beneficial and may foster innovation attributes of the ecosystem.

6. Limitations and Proposals for further Research:

The literature considered were all in English or German since these are the languages the author is familiar with. It is assumed that especially the inclusion of English literature and sources for this research ensures that the major works and the major influencers from practice on the topic have been covered. 'Grey literature' (e.g. proceedings, policy reports, dissertations) has not been reviewed. The literature in the area of practitioner application of ecosystems is still in its nascent stages. Ecosystems are a growing and mushrooming field. The literature on this has been sharply limited. Therefore it will be useful to get additional insights on how and why practitioners create ecosystems of ethical culture using qualitative and quantitative primary research directly at the source of leadership. The theory and the management implications were logically derived from the findings in particular the gap analysis between practitioners and scientists. Further research will be needed to validate the theory and make predictions based on its building blocks.

In a follow up research the innovative potential of the ethical ecosystems approach for the 17 UN Development Goals should be assessed. One option is using interviews with members of newly created ecosystems in business investment and finance to find out if how and in what ways leaders and organizational and network members have reflected on those ecosystems and on the impact of such ecosystems on the development of target knowledge, transformation knowledge, value propositions and decision making.[25]

At the level of the field as a whole, it is important to assess the perspectives and experience of industry leaders – asset owners, asset managers, demand-side actors and service providers – from both the Global North and Global South on ecosystems of ethical culture. Purposeful and stratified sampling methods can be used, though new players are regularly identified, especially at the regional and country levels, as the field evolves and activities become more visible and connected. Open-ended qualitative interviews with leaders and followers, as well as closed-ended surveys can be deployed. Over time, collecting useful data from this leadership cohort and followers on ecosystems will increasingly depend on the ability of evaluators to operate in multiple languages and to understand, in detail, diverse economic, political and cultural contexts.

Further, as industry associations form at the global, regional and national levels, network analysis can assist in classifying and assessing the structure, decision-making processes and financing of ecosystems (see Carden 2009). Participant observation at industry conferences, workshops and webinars can enrich such analysis. Tracking social media activity across the industry is also helpful in discerning trends, debates, achievements and obstacles, in real time.

Another dimension of field-building, particularly at the EU and international level, is that of policy related to ecosystem creation, scaling and leveraging.

Future research can clarify, how ecosystems of ethical business culture instil motivation, coopetition, cooperation, how they activate members and what are the self-sustaining forces

[25] We examine how and to what degree these business communities are fulfilling their quest 2. We ascertain whether these eco-communities are coalescing around a set of ethical principles. In the service of addressing the second goal, special attention will be paid to five quality of life issues that reflect the deliberate construction of ethical communities: A. Relatedness among members; B. Representation in governance and decision-making; C. Level of satisfaction with the experience; D. Access to economic production and distribution of labor across members; and E. Education and knowledge dissemination. For the business organizations a new canvass was used to model the values of the organization which emerge through a democratic process of co-creation

behind (inspiration, motivation, instigation, nudges), how ecosystems without a formal leadership avoid mission drift and to what extend management systems and governance support a stay the course approach.

Biographical Note

Karen Wendt is a PhD candidate at Modul University, Vienna, Austria. She holds a Bachelor degree in Business Economics from the University of Bonn (Germany) and a Master degree in Business Administration and Environmental Management from the University of Liverpool (UK). Before joining Modul University, she was an investment banker at Unicredit and Editor of the Sustainable Finance series with Springer Nature with Tourism, Heidelberg, Germany.

References:

Adger, W. N. (2000). Social and ecological resilience: Are they related? Progress in Human Geography, 24(3), 347–364. http://dx.doi.org/10.1191/ 030913200701540465

Allen, T. F. H., & Starr, T. B. (1982). Hierarchy: Perspectives for ecological complexity. Chicago: University of Chicago Press. Amabile, T. M. (1996). Creativity and innovation in organizations. Harvard Business School Background Note, 5, 1–15. Anderson, J. R. (1983). The architecture of cognition. Cambridge: Harvard University Press.

Anthony, R. N., & Govindarajan, V. (2004). Management control systems. New York: McGraw-Hill.

