HUMAN CAPITAL AND ASSETS IN THE NETWORKED WORLD

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HUMAN CAPITAL AND ASSETS IN THE NETWORKED WORLD

Edited by

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INVESTOR IN PEOPLE

This book is dedicated to my wife Fay, whose continuous unconditional loving support is a daily miracle and without whom the search for a better human condition would have been a lonely and cold journey.

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Michael B. Cohen is a senior lecturer in the Deakin Business School where he teaches topics in Management and Leadership. Michael's PhD thesis was on the problem of the valuation of intangible assets and he has previously held teaching posts at Victoria University in Melbourne, the University of Cape Town, and the University of the Witwatersrand. In addition to teaching, Michael has also been employed as an executive consultant for Ernst & Young (London) where he was part of the Risk

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Monia La Verghetta is PhD in Economics and Management at University of Macerata (Italy). Her research concerns organizational theory and behavior. Main works and researches focus on organizational vision outlined from different perspectives: from the field of studies on network to the ones related to leadership and gender issue.

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Joel Lobo completed his medical school and residency in Orthopaedic Surgery at the University of Toronto, and subsequently, two fellowships: Trauma and Upper Limb Reconstruction and Sports Medicine and Arthroscopy. His current practice at Lakeridge Health, Ajax-Pickering Hospital includes reconstruction of sports-related knee injuries, as well as Arthroscopy and open reconstruction of the shoulder with a special interest in complex shoulder instability and complex rotator cuff surgery. He also serves as an operative consultant for Ontario's Workplace Safety and Insurance Board's Shoulder and

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He is a co-founder of The Shoulder Centre, an innovative central intake and assessment model for shoulder care in the Province of Ontario. He is involved in educational outreach to family physicians, training of Shoulder Champions in the family physician community, development of the electronic referral form for The Shoulder Centre, and the physician lead for the Ajax Pickering Foundation for fundraising activities related to The Shoulder Centre.

His hobbies and interests include woodworking, music, graphic design, coding in JavaScript, electronics, and cooking gourmet food. He is a student of enology and high performance driver education, and an avid fan of professional hockey.

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Farah holds a combined BA in Economics and Psychology from McMasters University and a Certified Management Accountant designation from Toronto, Canada. For the past 6 years, Farah has worked in management positions at both Rouge Valley and

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Federico Niccolini is Associate Professor of Organizational Science at the University of Pisa (Italy). He has been Professor of Organizational Theory and Behavior at the University of Macerata from 2011 to 2015 and researcher from 2005 to 2010. His research interests are focused on protected areas management and organization, organizational dynamics related to sustainable development, organizational vision, and knowledge management. He has been visiting scholar or professor at universities in United States, including Stanford. Since 2007, he has been affiliated with the Department of Natural Resource Recreation and Tourism at the Colorado State University (USA).

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Krishna Priya Rolla is an alumnus of Indian Institute of Management, Ahmedabad for its Faculty Development Programme. She has authored more than 15 research articles published in some of the reputed conference proceedings across globe. The author has accomplished her PhD in Human Resource Accounting, wherein observations were made on its prevalence in manufacturing sector(s). With an experience of more than seven years in academics, she intends to continue her work in the field of human capital quantification methods.

Dafna Schwartz (Economist), Associate Professor. She is the Head of the MBA track in Entrepreneurship, High-Tech and Innovation

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Jesse Slade Shantz is a sports and shoulder surgeon and is a past Chief Medical Officer for OMSignal, a wearable tech company and co-founder of spxtrm, a healthcare tech company. He is interested in applying technology and management principles (Lean, etc.) to create a more patient-centered healthcare system focused on increasing value to users.

As well as holding a medical degree from the University of Western Ontario, with his residency in Orthopaedic Surgery at the University of Manitoba, he completed fellowships in bone biology research and orthopaedic trauma at the University of California, San Francisco, and shoulder and sports at the University of Toronto. His research focuses on technology, simulation and clinical trials. Concurrently, he holds an MBA from the Ivey School of Business. With his cross-enterprise training he advises start-up companies in the digital health field specializing in data use and privacy issues.

Ernie Stark holds a master's degree in Industrial Relations from Iowa State University and a PhD in Community and Human Resources from the University of Nebraska, Lincoln. Semi-retired, he serves as an international visiting lecturer for Saunders College of Business at Rochester Institute of Technology. He has published in *The Journal of Applied Management and Entrepreneurship, Journal of Managerial Issues*, *The Journal of Workplace*

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Knut Ingar Westeren has been a Professor of Economics at Nord University in Norway since 2001. He received his Master in Economics from the University of Oslo and PhD in Regional Science from the University of Minnesota/NTNU (Trondheim). He teaches knowledge management, knowledge and competitiveness and public economics at Nord University and also teaches philosophy of science at EDAMBA (**European Doctoral Programmes Association in Management and Business Administration**). He is also a professor at UNIOESTE in Parana, Brasil, and a visiting professor at the University of Wisconsin. He has written numerous books and publications dealing with several aspects of the knowledge economy, such as the business sector and the public sector, and in 2012 he published the book *"Foundations of the knowledge economy."* He has been working with several companies in Norway, Denmark, Brasil, Kuwait, and Sri Lanka to analyze how to improve competitiveness by utilizing knowledge more efficiently.

