Doctoral School of Regional Sciences and Business Administration

Enikő Varga

Cyber Farmers' informal learning

Doctoral dissertation

Supervisor: DSc. Zoltán Baracskai

Győr, 2020

Enikő Varga

Cyber Farmers' informal learning

Doctoral dissertation

Supervisor: Dsc. Zoltán Baracskai

Győr

2020 November

Széchenyi István University

Author's Declaration

No portion of the work referred to in this dissertation has been submitted in support of an application for another degree or qualification of this or other university or other institution of learning.

Furthermore, this dissertation contains no material previously written and /or published by another person, except where an appropriate acknowledgment is made in the form of bibliographical references.

Abstract

Abstract of the dissertation submitted by:
Enikő Varga

For the degree of Doctor of Philosophy and titled: Cyber Farmers' informal learning

Month and year of submission: July 2020

The meaning of 'newcomer' in common language is someone who recently arrived in a place or became involved in an activity. Research highlights that, nowadays, newcomers to farming not only change living space, but professions as well. Rural in-migrant studies rarely focus on the individual decision-making process, and whether it is the pull of the countryside or push factors that drive the change. Today, newcomers leverage the internet as a learning ecology in their informal learning. Research on education and learning seldom considers post-experiential practitioners as learners in the focus of their research. Our curiosity to explore the quest for knowledge of the newcomers to farming was piqued due to personal involvement.

Firstly, we aimed to understand the mindset patterns of the newcomers who select organic farming as a new profession after venturing out from their original one. Secondly, we explored their informal learning in the digital age in order to get insight into which contents from the internet are considered relevant and applicable in overcoming their lack of knowledge.

Throughout our journey of studying this thought-provoking problem space, we conceptualized the "Organic Cyber Farmers" as counterubanizers, who choose farming as their new profession, venturing out from their original ones, and who leverage the digital era for their tentative problem solving, knowledge refreshing and sharing.

To understand the Organic Cyber Farmers' reality on the personal level, we adopted a transdisciplinary approach.

Based on semi-structured interviews, we developed a survey and collected data in 2019 from the newcomer population in Hungary. Through factor analysis and case-based reasoning of a knowledge-based system, we developed a model with "if-then" rules between the identified aspirations in order to describe the mindset patterns of the newcomers and soon-to-be newcomers.

We addressed the Cyber Farmer's informal learning in three threads: learning process, learner, learning content and its provider. Our developed conceptual model consists of "if-then" rules between aspirations describing the following: the learning process model in the digital age, the Cyber Farmer as a transdisciplinary learner with a bootstrap mindset, the learning content from the internet and the passionate practitioner as content provider.

The modeling of the Cyber Farmers' mindset patterns with a knowledge-based system provided a unique insight into their reasoning in the following areas: decision-making to become a newcomer to farming and applicable knowledge selection and validation from the internet in their tentative problem solving and knowledge refreshing.

On our journey we formulated the following thesis: the Cyber Farmers do not know what they should know. The antithesis of this assumption was that the Cyber Farmers know that the needed knowledge is available. From these we deduced the synthesis: searching for knowledge can be learned. We concluded that Cyber Farmers use the internet as a resource to overcome their lack of knowledge by accessing visual content published by practitioners. Their prior experiences influence their choices of new experiences to explore in both physical and virtual reality. At the end of our research we conceptualized "experience mining" as the process of "mining" other's experiences from the internet as one would mine for anything precious; sifting through material according to certain rules and only keeping the nuggets. Our resulting model adds to the literature in the area of practitioner's knowledge increase; and could be considered as an initial model to re-think transdisciplinary co-production of knowledge in organic agriculture in the digital age.

Acknowledgements

One of my favorite quotes from Charles Handy is "In life and in work, we learn things when we need them, not before we need them" (Handy, 1998, p. 217). I started on this journey in 2016 with 20+ years of work experience in information technology. I always wondered if joining the doctoral program was part of my life-long learning, an intellectual adventure, or there was a need. Some argue, that the way to find our limits is by pushing them. In this journey, during the thought-provoking classes, seminars, presentations, conferences, research I had several occasions to push and explore my limits. The insights, concepts, inspirations from the distinguished lecturers we were fortunate to have, influenced, formed our web of concepts, thinking and our personal level of reality. This eventually influenced my journey to explore the Cyber Farmer's knowledge increase in the digital age. I am extremely grateful to Prof. Zoltán Baracskai who accompanied my journey as a supervisor, mentor, coach. I feel privileged to have him walk along this explorative, challenging and sometimes bumpy path with me.

I am highly appreciative of the support provided by the PADME foundation.

Furthermore, I am very thankful to all who supported me during these years, without them, this work would not have been possible.

Finally, I am thankful to my family for their patience, encouragement, cheer and support which provided me the courage and motivation to complete my dissertation.

Table of contents

List of tables

List of Figures

Key to abbreviations

AI: Artificial Intelligence

CBR: Case Based Reasoning

CoP: Community of Practice

DIY: Do-It-Yourself

KBS: Knowledge Based System

LC: Learning Content

LCP: Learning Content Provider

LP: Learning Process

RBR: Rule Based Reasoning

1. Introduction

1.1. Required knowledge: Reasoning to Become Newcomer to Farming; Overcoming Lack of Knowledge in Farming Practices

The tendency to change profession alongside the change in lifestyle as part of the move from urban to rural areas attracted our attention. The move to rural from urban is coined with the concept of counterurbanization in social sciences, which addresses the phenomenon at the social level. Some counterurbanizer, newcomers to rural become farmers. We speculated whether these moves are mostly driven by the "rural-idyll" narrative, the pull of the countryside rather than push factors. The growing number of social media groups with increasing membership related to re-starting life in rural areas and the appearance of festivals organized by these newcomers to rural, all indicated that this is a rising phenomenon. The dialogs in the social media groups and the knowledge sharing nature of the newcomers' festivals show that those who move to rural areas use these forums for knowledge increase and sharing. Although strict records are inexistent for the size of the population who choose organic farming as a profession as part of the move to rural areas, the activities from the aforementioned social media groups indicate that most of the newcomers start gardening practices in their new surroundings. Our interest in the phenomenon elevated due to personal involvement. Through observing the individual lifestyles, profession changes and my personal implication further fueled our curiosity. We not only participated in newcomers' festivals, but as part of the World-Wide Opportunities on Organic Farms (WWOOF)[1] initiative as volunteers and hosts we got the opportunity to have further insights into the value sets, motivations and mindsets of those who changed, or were reflecting on changing professions and lifestyles.