Argyris, C., & Schon, D. (1974). Theory in practice: Increasing professional effectiveness. San Francisco: Jossey Bass. Armitage, D. R., Plummer, R., Berkes, F., Arthur, R. I., Charles, A. T., Davidson-Hunt, I. J., et al. (2009). Adaptive co-management for social–ecological complexity. Frontiers in Ecology and the Environment, 7(2), 95–102. http://dx.doi.org/10.1890/070089 Arnstein, S. R. (1969). A ladder of citizen participation. Journal of the American Institute of Planners, 35(4), 216–224. http://dx.doi.org/10.1080/ 01944366908977225

Ayuso, S., Rodriguez, M. A., & Ricart, J. E. (2006). Using stakeholder dialogue as a source for new ideas: A dynamic capability underlying sustainable innovation. Corporate Governance, 6(4), 475–490. http://dx.doi.org/10.1108/14720700610689586

Bartol, K. M., & Martin, D. C. (1994). Management. Maidenhead: McGraw-Hill. Becker, E. (1999). Fostering transdisciplinary research into sustainability in an age of globalization: A short political epilogue. In E. Becker & T. Jahn (Eds.),

Sustainability and the social sciences. A cross-disciplinary approach to integrating environmental considerations into theoretical reorientation (pp. 284–289). London: Zed Books.

Berkes, R., & Folke, C. (1998). Linking social and ecological systems: Management practices and social mechanisms for building resilience. Cambridge: Cambridge University Press.

Boulding, K. E. (1956). General systems theory – The skeleton of science. Management Science, 2(3), 197–208.

Burnes, B. (2005). Complexity theories and organizational change. International Journal of Management Reviews, 7(2), 73–90. http://dx.doi.org/10.1111/j.1468- 2370.2005.00107.

Callicott, J. B. (1992). Aldo Leopold's metaphor. In R. Costanza, B. G. Norton, & B. D. Haskell (Eds.), Ecosystem health: New goals for environmental management (pp. 3– 20). Washington, DC: Island Press.

Carson, R. (1962). Silent spring. Boston: Houghton Mifflin Harcourt.

Chapin, F. S., III, Carpenter, S. R., Kofinas, G. P., Folke, C., Abel, N., Clark, W. C., et al. (2009). Ecosystem stewardship: Sustainability strategies for a rapidly changing planet. Trends in Ecology and Evolution, 25(4), 241–249. http://dx.doi.org/10.1016/j.tree.2009.10.008

Chatman, J. A. (1989). Matching people and organizations: Selection and socialization in public accounting firms. Academy of Management Proceedings, 1, 199–203. http://dx.doi.org/10.5465/AMBPP.1989.4980837

Checkland, P. B. (1976). Science and the systems paradigm. International Journal of General Systems, 3(2), 127–134. http://dx.doi.org/10.1080/ 03081077608934748

Chelariu, C., Johnston, W. J., & Young, L. (2002). Learning to improvise, improvising to learn: A process of responding to complex environments. Journal of Business Research, 55(2), 141–147. http://dx.doi.org/10.1016/S0148-2963(00)00149-1

Chiva, R., Grandı́o, A., & Alegre, J. (2010). Adaptive and generative learning: Implications from complexity theories. International Journal of Management Reviews, 12(2), 114–129. http://dx.doi.org/10.1111/j.1468-2370.2008.00255.x

Churchman, C. W. (1967). Wicked problems. Management Science, 4(14), B141–B142. http://dx.doi.org/10.1287/mnsc.14.4.B141

De Groot, R. (2006). Function-analysis and valuation as a tool to assess land use conflicts in planning for sustainable, multi-functional landscapes. Landscape and Urban Planning, 75, 175–186. http://dx.doi.org/10.1016/j.landurbplan.2005.02.016

Dooley, K., Corman, S. R., McPhee, R. D., & Kuhn, T. (2003). Modelling high resolution broadband discourse in complex adaptive systems. Nonlinear Dynamics, Psychology, and

Life Sciences, 7(1), 61–85. http://dx.doi.org/10.1023/A:1020414109458

Duinker, P. N., & Greig, L. A. (2007). Scenario analysis in environmental impact assessment: Improving explorations of the future. Environmental Impact Assessment Review, 27(3), 206–219. http://dx.doi.org/10.1016/j.eiar.2006.11.001

Folke, C., Chapin, F. S., III, & Olsson, P. (2009). Transformations in ecosystem stewardship. In F. S., Chapin, III, G. P. Kofinas, & C. Folke (Eds.), Principles of ecosystem stewardship (pp. 103–125). New York: Springer

Forget, G., & Lebel, J. (2001). An ecosystem approach to human health. International Journal of Occupational and Environmental Health, 7(2), 3–38.