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She is an entrepreneurial spirited professional with broad experience in start-ups, global marketing, business development, and executive education. She had primary responsibility for marketing products and services and managing teams in more than 20 countries for technology companies and financial and academic institutions. Eudaimon Inc., her sixth start-up, leverages findings from her doctoral research.

Research: Her research focuses on mechanisms that help an increasingly mobile and entrepreneurial workforce thrive.

Passion: Development of games, tools, and workshops to help individuals find purpose and meaning in an increasingly complex and dynamic world, where a cohesive thread connects them to their past, present, and possibilities.

Daniel J. Worden <ideas@metacogni.com> has gained a wealth of experience working with emerging computer and communications technologies since 1982 and through focusing on their commercialization since 2000. He has published five books on topics ranging from Storage Networks to Java and relational databases. His work has been translated into Chinese and Japanese language versions. Currently, his research interests include smart contracts and provenance using blockchain technologies, as well as leveraging social media to create double loop learning dynamics as an integral part of organizational development and project management.

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ACKNOWLEDGMENT

The call for chapters for this book challenged the authors to consider the subject of human capital in the networked global economy from the connectionist epistemology of knowledge. The authors were invited to contribute chapters to the book based on proposals approved by the editor. Each complete chapter received external, blind review in addition to the editor review. The editor wishes to thank the Philip J. and Elizabeth Hendrickson Professorship in Business at UW-Green Bay for partial financial support.

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INTRODUCTION

The effective employment and deployment of intellectual capital and human assets in organizations are widely recognized as a critical characteristic of successful economies and organizations. Their abilities to respond to changing environments, to "learn," and to be efficient and competitive all depend, to some extent, on the individuals within their boundaries. It is the management of those individuals and their interactions with other actors and systems, in a way that is consistent with the goals and policies of the entities, that creates value for the organization and results in the creation of human and social capitals as an asset that will be the focus of this book. A number of developments are making human and social assets management and measurement increasingly salient to today's executives, including changing characteristics of the labor force, the rapid pace and implementation of technological innovation, greater international competition, new experiments with organizational structures, and greater attention to customers' relationships. Following a recent advanced definition of human and social capitals (among other forms of capital) using information, energy, and entropy, the focus of this book will be on the impact of new technologies (e.g., mobile, blockchain, and Internet of things) on the intersection of human and social capital, being grounded on the ensuing understanding of the importance of information and information processing as well as the perspective of humans as "being their data." Some of the recent resulting changes are the growth of direct bartering within the social exchange economy (e.g., Collaborative Commons or Sphere of Reciprocity), creation of new alternative currencies (e.g., Bitcoin),

and growth of outsourcing and the "gig" economy. Research needs to be done at the macro, mezzo, and micro level (including multiple levels), from numerous perspectives and disciplines, focusing on different and diverse units of analysis (country, region, organization, groups, and individuals).

This book is going beyond the current literature by providing a platform for a broad scope of discussion regarding human capital and assets, and, more importantly, by encouraging a multidisciplinary fusion between diverse disciplines. Multilevel and multidiscipline chapters are represented, as well as, when appropriate, plurality of empirical methods from diverse disciplines that are enhancing the building of a holistic theory of human capital and assets in the new networked society are reported.

The book's chapters discuss *human capital* and *human assets* from a **connectionist** (e.g., Russ, Fineman, & Jones, 2010) perspective, focusing on the growing infusion of the traditional human capital and social (e.g., Nahapiet, 2011; Nyberg, Moliterno, Hale, & Lepak, 2014) and knowledge-based systems (e.g., Kasabov, 2015), organizational capital perspectives. The book extends the discussion of the interaction between the three (and other) types of capital among different actors over different time frames (e.g., Wright, Coff, & Moliterno, 2014), assuming that the nature of such interaction is revolutionized; and continuously and dynamically changing resulting from the application of new networked technologies. As such, this book is going beyond the classic network building perspective of using knowledge when the individual, team, and organizations are the unit of analysis. The proposed alternative perspectives are viewing humans alternatively as *homo economicus, technologicus* (Puech, 2008), *sustainabiliticus* (Russ, 2014b) or *socialis* (Helbing, 2014), *inforgs* (Floridi, 2014); interacting in a multilevel system which is enabled by the pervasive mobile technologies and the Internets of things and "blockchain" technologies. This book broadens the human capital praxis introduced and used in Russ (2014a, 2014b, 2016),

into the new networked society (e.g., Floridi, 2014) focusing on definitions, management, value creation, valuation, and reporting of human capital and assets.