One interesting ascertainment was the Do-It-Yourself (DIY) attitude of the newcomers. DIY is not a fashion, trend for them, but rather is a way to approach to problem solving in everyday life, whether it is about gardening, making bread or building a house. We questioned if this attitude is in line with the DIY economy concept or if it is driven by some other needs, values and convictions. Everyone accepts that IKEA furniture is delivered in boxes and during the assembly process we are challenged depending on our skill levels, expertise and experience. However, it is known that the pride and joy that one feels when the furniture is assembled is incomparable with a ready bought furniture. We wondered if

[1] World Wide Opportunities on Organic Farms: https://wwoof.net/

growing tomatoes in one's garden has the same effect. We did not search for the answer for this very captivating question, but reflected on the learnings from the IKEA effect and the DIY economy to understand the newcomers' approach to problem solving.

The concept of Communities of Practice (CoP) in the old and new sense was one that emerged during our observations. Newcomers are environmentally conscious and share not only knowledge but goods as well. This is how we encountered the initiatives on community gardening, social enterprise. Sharing land, tools, effort and knowledge are all concepts that drive the sharing economy. Although, for instance in the case of community gardening, the scale, technology and drive might differ. This is how we ended up taking a detour to explore concepts like the sharing economy, social enterprise, transition towns and circular economy. Furthermore, these detours led us to explore the de-growth phenomenon along with zero-waste initiatives. These adventures, although were alternate routes from our original journey, enriched our overall understanding of the environment.

With the return to our main problem space, we next focused on the search for knowledge in the digital era. Learning does not end in formal education, but continues through one's professional career either in formal or informal settings. Formal education is focused on teaching, informal learning as described by Cross (2007) is focused on knowing.

The digital age brought changes to formal education, but more importantly unlocked the potential for informal learning. Today, the internet is used as a learning ecology to search and find new knowledge, solutions, share experiences. The TED[2] platform made access to the latest scientific achievements via short videos comprehensible for the masses. Translations to different languages enabled the spread of the content globally. With several years working experience in information technology it was self-evident to look for knowledge on the web. If an expert does not know how to configure certain features in an enterprise system, then the first step to search on Google. We were accustomed to search the web for facts. However, some learn how to play the guitar from YouTube, or learn how to bake a cake. We speculated whether the internet is a reliable source for knowledge on how to perform operations, to develop skills as well? Digital technology enables access to abundant information on the web at anytime from anywhere. To understand informal learning in the digital age it is fundamental to study the impact of technology on the way we learn, think and search for information. Carr (2011) describes how the internet makes us shallows. In our fear of missing out and feeling out of touch, which is tantamount to a fear

[2] TED Ideas Worth Spreading: https://www.ted.com/

of social isolation, we actually want to be interrupted, since every interruption brings information. Therefore, in line with Carr we regarded the newcomers to farming as shallows. We searched the internet for a couple of keywords in organic farming and YouTube for farming practice, as a result we were faced with abundant contents. This indicated the supply, not the need. We questioned that the demand-supply model would describe the phenomenon appropriately. The freely available content on the internet as a source of information engaged us in the exploration of the role of "free". Learners search for free content, learning content providers provide free content. However, one needs to reflect on the validity of the accessible knowledge. When accessible knowledge is abundant, the quick, rapid evaluation of the accessible knowledge is indispensable. The ability to synthesize, recognize connections and patterns is a skill we all must develop and improve.

The notions of global, local, and glocal emerged. Not only the abundance of the information but the glocal aspect also impacts the validation of the accessible knowledge. We wondered if the newcomers could use the internet as a learning ecology for their everyday problem solving and knowledge increase. One can find learning content on growing oranges, but what if one would need practices to grow apples in one's own environmental conditions? Therefore, beyond the language constraints, the glocal aspect of the accessible knowledge has to be taken in account.

Despite my professional background as an information technology expert, I am a digital immigrant. However, my teenage kids are both digital natives. We encountered the smart phone at the same time, although in the use of it I take advice from them. Without exploring all the ups-downs of the use of digital technology, we agree with the importance of the concept of digital wisdom. One can argue that Wikipedia is a good starting point to explore a given topic. It is always accessible as long as one is connected to the world wide web, so one does not need to go to the library to explore several books to find answers. Therefore, in our study of informal learning in the digital age the role of the "passionate practitioner" became apparent in learning content provision, additionally to learning content types. Are the passionate practitioners knowledgeable, talented and equipped to create "just right" content for newcomers' problem-solving needs there and then?

Throughout this journey we realized that in the understanding of the phenomenon on the personal level of reality, there were some key considerations to be made. The protagonist of our story is the newcomer to farming. Therefore, uncovering the mindset patterns of becoming an organic farmer was the first step we had to reflect on. We know from Daniel Kahneman (2013), that our protagonist is Human rather than Econ. The digital age changed

the way we search for knowledge, made us shallows, therefore exploring the learning process in this environment drove us further in our quest. The recognition that the learner's identity affects the learning process and the learning content selection and validation, lead us further in our exploration. Due to the newcomers' approach to the environment, Homo Ecologicus (Becker, 2006) was a concept we needed to reflect on. On the other hand, due to the digital era we all live in, we had to study the concept of Homo Sapiens Digital (Prensky, 2009). In this manner we arrived at the following assumption (thesis): newcomers to organic farming do not know what they should know. The antithesis of this assumption was that they are aware that the required, needed knowledge is available. From these a synthesis could be deduced, which was our research problem: searching for knowledge is a skill that can be learned.

1.2. Our journey to explore the available knowledge

In the following, we give a brief overview of the notions and concepts we encountered throughout our journey in understanding the newcomers' reality through the exploration of the literature. Exploratory research has two goals. Firstly, to find all the relevant knowledge that could drive the narrowing and consolidation of the problem space, in other words the initial observations. Secondly, the aim is to answer the question: are there any dominant keywords, key concepts which were not taken in consideration, but should have been, or were not revealed during the identification of the problem space?

In our approach to explore the literature we identified three parallel paths: (i.) find some distinguished thinkers as gurus (ii.) search the literature via key concepts or keywords, and (iii) identify relevant journals.

We started our exploratory journey with the first approach. To understand the phenomenon of moving to the countryside, we found the thoughts of Charles Handy (2015) on the DIY economy and "S-curve". Handy described changes in one's personal life, business or society with shifts from one sigmoid curve (S-curve) to another. The second guru was Jay Cross (2007), seemingly distant to our problem space. Cross's thoughts on informal learning influenced our work in the study of the knowledge increase for newcomers to farming. Understanding informal learning required us to reflect on concepts like personal knowledge (Polányi, 1962). Lastly, the third knowledge set originated from Karl R. Popper's (1992) tentative problem solving.