Foxon, T. J., Reed, M. S., & Stringer, L. C. (2009). Governing long-term social–ecological change: What can the adaptive management and transition management approaches learn from each other? Environmental Policy and Governance, 19(1), 3–20. http://dx.doi.org/10.1002/eet.496.

Freeman, R. E. (1984). Strategic management: A stakeholder approach. New York: Cambridge University Press

Freeman, R. E., & McVea, J. (2001). A stakeholder approach to strategic management. In M. A. Hitt, R. E. Freeman, & J. S. Harrison (Eds.), Handbook of strategic management (pp. 189–207). Oxford.

Fry, P., & Jurt, L. (2000). Comparing farmers' and scientists' views on soil quality and biodiversity. Transdisciplinary: Joint problem-solving among science, technology and society. Workbook I: Dialogue Sessions and Idea Market, 1, 411–415.

Gardner, R., Ostrom, E., & Walker, J. M. (1990). The nature of common-pool resource problems. Rationality and Society, 2(3), 335–358. http://dx.doi.org/10.1177/1043463190002003005

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). The new production of knowledge: The dynamics of science and research in contemporary societies. London: Sage.

Golley, F. B. (1993). A history of the ecosystem concept in ecology: More than the sum of the parts. New Haven: Yale University Press.

Grumbine, R. E. (1994). What is ecosystem management? Conservation Biology, 8(1), 27–38. http://dx.doi.org/10.1046/j.1523-1739.1994.08010027.x

Gunderson, L. H., Holling, C. S., & Light, S. S. (1995). Barriers broken and bridges built: A synthesis. In L. H. Gunderson, C. S. Holling, & S. S. Light (Eds.), Barriers and bridges to the renewal of ecosystems and institutions (pp. 489–532). New York: Columbia University Press.

Häberli, R., Bill, A., Grossenbacher-Mansuy, W., Thompson Klein, J., Scholz, R. W., & Welti, M. (2001). Synthesis. In J. Thompson Klein, W. Grossenbacher-Mansuy, R.

Häberli, A. Bill, R. W. Scholz, & M. Welti (Eds.), Transdisciplinarity: Joint problem solving among science, technology and society. An effective way for managing complexity (pp. 6–22).

Birkhäuser.Hall, W. (1995). Managing cultures: Making strategic relationships work. Chichester: Wiley.

Hart, S. L., & Sharma, S. (2004). Engaging fringe stakeholders for competitive imagination. Academy of Management Executive, 18(1), 7–18. http://dx.doi.org/10.5465/AME.2004.12691227

Haskell, B. D., Norton, B. G., & Costanza, R. (1992). What is ecosystem health and why should we worry about it? In R. Costanza, B. G. Norton, & B. D. Haskell (Eds.), Ecosystem health: New goals for environmental management (pp. 3–20). Washington, DC: Island Press.

Haynes, G. (2002). The catastrophic extinction of North American mammoths and mastodonts. World Archaeology, 33, 391–416. http://dx.doi.org/10.1080/00438240120107440.

Hilborn, R., Walters, C. J., & Ludwig, D. (1995). Sustainable exploitation of renewable resources. Annual Review of Ecology and Systematics, 26, 45–67. http://dx.doi.org/10.1146/annurev.es.26.110195.000401.

Hirsch Hadorn, G., Biber-Klemm, S., Grossenbacher-Mansuy, W., Hoffmann-Riem, H., Joye, D., Pohl, C., et al. (2008). The emergence of transdisciplinarity as a form of research. In G. Hirsch Hadorn, H. Hoffmann-Riem, S. Biber-Klemm, W. Grossenbacher-Mansuy, D. Joye, C. Pohl, U. Wiesmann, & E. Zemp (Eds.), Handbook of transdisciplinary research (pp. 19–39). Dordrecht: Springer.