Chapter 1, written by Knut Ingar Westeren and titled "Epistemological Perspectives in the Analysis of Human Capital and Human Assets and the Development of the Knowledge-Based Economy," discusses the use of the three epistemologies: cognitivism, connectionism, and autopoiesis, in the context of knowledge management. The author reviews the use of the three epistemologies in the academic literature and suggests that a combination of the three might be more fruitful while studying different aspects of knowledge management and human capital in the knowledge-based economy.

Chapter 2, also written by Knut Ingar Westeren and titled "Knowledge Transfer Networks, Value Creation, and Cultural Aspects of Industrial Production," studies knowledge transfer in meat producing firms in five different countries. The author found the connectionist epistemological platform as the most conducive for knowledge transfers in this traditional manufacturing industry, with a characteristic routinization of production. The most effective knowledge shared was typically: short, explicit, logic, and at the equivalent shared knowledge level; when there was shared understating of the operational context, the receiver's unique situation, the context of cooperation and allowing the receivers a space of finding a new solution when disagreeing with the proposed decision. At the organizational level of analysis, the author suggests that the autopoietic perspective was the most fruitful, when considering that the firm's organizational system is a quasi-closed system that mainly reproduces itself by sharing knowledge. Finally, the author suggests that productive companies must invest in human capital in order to benefit from the knowledge exchanged.

Chapter 3, written by Daniel J. Worden and titled "Emerging Technologies for Data Research: Implications for Bias, Curation,

and Reproducible Results," investigates the positive and negative impact of big data and artificial intelligence on how individuals specifically researchers scan their environment. The author considers different biases facing the researcher while scanning the environment and their risks. The use of recently developed tools that employ artificial intelligence (which are based on visualization) and cognitive analytics is demonstrated. The author also revises some of the networked world tools and web services available to researchers. The chapter suggests that such tools can enhance the value of human capital of a researcher, and their productivity by using such tools effectively and efficiently on a continuous basis.

Chapter 4, written by Victoria Choi Yue Woo, Richard J. Boland Jr., and David L. Cooperrider and titled "Thriving Transitional Experiences: Self-knowledge Improvisation and Transformation Quotient in a Highly Dynamic World," studies the adaptation of individuals to the fast-changing environment. The authors suggest that a transition in life can be viewed in terms of the magnitude of change and the individual's ontological experience of change. The proposed and studied four-quadrant framework represents different approaches to living in a highly dynamic and complex world. Specifically, the four types of individuals are identified as Survivor Incremental, Survivor Radical, Thriver Incremental, and Thriver Radical. In the chapter, the authors identify social, cognitive, psychological, and behavioral factors that contribute to thriving transition experiences, embracing dynamic stability. The chapter also offers two new constructs: (1) *Transformation Quotient* — measures the receptivity to change and (2) *Thriving Transitional Experiences* — measures the range of responses to transitions from surviving to thriving. The authors use quantitative and a mixed-methods study methodology to examine individual's responses to life transitions. Finally, the authors suggest that individuals can use the four-quadrant framework to mobilize resources to design a response and hypothesize a

desired outcome, so when facing change they embrace and engage proactively with transitions.

Chapter 5, written by Sukanto Bhattacharya and Michael B. Cohen and titled "Tacit Knowledge and Intra-Firm Teams: Reaping the Benefits of Co-operation in a Networked World," explores the conditions under which intra-organizational network's learning might be feasible and successful by using a Monte Carlo simulation model. The chapter's focus is on sharing tacit knowledge, since, according to the authors, the conditions under which the ability to share this form of knowledge between individuals and/or teams are yet to be understood. The authors frame their study using transaction cost economics, explaining the boundary of the firm, as well as the formation of teams within firms. The simulation examines and demonstrates the effects of costs and benefits that can be expected from "learning" in a multi-team firm. The authors consider for simplicity two extreme scenarios: (1) there is almost no specialization between teams and (2) the specialization is extreme. They conclude that only in cases of very large differences in tacit knowledge between teams is the transfer of such knowledge profitable, and as a rule, the existence of separate silos within firms should not be excluded, since in many cases, the loss in operational efficiency is not offset by the gains from network learning.