Following our understanding of these key concepts from the aforementioned thinkers, we continued our journey by exploring the literature according to these identified key concepts. The iterative process to explore the accessible literature according to the initially identified

keywords led us to new ones. In the literature review process, there were few limitations. The first limitation came from the exhaustive literature based on the identified keywords and concepts. There were several thousand hits even if the search was limited to the works and articles published in the past few years. As an example, search results for the keyword "newcomer" from the ScienceDirect[3] portal were above 36.000. The search results for "newcomers to farming" reduced the literature to 12. This is how we encountered another keyword we used in further searches, namely the "new peasant". the keyword "organic farming", the search results from the same portal for the articles published between 2015-2019 were above 2300, which increased in 2019 with more than 800 journal articles. Another example would be the keyword "farmer behavior", which also led to hits around 500 for the same period of time. The keyword "WWOOF" resulted in 26 hits for the entire time horizon. Examples for searches on the concepts from our aforementioned detours would be: permaculture, de-growth and transition towns. Without time constraints, they resulted in around 300-400 hits. These results indicated the emerging quality of the phenomena in research as well. The second limitation of the process was that if the search was restricted only to high ranked journals, then relevant knowledge from low ranked journals could be omitted. The third limitation was that for the keyword "bootstrap-age", one of the most imperative concepts we had, there were no search results which could be linked to the rest of the identified key concepts, nor to their synonyms (i.e. Do-It-Yourself).

Taking in account these limitations, the search method used to explore the literature was to limit the selection of the articles to those published in the last couple of years. The other part of the method was to identify those papers in which at least two of the keywords out of the three can be found, since those articles which used the keywords in another context were not relevant.

The third aspect of our approach to explore the literature was to identify relevant journals for problem space. Our iterative search process to identify the available background knowledge for the problem space was like searching for a needle in a haystack. Through synthesizing the identified journals, we finally arrived at the following non-exhaustive list of journals as main sources for literature review: Ecological Economics, Journal of Rural Studies, Sociologia Ruralis, Futures, Computers in Human Behavior, Computers and Education, Expert Systems with Applications, Transdisciplinary Journal of Engineering & Science.

[3]ScienceDirect portal to explore scientific, technical, and medical research www.sciencedirect.com

As a result of this iterative search process, we created the definition of the “Organic Cyber Farmer”. Organic Cyber Farmers are counterurbanizers, who chose organic farming as their new “S-curve”, adopting environmentally-friendly farming practices. They venture out of their original profession and leverage digital technology in many ways, one being knowledge refreshing and learning. “Newcomer to farming” is a notion used in common language; “new peasant” is a concept we encountered in literature. Nevertheless, we conceptualized the Organic Cyber Farmer in our research. In the presented works these concepts are used depending on the context.

Thus, the keywords our research were identified as follows: counterurbanization, newcomer to organic farming, mindset patterns, digital age and knowledge refreshing.
In the continuation we give a brief overview of the results of our exploratory research. The detailed reviews of the background knowledge related to the individual problem areas we presented in the papers constituting the subsequent chapters.

One of the concepts we stumbled on was counterurbanization in social sciences, used to describe the ongoing re-distribution of population within settlement systems. Although the concept was and is still a point of argument amongst scientists and describes the phenomenon on the social level, Halfacree's (2012) and Mitchell's (2004) works grounded our understanding of it. According to Mitchell (2004) despite the received attention, the concept of counterurbanization is too broad to cover its depth and meaning. Mitchell (2004) suggests the adoption of three concepts to adequately describe the phenomenon: counterurban as the de-concentrated settlement pattern, counterurbanizing as the process and counterurbanization as the movement. Adopting Mitchell's (2004) framework, we understand counterurbanization as a migration movement, contributing to a counterurban state. Since our research aimed to recognize the mindset patterns of the counterurbanizers, those who move to rural areas from urban areas, we had to reflect on the person instead of the process. In other words, our protagonist was the counterubanizer. Nevertheless, to understand the person, the process had to be well thought out as well.

One of the keywords in our search was the “newcomer to farming”; this is how we came across the papers in rural studies. Milone and Ventura (2019) studied the new generation of farmers in Italy, whom they called “new peasants”, where people, often with non-agrarian degrees, start farming enterprises. Our research focus was on a similar phenomenon in Hungary, although no strict record exists of those who change lifestyles and/or professions to start farming in rural areas. As highlighted before in our exploratory research in the area of organic farming and farmer behavior, we encountered several other notions, like

permaculture, de-growth and community gardening. These areas influenced our work to a certain extent, but they should rather be as themes for potential future studies.

We presumed and also revealed from the literature that one of the motivators of the move was the "rural idyll narrative". In our exploratory research we found interesting articles addressing the impact and influence of TV shows like "Farmer wants a wife" in different countries, reaffirming the rural idyll and good countryside image. This little detour on the persuading power of the media influenced our work in the study of the decision-making process to change lifestyles and professions. Several researchers have highlighted that the explanation of the phenomenon cannot be restricted uniquely to the rural idyll narrative (Ní Laoire, 2007) (Bijker, Haartsen and Strijker, 2012) (Stockdale, 2014) (Shucksmith, 2018).

Therefore, we reflected on the thought collectives and thought styles, coined by Fleck (1979), to understand the mindset of newcomers to organic farming. He argues that "The individual within the collective is never, or hardly ever, conscious of the prevailing thought style, which almost always exerts an absolutely compulsive force upon his thinking and with which it is not possible to be at variance." (Fleck, 1979, p.41).

Furthermore, to understand decision-making and reasoning, as the foundations of our understanding, we studied the works of Charles Handy, Richard H. Thaler, Dan Ariely, Herbert A. Simon, James G. March and Daniel Kahneman. Hence, we present some thoughts, without a non-exhaustive overview, from the works of these great thinkers which influenced and paved the road for our research. In line with Handy, we argued that changing profession and/or lifestyle described as a move to a new "S-curve" is filled with uncertainty and doubt. As Thaler writes "People think about life in terms of changes, not levels. There can be changes from the status quo or changes from what was expected, but whatever form they take, it is changes that make us happy or miserable." (Thaler, 2015, p.41) The models considering Homo Economicus, Econs as decision makers in our study had to be handled with care, rather we focused on Humans, who do a lot of misbehaving. Consequently, procrastination and self-control were concepts that emerged. Self-control definitions and descriptions can be understood by thinking about an individual as containing two semiautonomous selves, a far-sighted "Planner" and a myopic "Doer." As Thaler and Sunstein (2008) put it, the "Planner" is concerned with long-term welfare, while on the contrary the "Doer" is exposed to temptations which come with arousal. Decisions on profession and lifestyle changes involve the "Planner" more, who needs to cope with the feelings, mischief and strong willpower of the "Doer". According to Herbert A. Simon (1977) decisions are intended to be rational, but are bounded by cognitive biases. James G.