Holling, C. S. (1973). Resilience and stability of ecological systems. Annual Review of Ecology and Systematics, 4, 1–23. http://dx.doi.org/10.1146/annurev.es. 04.110173.000245.

Holling, C. S., & Meffe, G. K. (1996). Command and control and the pathology of natural resource management. Conservation Biology, 10(2), 328–337. http://dx.doi.org/10.1046/j.1523-1739.1996.10020328.x

Huber, G. P. (1991). Organizational learning: The contributing processes and the literatures. Organization Science, 2(1), 88–115. http://dx.doi.org/10.1287/ orsc.2.1.88.

Hughes, T. P., Gunderson, L. H., Folke, C., Baird, A. H., Bellwood, D., Berkes, F., et al. (2007). Adaptive management of the great barrier reef and the Grand Canyon world heritage areas. AMBIO: A Journal of the Human Environment, 36(7), 586–592. http://dx.doi.org/10.1579/0044-7447(2007)36[586:AMOTGB]2.0.CO;2.

Hyun, E. (2011). Transdisciplinary higher education curriculum: A complicated cultural artifact. Research in Higher Education Journal, 11(1), 1–19.

Iannucci, C., Munafo`, M., & Sambucini, V. (2011). A system approach to the integration of ecosystem services with DPSIR components. Aachen: Shaker Verlag.

Janssen, M. A. (2002). A future of surprises. In L. H. Gunderson & C. S. Holling (Eds.), Panarchy: Understanding transformations in human and natural systems (pp. 241–260). Washington, DC: Island Press.

Jantsch, E. (1976). Self-transcendence: New light on the evolutionary paradigm. In E. Jantsch & C. W. Waddington (Eds.), Evolution and consciousness: Human systems in transition (pp. 9–10). Reading: Addison-Wesley.

Kang, S. C., Morris, S. S., & Snell, S. A. (2007). Relational archetypes, organizational learning, and value creation: Extending the human resource architecture. Academy of Management Review, 32(1), 236–256. http://dx.doi.org/10.5465/AMR.2007.23464060

Kaplan, R. S., Norton, D. P., & Rugelsjoen, B. (2010). Managing alliances with the balanced scorecard. Harvard Business Review, 88(1), 114–120.Kay, J. J., Regier, H. A., Boyle, M., & Francis, G. (1999). An ecosystem approach for sustainability: Addressing the challenge of complexity. Futures, 31(7), 721–742. http://dx.doi.org/10.1016/S0016-3287(99)00029-4.

Kleiber, C. (2001). What kind of science does our world need today and tomorrow? A new contract between science and society. In J. Thompson Klein, W. Grossenbacher-Mansuy, R. Häberli, A. Bill, R. W. Scholz, & M. Welti (Eds.), Transdisciplinarity: Joint problem solving among science, technology and society. An effective way for managing complexity (pp. 47–58). Basel: Birkhäuser.

Koch, P. L., & Barnosky, A. D. (2006). Late quaternary extinctions: State of the debate. Annual Review of Ecology, Evolution, and Systematics, 37, 215–250. http:// dx.doi.org/10.1146/annurev.ecolsys.34.011802.132415.

Koestler, A. (1978). Janus: A summing up. London.

Kofinas, G. P. (2009). Adaptive co-management in social–ecological governance. In F. S., Chapin, III, G. P. Kofinas, & C. Folke (Eds.), Principles of ecosystem stewardship (pp. 77–101). New York: Springer.

Krishnamurti, J. (1994). On learning and knowledge. San Francisco: Harper.

Larkin, P. A. (1977). An epitaph for the concept of maximum sustained yield. Transactions of the American Fisheries Society, 106(1), 1–11. http://dx.doi.org/10.1577/ 1548-8659(1977) 106<1:AEFTCO>2.0.CO;2

Layton, R., Foley, R., & Williams, E. (1991). The transition between hunting and gathering and the specialised husbandry of resources. Current Anthropology, 32, 255–274. http://dx.doi.org/10.1086/203953

Lemon, M., & Sahota, P. S. (2004). Organizational culture as a knowledge repository for increased innovative capacity. Technovation, 24(6), 483–498. http:// dx.doi.org/10.1016/S0166-4972(02)00102-5

Leopold, A. (1949). A sand county almanac and sketches here and there. New York: Oxford University Press.