Chapter 6, written by Federico Niccolini, Elizabeth B. Davis, Monia La Verghetta, and Valentina Pilotti and titled "Integrating Values, Purposes, and Visions for Responsible Development," documents a study revealing that knowledge sharing and envisioning processes can have positive effects on human and social capital growth within an international network. The chapter compares the responsible development perspective with the sustainability perspective regarding integrating values, purposes, and visions of organizations in such a context. The authors conducted a study using the "Participatory Action Research" methodology analyzing a process of building a strategic vision within a network of

organizations with the goal of improving their responsible development orientation. Specifically, the implementation of the envisioning process was studied via quantitative/qualitative research tools, confirming the importance of envisioning processes in building social and human capital at the inter-organizational level. The authors also suggest that the relevant "learning-by-interacting" experience can create a growth process for the human and social capital of entire communities. The project was selected as a best practice by a European Union Commission.

Chapter 7, written by Mikel Larreina and Leire Gartzia and titled "Human Capital Gone into the Dark Side: XXI Century's Financial Centres: Is FinTech a Solution?," reviews the recent and current challenges of the financial industry from the lens of human and social capital. The authors survey some of the factors that allowed unethical behavior and a short-term financial focus in the financial sector, and exposes, how, in their opinion, the compensation structure and an extremely competitive culture became key elements that favored greedy and manipulative behavior and ultimately generated socially detrimental human and social capital in the financial sector. Finally, the authors suggest that a number of emergent game-changers (e.g., Brexit, FinTech, the growing weight of ethical standards, and the increasing participation of women and millennials in the FinTech industry) might represent an opportunity for change and help restructure and reshape the financial industry.

Chapter 8, written by Farah Nabi, Stephen Gallay, Erik Hellsten, Joel Lobo, and Jesse Slade Shantz and titled "Transforming Shoulder Care with Innovative Networks and Shared-Care Accountability Models," studies a new model of collaboration in the Canadian healthcare system introduced by The Shoulder Centre (TSC) in Ontario. According to the authors, the TSC is a transformative novelty that addresses the healthcare system's constraints through the development of an innovative and comprehensive model of care which builds on (1) novel

collaborative and legal partnerships between community providers and the Centre's clinical team, (2) A Patient-Centered Specialty Practice (PCSP), and (3) leveraging existing technology solutions. The collaborative arrangement has transformed the system and the health services by converting service providers into partners with shared accountabilities, ensuing in economic value through human capital optimization and improved system efficiencies through the building of social capital. The authors found that TSC's performance results proved measured system savings, increased patient and provider satisfaction, and targeted knowledge growth. This innovative solution confirms that the healthcare system contains a greater than expected abundance of human and financial resources, if combined appropriately with social capital and supported by legal arrangements to provide access to high quality and timely care without any further system investment. This chapter suggests that with the suited leadership and available legal and organizational space for innovation, the mix of human, social, organizational, and financial capital can be rearranged synergistically benefiting all constituents.

Chapter 9, written by Carolyn M. Youssef-Morgan, Paul P. Poppler, Ernie Stark, and Greg Ashley and titled "Human-Derived Capital: The Search for "Yeti" or an Evidence-Based Approach?," selectively reviews the interdisciplinary literature on exemplars of human-derived capital academic literature. The authors systematically examine specific epistemological strengths, weaknesses, and gaps in academically established theories, measures, and in practices of human capital. Specifically, a multidisciplinary, multilevel, connectionist point of view is utilized by the authors. Their analysis suggests that in many cases the theories and measures are nonbinding, non-measureable, idiosyncratic, tautological, and therefore practically impossible to use for any comparative market valuation. The authors conclude that much like "Yeti," the Abominable Snowman whose footprints are everywhere but itself

nowhere to be seen, unfounded assertions of human capital as valuable contributors to strategic success continue to proliferate.

As a solution, the authors present the case for an evidence-based classification system of human-derived capital at the micro-, meso- and macro-levels. Their framework goes beyond static stock models by emphasizing dynamic human-derived capital flows, as well as their within-level and cross-level linkages, all within the context of a modern technologically intensive society that increasingly is networked, fluent with technology and prodigious with social media.

Chapter 10, written by Krishna Priya Rolla and titled "Human Capital: The Mathematics of Measurement!," systematically reviews the interdisciplinary studies deliberating the challenge of measuring intangibles, specifically human capital. The author makes a concise mention of research precedents, including among others, the Bhutan's Gross National Happiness and the Cobb-Douglas Model. The author's intention is to develop clarity of the concept of human capital measurement by systematically analyzing the literature. The author concludes with a number of recommendations for practitioners and academic researchers.