March (1978) highlights that expectations, incentives and desires drive the decisions. While according to Ariely (2008), expectations shape stereotypes. He argues that "We don't even know what we want to do with our lives- until we find a relative or a friend who is doing just what we think we should be doing." (Ariely, 2008, p.3). Lastly, we need to report on the influence of Daniel Kahneman's (2013) thoughts had on our studies. They inspired us in several aspects, and in our search for mindset patterns we reflected on concepts like intuitive knowledge and planning fallacy.

To understand the Do-It-Yourself economy and mindset, we started from Handy's (2015) thoughts followed by the IKEA effect (Norton, Mochon and Ariely, 2012). Regrettably these concepts did not describe completely the newcomer's approach to problem solving. Then, we recalled the old story of "Surprising Adventures of Baron Munchausen" -written by Rudolph Eric Raspe- where the main character pulled himself out of the swamp by his own ponytail (or bootstraps, depending on the version). By common understanding bootstrapping means to pull oneself up by one's bootstraps, just like Baron Munchausen. We reason that this idiomatic "bootstrap" model fits the mindset of the newcomers to farming. Therefore, we concluded that the bootstrap mindset fits better to our study than the DIY mindset. So, bootstrap age and bootstrap mindset became our keywords. Although, the bootstrap concept emerged in several disciplines, in our exploratory research we could find few articles using it in the aforementioned context. As Nicolescu said, "The bootstrap is therefore a vision of the world's unity, a principle of nature's self-consistency: the world built on its own laws through self-consistency" (Nicolescu, 2014a, p.90).

The digital age, was a topic examined from several perspectives. In the abundance of available knowledge on the subject, we focused on couple of key notions. The thoughts of Chris Anderson, Marc Prensky and Nicolas Carr were the main sources which effected our research. Based on Anderson's books the significance of "free" and the role of the "passionate practitioners" influenced our studies (Anderson, 2006; 2009). We mentioned before the concepts of "digital natives", "digital immigrants", "Homo Sapiens Digital" and "digital wisdom" attributed to Prensky (2001a; 2001b; 2009), which are covered in the literature review sections in the respective papers. We are in agreement with Simon (1971) that an information rich world creates a poverty of attention. This is in line with the notion of "shallow" we discussed earlier in the current work. Carr in his books "The Shallows: What the internet is doing to our brains" (Carr, 2011) and "The glass cage: how our computers are changing us" (Carr, 2014) explores the impact of technology on our ability to focus, our concentration, and how it makes us "shallows". On one hand, the internet provides

a supplement of our personal memory. On the other hand, when we use the web as a substitute of our personal memory, we risk emptying our minds, obstructing the consolidation of long-term memories and the development of schemas. New technology has an impact on production and consumption as well as on people's behaviors and perceptions. Technology, like navigational tools, shape our relationships with the content: promote quick scanning of the information, without deep engagement with the narrative.

Moving to our next keyword, knowledge refreshing, we explored several theories and concepts around education, learning and knowledge construction, with focus on post-educational learning. The following notions we regarded as imperative to introduce: informal learning, tentative problem solving, conceptualization of knowledge, experiential learning and narratives. We based our studies on Cross's (2007) concept of informal learning, which continues throughout one's professional life. Tentative problem solving was the framework for our study of the learning process, which is a trial and error elimination process according to Popper (1992). One cannot discuss learning without reflecting on knowing and knowledge. Our conceptualization of knowledge is based on Polányi's (1962) notion of "personal knowledge" and "tacit knowing". Meta-knowledge as defined by Baracskai and Dörfler (2017) consists of meta-concepts, which are communicated by great thinkers in forms of metaphors. In the teaching process the meta-concepts are not taught, but rather "sent" through metaphors, and narratives which are "received" by the learner. From the tentative problem solving framework and the meta-knowledge concept Baracskai and Dörfler (2017) arrived at "bootstrap learning". To acquire a skill, one has to experiment, to make mistakes, to accept feedback and to try again. Experiential learning theory by Kolb and Fry (1974) is a model for this cyclical learning process. Throughout our learning, however, we have limitations: we cannot experience everything. Therefore, we need to leverage our connections to learn from other people's experiences. This is how experiential learning theory lead us to explore the concept of communities of practice, which represents groups sharing the same concern or passion for something they do, and by regular interaction they learn how to do it better (Wenger, 1998; 2000; Wenger and Trayner-Wenger, 2015). Members of the CoP are practitioners, who develop a shared repertoire of resources: experiences, stories and tools. Newcomers to farming share their knowledge and expertise in workshops, festivals and also on the internet. However, the use of the tools of information technology to access new knowledge spurred us to explore the connectivism learning theory (Siemens, 2005). Our studies on learning also incorporated Nicolescu's (2005) thoughts on transdisciplinary education and Jerome Bruner's (1985) on narratives.

1.3. Problem space: Cyber Farmers' mindset patterns and search for applicable knowledge to perform the operations

Based on the required and available knowledge described in the previous paragraphs, we narrowed the original problem space to five problem areas, or we could say five pillars. These five areas on one hand represent our journey to understand the newcomers' tentative problem solving in the overcoming of their lack of knowledge. On the other hand, these standalone problem areas cover some of the most thought-provoking topics we came across. Our initial concept-map was the foundation upon which we defined the steps for our study. During our research process, there were no major changes to it. Revisions were rather due to narrowing of the problem space, purification of the concepts, notions and frameworks. One representation of our problem space is visible in Figure 1.1.