Leopold, A. (1991). Conservation: In whole or in part? In S. L. Flader & J. B. Callicott (Eds.), The river of the mother of God and other essays by Aldo Leopold (pp. 310– 319). University of Wisconsin Press: Madison.

Ludwig, D., Hilborn, R., & Walters, C. (1993). Uncertainty, resource exploitation and conservation: Lessons from history. Science, 260(2), 17–36. http://dx.doi.org/ 10.1126/science.260.5104.17

Martins, E. C., & Terblanche, F. (2003). Building organisational culture that stimulates creativity and innovation. European Journal of Innovation Management, 6(1), 64–74. http://dx.doi.org/10.1108/14601060310456337 .

Matson, P. A., Parton, W. J., Power, A. G., & Swift, M. J. (1997). Agricultural intensification and ecosystem properties. Science, 277(5325), 504–509. http://dx.doi.org/ 10.1126/science.277.5325.504.

Max-Neef, M. A. (2005). Foundations of transdisciplinarity. Ecological Economics, 53(1), 5–16. http://dx.doi.org/10.1016/j.ecolecon.2005.01.014

McConnell, G. (1954). The conservation movement: Past and present. Western Political Quarterly, 7(3), 463–478.

Meffe, G. K., Nielsen, L. A., Knight, R. L., & Schenborn, D. A. (2002). Ecosystem management: Adaptive, community-based conservation. Washington, DC: Island Press. Millennium Ecosystem Assessment (2005). Ecosystems and human well-being: Health synthesis. Island Press: Washington, DC.

Minkler, M., & Wallerstein, N. (2008). Introduction to community-based participatory research. In M. Minkler & N. Wallerstein (Eds.), Community-based participatory research for health: From process to outcomes (pp. 5–23). San Francisco: John Wiley & Sons.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. Organization Science, 5(1), 14–37. http://dx.doi.org/10.1287/orsc.5.1.14 .

Nowotny, H. (2004). The potential of transdisciplinarity. Nordic Reader, 6, 10–19.

O'Reilly, C. A., Chatman, J., & Caldwell, D. F. (1991). People and organizational culture: A profile comparison approach to assessing person–organization fit. Academy of Management Journal, 34(3), 487–516. http://dx.doi.org/10.2307/256404

Ostrom, E., Burger, J., Field, C. B., Norgaard, R. B., & Policansky, D. (1999). Revisiting the commons: Local lessons, global challenges. Science, 284(5412), 278–282. http://dx.doi.org/10.1126/science.284.5412.278.

Paton, R. A., & McCalman, J. (2000). Change management: A guide to effective implementation. London: Sage.

Peden, D. G. (1999). Mono-, multi-, inter-, and transdisciplinarity in IDRC research activities. Ottawa: International Development Research Center.

Pedersen, E. R. (2006). Making corporate social responsibility (CSR) operable: How companies translate stakeholder dialogue into practice. Business and Society Review, 111(2), 137–163. http://dx.doi.org/10.1111/j.1467-8594.2006.00265.x

Peterson, G. D., Cumming, G. S., & Carpenter, S. R. (2003). Scenario planning: A tool for conservation in an uncertain world. Conservation Biology, 17(2), 358–366. http://dx.doi.org/10.1046/j.1523-1739.2003.01491.x .

Pimentel, D., & Edwards, C. A. (1982). Pesticides and ecosystems. BioScience, 32(7), 595–600. http://dx.doi.org/10.2307/1308603.

Pinkerton, E. (2009). Coastal marine systems: Conserving fish and sustaining community livelihoods with co-management. In F. S., Chapin, III, G. P. Kofinas, & C. Folke (Eds.), Principles of ecosystem stewardship (pp. 241–257). New York: Springer.

Pondy, L. R., & Mitroff, I. I. (1979). Beyond open system models of organization. Research in Organizational Behavior, 1(1), 3–39.