Chapter 11, written by Raphael Bar-El, Ilanit Gavious, Dan Kaufmann, and Dafna Schwartz and titled "Under-Investments in Innovative SMEs: The Effect of Entrepreneurial Cognitive Bias," dissents the impact of the CEOs cognitive biases and perception from external financial constraints on innovative SMEs' growth opportunities. The study proposes that in addition to the shortage of financial capital available to innovative and entrepreneurial SMEs, there exists a twofold problem on the demand side for external financial capital by such companies: the CEO's over-pessimism and negative cognitive bias. Specifically, the authors find that there is a tendency for these companies to avoid approaching external funding sources, especially ones that gear their investments toward innovation. Also, the authors find a cognitive bias (over-pessimism) affecting the entrepreneurs' (lack of) demand for

external financing over and above other firm-specific factors. CEO tenure — the study proxy for human and social capital — is significantly lower (higher) in firms that did (did not) pursue external funding. Thus, it seems that the more experience (human capital) the CEO has, the more s/he is aware of the reality of a lack of external funding for SMEs (possibly indicating lack of social capital with financial institutions), which drives the enterprise's human capital to not exert any effort (in approaching sources) that would ultimately prove irrelevant. The authors, using in-depth interviews with the CEOs of 115 SMEs, also document a negative impact for this finding resulting in under-investment in the company at the microlevel and the macro-level, due to under-realization of the potential for employment, productivity, and growth of the SME firms. Finally, the study also illuminates market failures that are associated with the demand side of external financial capital and encourages creation of policies aimed at encouraging SMEs to make use of different supply options, including more advanced tools such as VCs, mezzanine, or crowd financing, to complement policies directed toward the supply side of financial capital. This final chapter in the book is an illustrious example of using a multidisciplinary approach, combining micro-organizational behavior and financial analyses and utilizing the cognitivist research paradigm.

As the reader can see, the chapters apply diverse epistemologies (and sometimes a mix of them); a very diverse set of research methodologies, covering multiple units of analysis and industries and responding to a very broad scope of research questions, from very basic ones, such as do we need human capital as a construct at all, to very practical and operational ones, such as the role of knowledge transfer in meat processing firms. Regardless, the intersection of human and social capital and the growing role of technology should be obvious to the reader. Their synergies will only become more important in the near future.

I hope you will enjoy reading the chapters and use them in your research as I enjoyed editing it.

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PART A

CONCEPTUAL INTRODUCTION-EPISTEMOLOGIES

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CHAPTER 1

EPISTEMOLOGICAL PERSPECTIVES IN THE ANALYSIS OF HUMAN CAPITAL AND HUMAN ASSETS AND THE DEVELOPMENT OF THE KNOWLEDGE-BASED ECONOMY

Knut Ingar Westeren

ABSTRACT

In the 1990s, von Krogh, Roos, and Slocum (1994) and Venzin, von Krogh, and Roos (1998) began discussions centered around epistemology and knowledge management, focusing mainly on the varied sources and backgrounds for knowledge management. Since 2000, we have seen a much wider debate on several issues that are related to the development of a knowledge economy. The main task became the establishing of a conceptual framework for further discussion of epistemological categories, using three keywords: cognitivism, connectionism, and autopoiesis. One objective of this book is to analyze the progression to a more knowledge-based economy by linking these keyword perspectives together, and

the intention of this chapter is to present a fundament for these epistemological discussions.

Keywords: Epistemology; the knowledge economy; knowledge management

INTRODUCTION

One vision of this book is to analyze changes to a more knowledge-based economy by linking different perspectives together. In the 1990s, we saw increased interest in the debate about different epistemological fundaments for the knowledge concept in organizational and management research (Venzin, von Krogh, & Roos, 1998). Since then we have seen several contributions such as Roos (2005). These contributions seem to have the following in common:

- We have three main epistemological perspectives (or platforms) in the field of organizational and management analysis — the cognitive, the connectionist, and the autopoietic.
- Which perspective we choose is of importance for focus and design of our analysis of knowledge as a contributor to competitiveness of firms and the development of the knowledge-based economy.
- In the analysis of how organizations (like firms) develop into more knowledge-based activities we can (normally) not say that we base our analysis solely on one of these perspectives — they are interrelated.
- When we operationalize these perspectives we must take into consideration that they can be differently interpreted in different cultural settings.

The debate in the 1990s about epistemological positions, knowledge management, and organizational analysis starts off with contributions of Varela (1992), Varela, Thompson, and Rosch (1991), and Venzin et al. (1998). Venzin et al. (1998) suggest the following link between position and contributors:

- The cognitivist position (Simon, 1993)
- The connectionist position (Kogut & Zander, 1992)
- The autopoietic position (Nonaka & Takeuchi, 1995)

No doubt the contribution of Venzin et al. (1998) building on von Krogh and Roos (1995) and later followed up by Roos (2005) has had a substantial impact on the discussions of this subject and the references to the cognitivist and connectionist positions are widely accepted. When it comes to the autopoietic tradition most contributions look at the contributions starting with Maturana and Varela (1980) and continuing with work as mentioned above by Varela.

In the call for chapter proposals for this book, the editor emphasized the connectionist perspective; in this chapter we will conclude by saying — yes — the connectionist perspective is the one that contributes most to a fruitful analysis about how firms can enter into the knowledge economy and increase productivity based on knowledge. But we will also show how the other perspectives have a contribution and that all three perspectives must be understood in the cultural context.