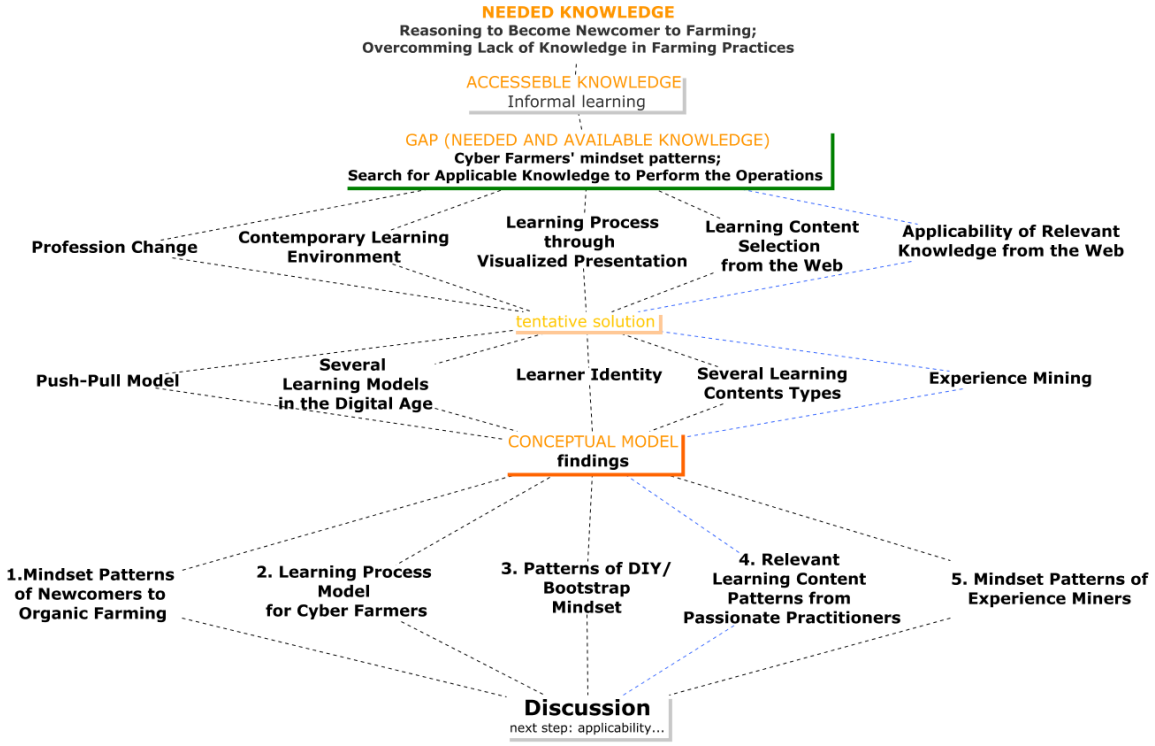


Figure 1.1: Concept map of our problem space

The first problem area we identified was the decision-making process to become a newcomer to organic farming. We aimed to find mindset patterns for those who change profession and/or lifestyle and move to rural areas. In the second problem area we observed the contemporary learning environment. We assumed that several learning models co-existent in the digital age. Our finding, the developed learning process model drove us to the third problem area, which was to understand how to learn via visualized presentation. The fourth problem area addressed the validation of relevant learning content from the world

wide web. In the fifth problem area we studied the validation of applicable knowledge. The resulting conceptual model for this last problem area presents mindset patterns of experience miners in the digital age.

From the findings of these five identified problem areas originated the resolution for our defined knowledge gap. This resolution is more than the sum of its parts. The five partial results, must be regarded as delineating the final solution. Starting from a distinct problem definition for the problem space, different results could have been achieved.

1.4. Approach and methodology

1.4.1. Transdisciplinary approach

The demarcated problem space for our research determined our approach. Similarly, to every real problem, the resolution of the defined five problem areas of our research, resist to mono-, multi- or interdisciplinary frameworks. Therefore, we adopted a transdisciplinary approach, which is our doctoral schools' basic principle. We based our work on Nicolescu's (2014a) conceptualization. He used the metaphor of birds in their cages to represent individual disciplines. A bird in a cage would represent a mono-disciplinary approach. The bird in its cage observes the reality outside of it through the grids of the cage. What the bird sees from the cage is partial and subjective. However, from inside the cage the bird could think that it observes reality as it is. A multidisciplinary approach using the same metaphor could be to have several birds in their own cages. Each of them observes reality within the boundaries of their cages, but by "talking" to each other they could have a richer picture of the reality. Interdisciplinarity would involve fewer birds, temporarily bringing over one bird to the cage of another. This way concepts, methods, tools, approaches are shared. Nevertheless, by opening the doors of the cages, the birds could fly freely. This setting would bring transdisciplinarity, which goes beyond the disciplinary boundaries.

Transdisciplinarity is also seen as interventionist, required to address the relation between science and society. Thus, it is viewed more than a research approach used to cope with complex problems. "At its core transdisciplinarity is, as we see it, both critical and self-reflexive: It not only systematically scrutinizes in which ways knowledge is produced and used by different societal actors in support of their concerns; it also methodically challenges how science itself deals with the tension-between its constitutive pursuit of truth and the ever-increasing societal demand for the usefulness of its results." (Jahn et al, 2012, p.9)

In the works of Gibbons et al. (2010) transdisciplinary knowledge production is characterized by a constant flow between fundamental and applied, theoretical and practical.

In their view the disciplinary boundaries and distinctions between applied and pure research become less relevant; the focus rather shifts to the problem area. Max-Neef (2005) highlights that transdisciplinarity is a manner of seeing the world more holistically.

In our exploratory research we encountered transdisciplinarity from several viewpoints. However, we chose to adopt Nicolescu's transdisciplinary methodology. "After many years of research, we have arrived at the following three axioms of the methodology of transdisciplinarity: 1. The ontological axiom: There are, in Nature and society and in our knowledge of Nature and society, different levels of Reality of the Object and, correspondingly, different levels of Reality of the Subject. 2. The logical axiom: The passage from one level of Reality to another is ensured by the logic of the included middle. 3. The complexity axiom: The structure of the totality of levels of Reality or perception is a complex structure: every level is what it is because all the levels exist at the same time." (Nicolescu, 2014b, p.21). Along these methodological guidelines of transdisciplinarity, we distinguished between the different levels of reality. On each level of reality, a bivalent logic may be valid, however according to the logical axiom transdisciplinarity transcends bivalent logic. Nicolescu (2014a) argues that transdisciplinarity means the transgression of duality, the opposing binary pairs like subject-object, simplicity-complexity, diversity-unity, and so on.

In line with the logical axiom of non-contradiction (Nicolescu, 2014a) , throughout our journey we speculated on the several A, non-A, and T states. These logical connections were not included in the presented papers and arguably a different thought thread could potentially lead to different connections. However, we felt important to present them in Appendix 1, since they affected our thought process and approach.

In the current work we observed the Organic Cyber Farmer's reality on personal level. To study the phenomenon on social level could be the problem space of a separate, future research.

1.4.2. Data collection and analysis

The data collection and analysis were qualitative-quantitative processes, which are elaborated in the respective papers for the different problem areas. In our studies, the observations in some areas have been supported by collected data. Firstly, we identified the data types, followed by data collection. For the first problem area, to understand the mindset patterns to choose organic farming as a new "S-Curve", the data collection was performed with a survey, because there is no validated questionnaire to study the phenomenon.

The responses from the survey were analyzed with factor analysis and a Knowledge Based System (KBS). The data collection process for KBS is called knowledge acquisition (Wagner, 2017). The participants of the knowledge acquisition process are the knowledge engineer and the domain expert or decision-maker. The knowledge engineer works with the expert to acquire the aspects of the decision, describing previous cases, or articulating rules from the decision-maker's experience. Knowledge engineering is the process to create a representation of the decision-maker's knowledge (Wielinga, Sandberg and Schreiber, 1997; Baracskai, Velencei and Dörfler, 2007). Different knowledge representation techniques are in use, like cognitive maps, frames or rules (Wagner, 2017; Gavrilova and Leshcheva, 2015). By knowledge representation the expert's reasoning becomes transparent. Rule-based reasoning (RBR) and Case-based reasoning (CBR) are the most widely known and applied functionalities of the Knowledge Based Systems.