Post, J. E., Preston, L. E., & Sauter-Sachs, S. (2002). Redefining the corporation: Stakeholder management and organizational wealth. Stanford: Stanford University Press.

Prigogine, I., & Stengers, I. (1984). Order out of chaos: Man's new dialogue with nature. New York.

Ramadier, T. (2004). Transdisciplinarity and its challenges: The case of urban studies. Futures, 36(4), 423–439. http://dx.doi.org/10.1016/j.futures.2003.10.009.

Rapport, D. J., Regier, H. A., & Hutchinson, T. C. (1985). Ecosystem behavior under stress. American Naturalist, 125(5), 617–640.

Rodriguez, J. P., Beard, T. D., Jr., Bennett, E. M., Cumming, G. S., Cork, S., Agard, J., et al. (2006). Trade-offs across space, time, and ecosystem services. Ecology and Society, 11(1), 28.

Rowley-Conwy, P., & Layton, R. (2011). Foraging and farming as niche construction: Stable and unstable adaptations. Philosophical Transactions of the Royal Society B: Biological Sciences, 366(1566), 849–862. http://dx.doi.org/10.1098/rstb.2010.0307.

Schaeffer, D. J., Herricks, E. E., & Kerster, H. W. (1988). Ecosystem health. I. Measuring ecosystem health. Environmental Management, 12(4), 445–455. http://dx.doi.org/10.1007/BF01873258.

Scheffer, V. B. (1991). The shaping of environmentalism in America. Seattle: University of Washington Press.

Senge, P. M., & Carstedt, G. (2001). Innovating our way to the next industrial revolution. MIT Sloan Management Review, 42(2), 24–38.

Senior, B., & Fleming, J. (2006). Organizational change. London: Prentice Hall.

Smeets, E., & Weterings, R. (1999). Environmental indicators: Typology and overview. Copenhagen: European Environment Agency

Smith, R. F., & van den Bosch, R. (1967). Integrated control. In W. W. Kilgare & R. L. Doutt (Eds.), Pest control (pp. 295–340). New York: Academic Press.

Smuts, J. C. (1926). Holism and evolution. New York: Viking.

Soule, M. E., & Wilcox, B. A. (1980). Conservation biology: An evolutionary-ecological

perspective. Sunderland: Sinauer Associates.

Stacey, R. D. (2007). Strategic management and organisational dynamics: The challenge of complexity to ways of thinking about organisations. London: Prentice Hall.

Stern, P. C., & Fineberg, H. V. (1996). Understanding risk: Informing decisions in a democratic society. Washington, DC: National Academies Press.

Tansley, A. G. (1935). The use and abuse of vegetational concepts and terms. Ecology, 16(3), 284–307.

Tesluk, P. E., Faar, J. L., & Klein, S. R. (1997). Influences of organizational culture and climate on individual creativity. Journal of Creative Behaviour, 31(1), 21–41. http://dx.doi.org/10.1002/j.2162-6057.1997.tb00779.x.

Thomas, C. R., & Maurice, S. C. (2005). Managerial economics. New York: McGraw-Hill.

Walters, C. J., & Hilborn, R. (1978). Ecological optimization and adaptive management. Annual Review of Ecology and Systematics, 9(1), 157–188. http://dx.doi.org/10.1146/annurev.es.09.110178.001105.

Walters, C. J., Korman, J., Stevens, L. E., & Gold, B. (2000). Ecosystem modeling for evaluation of adaptive management policies in the Grand Canyon. Ecology and Society, 4(2), 1.

Waltner-Toews, D., Kay, J. J., & Lister, N.-M.E. (2008). The ecosystem approach: Complexity, uncertainty, and managing for sustainability. New York: Columbia University Press.

Wilcox, B. A., Aguirre, A., & Horwitz, P. (2012). Ecohealth: Connecting ecology, health and sustainability. In A. A. Aquirre, R. S. Ostfield, & P. Daszak (Eds.), New directions in conservation medicine: Applied cases of ecological health (pp. 17–32). Oxford University Press: New York.

Wollenberg, E., Edmunds, D., & Buck, L. (2000). Anticipating change: Scenarios as a tool for adaptive forest management: A guide. Bogor: Center for International Forestry Research (CIFOR).