DIFFERENT PERSPECTIVES ON EPISTEMOLOGY

Introduction

Epistemology has been a scientific field starting with the Greek philosophical tradition and even before. The word comes from the Greek language and consists of the first part “episteme” which

means knowledge and the second part "logos" has through different philosophical eras meant "word," "concept," "sense." The interpretation of the word "logos" became even more important in the Christian tradition starting with the Gospel of John which in Chapter One starts with the famous introduction of "logos." The integration of the Greek philosophical discussions, combined with the Christian tradition, leads to the understanding of "logos" as a communicative thought that cannot be understood without adding the dimension of reason.

Starting in the 1990s, we saw a discussion about epistemology and knowledge management with contributions by von Krogh, Roos, and Slocum (1994) and Venzin et al. (1998). The discussions here were mainly focused on different epistemological sources and backgrounds for knowledge management, but after 2000 we have seen a much wider debate taking up several issues that are related to the development of the knowledge economy. The main achievement of the mentioned papers was to establish a conceptual basis for the discussion of different epistemological categories for the knowledge concept using the three keywords as earlier mentioned — cognitivism, connectionism, and autopoiesis.

The Cognitivist Perspective on Knowledge

Most scientific contributions such as Jelavic (2011), Fialho, de Bem Machado, and Moussa (2016), Venzin et al. (1998), and Roos (2005) take the writings of Herbert Simon (1969, 1977, 1993) as the point of departure for the cognitivist understanding of the knowledge concept. Simon, like most scientists in this field, starts by looking at how the human brain acquires knowledge. His model of human understanding is that the brain in general discovers through perception. By doing this Simon has to establish a platform about what the human cognitive process is like. The first keyword from Simon is **representation** and the important basis for his understanding is that the human brain does representations of

the world as accurate as possible. This is the starting and fundamental process for requiring knowledge. The next step is **symbol manipulation** which is how the representation process is done.

Simon had been fascinated by cybernetics beginning with the scientific works by Turing and von Neumann starting after 1945. In principle, they looked at the computer as a device that received inputs, did logical manipulations, and produced outputs. Cognitive science from 1945 to 1955 was to a large degree influenced by cybernetics and the use of the computer as a metaphor for building knowledge. The cognitive perspective builds on a logic where internal consistency is central. This means that when we do representations of the world outside us and manipulate this with computer-like systems, this will give solutions that both increase our knowledge and are controllable. The fundamental assumption here is that the representations we use are correct when they are collected and analyzed. Simon was aware of the fact that the first representations we could do of a phenomenon may not be completely correct, but then the analysis would improve and we still could do better approximations of reality, and come closer and closer to a result.

Simon's method of knowledge creating also built on the assumption that humans are capable of receiving information from the environment. This was combined with the science of logic as one fundamental human competence that helped us to improve the analysis. In summary, we can say that the three fundamental building blocks of the cognitivist position are representation, internal consistency, and logic.

Another important characteristic linked to the cognitivist notion of knowledge was that the representations were possible to decode and store in a way so that they could be identified. This assumption can be linked to two other discussions. From 1960 to 1980, we had discussions about the positivist positions and other positions like the hermeneutic and social constructivist in the philosophies of science. We can see that the cognitivist position

has similarities with positivist standpoint as done by Popper (1959) where verification and later double-blinded tests are the main criteria for finding the truth. The important similarity is that both these traditions argue strongly that representations must be possible to codify and retrieve. The other link to more philosophical-oriented discussions is about the knowledge pyramid (Frické, 2009; Lavergne & Earl, 2006). The argument is that the cognitivist position only relies on the two lower building blocks in the pyramid, which is about data and information. There have been discussion and various view points on whether the cognitivist position actually reaches the knowledge level in the knowledge pyramid (see Lavergne & Earl, 2006). Another criticism of the cognitivist position is the demand that we must be able to do a subject–object split which means that we actually assume an objective world outside and independent of the human being.

Connectionist Epistemology

The start of the connectionist view can be linked to several scientific fields, such as philosophy of science (hermeneutics and social constructivism), but also to other fields such as cognitive science, cybernetics, and neurology. The connectionists take the view that it is necessary to use symbols to build new symbols, but they look at new scientific results about how the human brain functions. Cognitive research during the 1970s and 1980s submitted views that the human brain works in both digital and analog capacities. Scientific results show that business operators learn and (sometimes) change behavior because of their interactions in networks where they are represented (cf. Nelson & Winter, 1982; Kogut & Zander, 1992; Kogut, 2000; Cohendet & Llerena, 2003).