In the case of RBR or deductive reasoning, the knowledge engineer works with the decision-maker or expert to identify the aspects of the decision and the logical rules between them. CBR or inductive reasoning is applied when the cases can be described by the same aspects based on the decision-maker's previous experience.

In our studies we used the Doctus Knowledge Based System (Baracskai, Velencei and Dörfler, 2007), developed based on Simon's (1977) conception of bounded rationality. In Doctus KBS the aspects of the decision are called attributes. The knowledge representation in Doctus KBS is based on symbolic artificial intelligence (AI). Doctus KBS delivers CBR using an entropy-gain method based on a modified ID3 algorithm (Quinlan, 1986; Velencei et al., 2015). Reductive reasoning, the unique functionality of Doctus KBS always follows CBR. Based on the most informative attributes identified during CBR, the system generates a new rule-based knowledge base. In our studies we used all three functionalities (rule-based reasoning, case-based reasoning and reductive reasoning) of Doctus KBS. The details regarding the knowledge acquisitions, reasonings and knowledge representations are included in the respective papers.

1.5. Papers included and contribution

The rest of the dissertation presents five works developing conceptual models for the identified five problem areas.

We received a dozen reviews on the papers comprising this dissertation. We will forgo the complete presentation of these critiques, and will rather reflect on some recurring questions. When addressing the study and resolution of real problems, it is natural to use concepts from several disciplines, including the use of lesser-known new concepts as well. It is apparent

that out of the thirteen concepts in the current work, there might be a few unfamiliar for every reader. Needless to say, the majority of the concepts are presented with references and/or quotes, which might not be sufficient for the accustomed treatment of the concepts. We do not claim that definitions are not helpful, but they cannot lead to a clear overall picture view. For example: the protagonist of our research is the Organic Cyber Farmer, which is a new concept introduced and we provided a definition for it. However, this protagonist can be seen as a newcomer, a learner, or alternatively as a problem solver. Some of these notions can be linked to the classical farmer as well, however not all of them. When we use any of these concepts or their combinations, they are comprehensible based on the context, which inevitably leads to the difficulty of reading certain sections. We are not convinced that we could describe the phenomenon using exclusively new concepts. Regardless of what concepts we would formulate, they would not associate to those used to describe our protagonist. There were also profession and discipline specific concepts in the quantitative and qualitative data analysis. The presentation of the artificial intelligence based KBS functionalities would be difficult without the use of existing notions from the field of decision support. The concept of "aspiration" (March and Simon, 1958) is well-known and accepted in the study of decision-making. However, for those standing outside of this field, "aspiration" is probably a noun with a different meaning than for those involved in the study of decision-making. The use of concepts from any other profession or discipline, or the use of a new concept, would equally make it harder for the reader. This short elucidation perhaps helps the reader to accept that the use of concepts and frameworks from distinct disciplines limit the approach to the resolution of real problems. Therefore, as we argued in the methodology section, to explore this thought-provoking problem space, we needed to step out from the disciplinary boundaries and adopt a transdisciplinary approach.

In the first paper (Chapter 2), "Mindset patterns of newcomers to organic farming" (Varga and Baracskai, 2020c), we aimed to understand the reasoning of those who move to rural areas, venturing out from their original profession and start organic farming as a new "S-curve". To reveal the mindset patterns, we addressed the newcomers in Hungary with a survey. From the collected responses we attempted to uncover several different mindsets with two methods. The mindset patterns were presented with "if-then" logical rules between the identified attributes. We found that the three different groups of respondents (already organic farmer, in-process, thinking about it) being in different stages of the decision-making process have different aspirations. The results from this study closed the knowledge gap for the first problem area.

In the conference paper (Chapter 3), “Global vs. local knowledge in DIY economy“ (Varga, 2017), we developed a learning process model in the Do-It-Yourself economy. In our conceptual model we presented the learning process in today’s digital era as consisting of three steps: validating the consistency of the accessible knowledge through search engines, validating the relevance of the consistent knowledge and validating the applicability of the relevant knowledge. The learning process model developed in this paper served as the foundation for the studies for the succeeding problem areas.

The third conference paper (Chapter 4), “Cyber DIY: Learner expectation patterns in new knowledge selection and validation” (Varga and Baracskai, 2018) presents our conceptual model, which demonstrates the DIY/bootstrap mindset during learning through visual presentations. One conclusion we had was that if scientist’s and practitioner’s levels of reality are not distant, then visual content enables spread of ideas and practices without language barriers. Once we understood the bootstrap mindset of the Organic Cyber Farmers and their learning environment, we moved to the fourth problem area.

The fourth conference paper (Chapter 5), “Cyber Farmer informal learning through YouTube” (Varga and Baracskai, 2020b) concerns the learning content selection from the World Wide Web. YouTube as a video sharing platform is used by DIYers in their quest for knowledge. The freely available abundant contents published by passionate practitioners raised the question of the relevancy of them. In this study we identified relevant learning content patterns from the YouTube published by the passionate practitioners. However, we did not observe what drives the passionate practitioners to create and publish videos, this topic would be a thought-provoking area for further exploration.

In the last paper (Chapter 6) (Varga and Baracskai, 2020a), we present our conceptual model of the informal learning process for Cyber Farmers. We aimed to understand how is the applicability of the relevant knowledge from the internet validated by the learners. We assumed that this validation could be achieved through experience mining. The model was based on the findings of previous problem areas. Our result is not a synthesis of several different theories, rather an integrated model including: (i.) the learner with a bootstrap mindset, (ii.) the learning process for the digital age, (iii.) content types and (iv.) the passionate content provider.

Following Popper's (1992) tentative problem solving process from the original problem through our research, we were faced with new, even more captivating problems. The results from the five problem areas should not be viewed as each forming a fifth of our conclusions, but they should rather be deemed as results which determined the next problem areas’

frameworks. For example, the learning process model developed for the digital age served as the framework in our study for the fifth problem area. The three identified learning process steps to validate the consistency, relevancy and applicability of the knowledge were fundamental elements of our model. Nevertheless, the conceptual model incorporated some of the findings from previous problem areas as well. All our conclusions have limitations. For the first problem area, we were faced with the difficulty of estimating the size of the newcomers to organic farming population. Another limitation was the geographical constraint; in our studies we observed the newcomer population only in Hungary. These should be viewed not only as the limitation for the given problem area, but also for our whole study. Therefore, our results should be handled inside these boundaries.