Another point of departure was the criticism of cognitivist epistemology and their positivist view of building representations. In the connectionist view, the process of building representations takes place in another way. It is assumed that all members of an

organization can have connections to each other. The main focus of knowledge building is to single out the most important connections and assess to what extent these connections contribute to the buildup of more general knowledge. This also is of fundamental importance for how the rules of interactions are formulated between the members of the organization. These rules, such as routines, must have a design that supports knowledge transfer in a way to optimize knowledge possession that is used in the firm. One important feature in the connectionist view is that these rules change as the organization develops.

One interesting parallel between the more general views about the epistemology of connectionism and the development and use on how a firm uses knowledge to develop its competitiveness is that the rules about knowledge creation and transfer are not universal and that they are locally founded. This view also supports the emergence of the concept and theory about core competences (Hamel & Prahalad, 1990) where one main assumption is that the firm that is able to develop the most productive competence will win in the competitive situation because their knowledge is more productive than their competitors.

In the connectionist view, knowledge creation and transfer develop as a part of the interactions inside an organization and between the organization and the environment. From the philosophy of science perspective, the connectionist view is not compatible with the positivistic way of looking at knowledge creation. The positivistic position takes for granted that knowledge is identifiable and explicit and that it is important to test and retest in a more sophisticated way. The connectionist view takes a step closer to the hermeneutic philosophy of science where knowledge is accumulated by learning from all networks in which the members of the organization participate (see also Russ, Fineman, & Jones, 2010, p. 3). This also means that the discussions about what are the stock and flow of knowledge and how the organizational knowledge changes

are much more complicated because organizations have continuous knowledge development. The important process for the firms is how it absorbs, redefines, creates, and implements knowledge as a part of the day-to-day interaction and learning process.

The connectionist view also stresses the importance and emergence of knowledge management. The tasks for the knowledge manager are not just to evaluate results from positivistic knowledge processes, but also to synthesize from all changes at all levels. As a knowledge development strategy, the organization needs to optimize and integrate this strategically. The connectionist view still starts with looking at knowledge as individually based. The knowledge is in the mind of the individual but is transferred via different connections that individuals have. We have seen further developments of this built on an assumption that when knowledge is translated, understood, and accepted in time and space, it becomes institutionalized (Orlikowski, 2002).

Another discussion we have seen is about concept consistency. When we analyze knowledge transfers between different persons about more or less the same subjects we may wonder if the concepts used are understood in the same way. This has led to a discussion about how the connectivist view of knowledge connects to the philosophy of science school called social constructivism. Westeren (2012, Ch. 5) discusses the concept of innovation in different firms. In general, firms try to stimulate the emergence of innovative ideas by asking the workers to come with suggestions for changes, for example, in routines. This raises the question whether an innovation is understood in the same way in different relational situations and in different parts of the firm. From a knowledge management point of view, the responsible leaders saw it as an advantage that all workers had a reasonably equal view about what an innovation was for day-to-day innovations. On the other hand, you can never

expect that workers have an equal understanding of what a radical innovation can be in a firm.

This also links to the discussion about the subject–object spilt, which is discussed in the philosophy of science. The positivist point of view assumes that a subject–object split is necessary, while in hermeneutics and social constructivism this split cannot logically be there and this goes well together with the connectionist view of knowledge transfer and creation.

But there are also some valid insights from the cognitive and the connectionist perspectives that show similarity. Both traditions build on the concept of representations and that the organizations are getting feedback from the environment, or said in another way, both perspectives have an input–output view toward the environment. Both perspectives also have an empirical basis, the cognitive epistemology can be linked to empiricism via, for example, the way that Popper formulates the theory of knowledge accumulation. The connectionist perspective has also roots in the empirical world, but the empirical test criteria are usually different. The connectionist view invites a discussion about knowledge creation from both explicit and tacit knowledge which is not possible when we emphasize the strong link between the cognitive epistemology and the Popper criteria for knowledge creation (Popper, 1959).

Autopoietic Epistemology

The work on autopoietic epistemology has roots back to early work by Maturana and Varela, but it was first with Maturana and Varela (1980) that this tradition got a wider audience, and later has been followed up by Varela et al. (1991) and Varela (1992, 1999). The start by Maturana and Varela comes from biology and takes as the model that in biology organisms reproduce themselves. Maturana (1981a) gives the following definition:

Autopoiesis

> *We maintain that there are systems that are defined as unities as networks of productions of components that (1) recursively, through their interactions, generate and realize the network that produces them; and (2) constitute, in the space in which they exist, the boundaries of this network as components that participate in the realization of the network. (Maturana, 1981a, p. 22).*

In other explanations, Maturana (1981b) uses metaphors suggesting that an autopoietic system can be looked at as a machine with components that reproduce themselves as a network.

The fundamental understanding is here that the autopoietic system reproduces itself and its elements. One important consequence of this is that the components of the system do not have "active" relationships to the environment. This breaks fundamentally with the logic of the cognitive and connectionist perspective which is built on an input–output relationship with the environment. In the autopoietic understanding of epistemology, the internal structure is vital and the different parts have connections to each other. The way these connections and structures are designed determines how the system looks. The concept of autonomy is central in the autopoietic system because the fundamental assumption is that the systems reproduce themselves and taken to the organizational level, this means that the component of the system constitutes the organization and the systems identity, as affected by the state of their knowledge (Russ et al., 2010, p. 3).

By analyzing the system, it is possible to find out how the system is organized and the rules for reproduction. We have autopoietic ways of analyzing systems from biology, cybernetics, and organizations and when systems like this exist in a real world

they are not looked at as completely isolated islands. Autopoietic systems do not have inputs and outputs in the traditional way but changes in the environment of the systems can have effect. The system will always follow the rules under which it is working. Then disturbances from outside are met by actions created internally as "filtered" by their knowledge, to meet changes of the environment (Russ et al., 2010, p. 3). It is therefore a property of the autopoietic system that a system learns the environment by continuous use of the internal rules of the system. This means that an autopoietic system is self-referential (Varela, 1999). Von Krogh and Roos (1995) formulate this in the following way:

> *Self-reference means that the knowledge accumulated by the system about itself affect the system and operation of the system. (von Krogh & Roos, 1995, p. 39)*

If we take this a little further, the interpretation from von Krogh and Roos (1995) is that knowledge in an autopoietic system is constantly affected by what the participants of the system know at the initial stage, and what they will know in the future depends on the current state of knowledge.

Piaget's research and writings about child development (e.g., Piaget, 1964) can be used to give better understanding of the differences between the autopoietic and connectionist systems. In the first month of the child, the knowledge that the child uses is most easily understood by the autopoietic vision of knowledge. The child is mainly reproducing itself. Then after some months the child learns to represent the world outside through signs and symbols which mean images and words. Then the child rearranges its vision of the world through connection, understanding, and feedback.

Maturana's and Varela's theory of autopoiesis uses models from biology to show how structures reproduce themselves. The

systems also have connections or interactions with the environment through what they call structural couplings:

> *Structural couplings is a history of recurrent interactions leading to a structural congeries between two or more systems. (Varela, 1992, p. 85)*

But these couplings do not change the internal structure of the system. Maturana and Varela use this as a metaphor in the research of how the human brain functions. The reasoning is that the nerve system within the human brain keeps its organization, structure, and integrity in the same way but is capable of understanding the environment better when the environment changes. The main point here is that Maturana on the basis of his and other explanations in neurophysiology used this as the fundament for his epistemological position.

Thompson (2007) has tried to make the concept of autopoiesis easier to understand:

> *For a system to be autopoietic,*
>
> 1. *the system must have a semipermeable boundary;*
> 2. *the boundary must be produced by a network of reactions that takes place within the boundary;*
> 3. *the network of reactions must include reactions that regenerate the components of the system. (Thompson, 2007, p. 101)*

The idea about self-generating systems is not new in philosophy, for example, Spinoza claimed that the actions of God are the necessary manifestations of his essence. How autopoiesis is understood and built into epistemology and further into the analysis of organizations is commented on by many writers and up until now a highly debated theme (Fialho et al., 2016).

A SUM UP

In this chapter, we have presented the argument that the cognitivist position only relies on the two lower building blocks in the pyramid, data, and information. Most positivist researchers argue that the cognitivist position reaches the knowledge level in the knowledge pyramid. Conversely, the necessity of creating a subject–object split validates the criticism of the cognitivist position and implies that we assume an objective world, outside and independent of the human being. In hermeneutics and social constructivism, this split cannot logically exist, further complementing the connectionist view of knowledge transfer and creation. The connectionist view is the most fruitful within the perspective of this book because, as an example, we need a discussion of both tacit and explicit knowledge as categories for an understanding of the emergence of the knowledge economy.

There are also some valuable insights from the cognitive and the connectionist perspectives that show similarity between the two. Both traditions are predicated on the concept of representations, and that the organizations are getting feedback from the environment. Stated simply, both perspectives have an input–output view in relationship to the environment.

Autopoietic systems are self-referential in the respect that they learn from the environment by continuous use of their internal rules. In contemporary market systems it is hard to find a "complete" autopoietic firm system, but we see many organizations with characteristics in this direction, such as the defense industry. So no doubt the autopoietic concept adds to our understanding of organizations in general. And it is of special interest to analyze how (quite) closed firms can survive and change. There is also a cultural aspect at work here, as our research has shown we see more self-referential autopoietic business systems in the Arabic world than in Europe.

The conclusion so far is still that the connectionist platform is a superior tool when analyzing transfer of knowledge and the

development of organizations, like firms, into the knowledge economy. It must be remembered, however, that this analysis is dependent on the understanding and use of the other aspects when necessary.

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