2. Mindset patterns of newcomers to organic farming

Working paper:

Varga, E[1]. and Baracskai, Z[2]. (2020c) *Mindset patterns of newcomers to organic farming*. European Countryside (http://www.european-countryside.eu/), under review

Author information (for the time when the research was conducted):

[1]Széchenyi University, Győr, Hungary

[2]Széchenyi University, Győr, Hungary

Abstract

Counterurbanization, rural in-migrant trend studies rarely focus on the individual decision-making process. This paper studies the mindset patterns and frames the decision to select organic farming as a next career. We aimed to deepen our understanding of the complex reasoning that motivates newcomers to choose organic farming on a personal level. Based on semi-structured interviews we developed a questionnaire and collected data from the newcomer to organic farming community in Hungary. The responses were analyzed using: (1) factor analysis to assess the dimensionality of the factors and (2) Knowledge Based System to identify the logical connections between the aspirations. Our conceptual model was developed based on if-then rules between the identified aspirations, which describe the mindset patterns of newcomers to organic farming.

Keywords: counterurbanization, newcomers to organic farming, mindset patterns

Absztrakt:

Nem ismert, hogy az öko-farmokon újrakezdők milyen gondolkodási folyamat nyomán választják a gazdálkodást tanult szakmájuktól távol álló karriernek. Ez a cikk feltárja az öko-farmokon újrakezdők döntései mögött lévő gondolkodást. Célunk az öko-farmokon újrakezdők gondolkodásában használt minták megértése volt. Lazán struktúrált interjúk alapján adatokat gyűjtöttünk a magyarországi öko-farmokon újrakezdőktől. Az adatokat először faktoranalízissel elemeztük, majd egy mesterséges intelligencia alapú szakértői rendszerrel feltártuk a jelenséget kiváltó gondolkodás logikai szabályait. A jelenség megértéséhez a bemutatott fogalmi keret az elvárások közötti ha-akkor szabályokkal írja le az öko-farmokon újrakezdők döntését.

Kulcsszavak: menekülés a városból, öko-farmokon újrakezdők, gondolkodási minták

2.1. Introduction

Handy (2015) uses the metaphor of the sigmoid curve, the S-curve, to represent changes in business, society, career trajectories, or any other progression typified by periods of growth and decline. It also offers strategies to manage those changes over time. Following common business wisdom, the best time to start a new curve is before one reaches the peak of the current curve, when resources and motivation are plentiful enough to progress to new heights. In one's professional and personal life more than one S-curve can appear, but it is difficult to identify which factors influence the decision to shift from one curve to the next.

Milone & Ventura (2019) study the new generation farmers in Italy whom they call "new peasants". These farmers are often people with non-agrarian degrees who decide to create land-based rural enterprises. The move to rural is observed widely (Ní Laoire, 2007; Halfacree, 2008; Oliveira & Penha-Lopes, 2020) although there is no strict record of the individuals who change lifestyle and/or profession to become new peasants or newcomers to farming. Counterurbanization in Central Eastern Europe follows similar trends to its western counterpart (Brown, Kulcsár, Kulcsár, & Obádovics, 2005; Csurgó, 2013; Šimon, 2014).

It would be superfluous to detail literature on the impact of the digital technology on everyday-life, teaching, learning, business models. However, it is fundamental in the understanding of the new peasants' environment. These concepts lead us to the definition of Organic Cyber Farmer to describe those who select organic farming as their new S-curve by moving to a rural area to start an enterprise, venturing out from their original profession and leveraging the digital age for learning and business opportunities. They leverage the digital era for knowledge increase; search and share practices through the internet. As this paper does not treat the use of information technology, therefore in the current paper we use the concept Newcomer to Organic Farming instead the beforementioned Organic Cyber Farmer.

Several concepts emerge in the study of selecting organic farming as a new S-curve: new peasants, move from urban to rural (counterurbanization), narratives, digital era, organic farming, decision making, tentative definition of aspiration levels. Therefore, we bound to those which are strongly connected with our understanding of the phenomena.

This paper is organized as follows: the theoretical background section presents a short overview of counterurbanization, human decisions for a tentative definition of the aspiration levels. The following section describes the approach, offers an explanation as why Knowledge Acquisition supported by a Knowledge Based System is an appropriate method

of study. Our findings of the analysis are presented in the Mindset patterns to select organic farming as a new S-curve section, followed by the Discussion and Concluding remarks.

2.2. Theoretical background

Mitchell (2004) argues that the concept of counterurbanization is too broad to cover its depth of the meaning. She distinguishes three types of migration: ex-urbanization, displaced-urbanization and anti-urbanization. Ex-urbanization is the movement from the city to rural of those who perceive a limited dream of the countryside. Displaced-urbanization is the move of individuals or families who search for job opportunities in the rural attracted either by land or property prices. Anti-urbanization consists of those individuals who reject the urban lifestyle, defined as: (i.) back to the land movement, (ii.) relocation to enhance quality of life, (iii.) retirement migration (Mitchell, 2004; Stockdale & MacLeod, 2013; Stockdale, 2014). The concept of "rural gentrification" also emerges in several studies on counterurbanization (Phillips, 2010; Halfacree, 2012). Shucksmith (2018) approaches the phenomena from the "rural idyll" narrative perspective, which sees the rural idyll as "something to which many aspire, perhaps as a vision of a good place to live or as a repository of values" (Shucksmith, 2018: 163). Stockdale (2014) similarly studies the decision-making process to migrate to rural areas in the United Kingdom and argues that the process should not just be understood as an effort to change the quality of life, that is, the rural idyll narrative. He concludes that those who move to rural areas disguise the true nature of the migrant decision-making process; the decision to move to rural may not be a rational, conscious decision. Studies on suburbanization and counterurbanization in Hungary conclude that migration flows are comprised of both economic and lifestyle motivated migrants (Ilcsikné Makra, Bajmócy, & Balogh, 2018; Bajmócy, Hosszú, Dudás, & Balizs, 2011). Csurgó (2013) identified three types of counterurbanizers: the rural idyll representation type, the rural family idyll representation type and the rural as garden-city representation type.

Although related, identity and attitudes are different constructs. One's identity defines how one thinks about oneself, how one views the world and one's environment. Identity is affected by society. An attitude is an opinion, belief, or preference. For example, one can view oneself as a farmer (identity) and not favor the use of pesticides (attitude towards farming practices, processes) (Sulemana and James, 2014). Seabrook & Higgins (1988) highlight that the image farmers hold about themselves significantly affects their behavior and the decisions they make about the practices and processes used in their farming business. Schöll & Binder (2010) compared present and future mental models of farmers towards

pesticide use and identified three types: deductive effect-focused farmer, deductive cause-focused farmer, imaginative effect-focused farmer. Becker (2006) defines Homo Ecologicus as "characterized by (a) sympathy with and respect for nature, (b) orientation of its own creativity upon the creativity found in nature, and (c) a relationship with nature, which is especially based on personal experience and encounters with it". (Becker, 2006:18) In line with the Homo Ecologicus definition newcomers to organic farming adopt environmentally-friendly farming practices.

Kahneman (2013) describes the thought process using the metaphor of two systems. "System 1" produces fast thinking. It makes quick judgments based on familiar patterns and works automatically and effortlessly. "Fast thinking includes both variants of intuitive thought – the expert and the heuristic – as well as the entirely automatic mental activities of perception and memory" (Kahneman, 2013:13). "System 2" produces slow thinking. It requires more intense focus, takes much effort and operates methodically. These two systems interact continually but not always smoothly. To understand the decision-making process when selecting the new S-curve, the decision maker's thinking process and aspirations have to be taken in consideration. In accordance with Simon (1977), we understand the process of taking action on a decision as comprised of three principal phases: finding an occasion to make a decision, exploring different courses of action and, finally, choosing from those courses of action.

In the study of the human thought process, the concepts Econs and Humans emerged (Thaler, 2015). Homo Economicus (Econs) is rational and economical models were built based on the assumption that all decisions are inherently rational. From that perspective, there is no differentiation between what we want and choose; choices simply reveal preferences. However, to understand behavior there is a need to study "Humans" rather than Econs". Due to the heterogeneous characteristics of counterurbanizers, including lack of experience and the variety of aspirations, the Econ-mindset does not give us relevant insights regarding the future of newcomers to organic farming. Therefore, in accordance with Thaler (2015), we reflect on an important concept, self-control, which arises when preferences are inconsistent across time or context. Ariely (2008) suggests that almost everyone has problems with procrastination and self-control, but those who recognize and admit these weaknesses are more successful in overcoming them. Our expectations influence our views of subsequent events. They also shape stereotypes, which are understood as a way of categorizing information. Even when faced with new scenarios, our cognitive processes do not start from scratch. Instead, they build upon previous experiences.

Bruner (1986) argues that we organize our experiences and our memory of events mainly in the form of narratives, stories, and myths. Recently, the situation has reversed. We can almost say that we expect too much from narratives. Therefore, newcomers to organic farming should be aware that even if they don't have narratives about farming, they are exposed to several narratives related to rural lifestyle like healthy living, coevolution with nature, rural idyll and many more. "We give different 'reality' status to experiences we create from our differently formed encounters with the world. We place a canonical value on certain stances that yield certain forms of knowledge, certain possible worlds." (Bruner, 1986:110)

According to March (1978), decisions are driven by expectations, incentives, and desires. One has to evaluate the possible solutions, the consequences that follow the solutions, and then choose those solutions which promise consequences most congruent with one's desires. In the decision-making process, solutions and expectations are not known but have to be discovered or developed. This introduces uncertainties and errors; decisions are intended to be rational but are bounded by human limitations. Therefore, aspirations and search rules are adjusted over time in response to experience (March, 1991). Previously, researchers resisted studying narratives, although they play an important role in the development of thought processes. We considered the sigmoid curve, S-curve (Handy, 2015) as a starting point of our study. We speculated whether the moves are mostly driven by the "rural-idyll" narrative, the pull of the countryside rather than push factors. The goal of our research was to surface the aspirations, intuitive knowledge (Kahneman, 2013) of decision makers, in order to deepen our understanding of an emerging phenomenon: newcomers to organic farming. Our propositions were as follows: i.) people in different stages of the decision process have different mindset patterns ii.) understanding of the Newcomers' reasoning is attained through unfolding several mindset patterns for selected aspirations.

2.3. Methodology, approach to identify mindset patterns

Transdisciplinary approach has been considered a way to address complex societal problems, which cross disciplinary boundaries(Costanza, 1991; Horlick-Jones & Sime, 2004; Max-Neef, 2005; Pohl, 2008; Popa, Guillermin, & Dedeurwaerdere, 2015; Polk, 2015; del Cerro Santamaría, 2015; Guimarães, Pohl, Bina, & Varanda, 2019). We based out work on Nicolescu's (2014a) conceptualization of transdisciplinarity. To describe the individual disciplines, he used the metaphor of birds in their cages. The bird from its cage observes the reality through the grids of the cage, which represents mono-disciplinary approach. In this scenario, what the bird sees from the cage is partial and subjective, however the bird could

think that it observes reality as it is. Multidisciplinary approach could be to have the birds „talk" to each other, which could bring a richer picture of the reality. Along this metaphor, interdisciplinarity would mean bringing the birds over the other's cages, in this way methods, tools, approaches would be shared. Transdiscplinarity, which goes beyond the disciplinary boundaries would mean the opening of the doors of the cages, so the birds could fly freely. Our research problem determined our approach, which similarly to every real problem resist to mono-, multi- or interdisciplinary frameworks. According to Max-Neef (2005) transdisciplinarity is a manner of seeing the world more holistically.

To understand the mindset pattern of a newcomer to organic farming we need to consider concepts like counterurbanization, human decisions and social narratives. The concepts for our study come from sociology, behavioral economics and cultural anthropology. Therefore, we share the view on the notion of transdisciplinary as being considered to go beyond the conceptions of scientific disciplines and to try to integrate and synthesize many different disciplinary perspectives. According to Jahn, Bergmann, & Keil (2012), the transdisciplinary approach should use simple language shared by disciplines and understandable by society. The capacity to transgress disciplinary or professional boundaries, by common understanding to "think out of the box" is considered as a characteristic of transdisciplinary inquiry (Lawrence, 2015). In our approach we chose to adopt Nicolescu's transdisciplinary methodology. "After many years of research, we have arrived at the following three axioms of the methodology of transdisciplinarity: 1. The ontological axiom: There are, in Nature and society and in our knowledge of Nature and society, different levels of Reality of the Object and, correspondingly, different levels of Reality of the Subject. 2. The logical axiom: The passage from one level of Reality to another is ensured by the logic of the included middle. 3. The complexity axiom: The structure of the totality of levels of Reality or perception is a complex structure: every level is what it is because all the levels exist at the same time." (Nicolescu, 2014b: 21) Therefore, we distinguished between different levels of reality. Transdisciplinary approach was used as a framework to understand the Newcomers' to Organic Farming reality.

Harmonized with the ontological axiom of Nicolescu (2010, 2014) that every newcomer's to organic farming decision is made on a personal level, we observe the mindset patterns on the personal level. In our study we exclude both the organizational and the social levels.

To understand the mindset patterns a questionnaire was prepared based on semi-structured interviews (Saunders, Lewis and Thornhill, 2007). The order of questions varied depending on the flow of the conversation; additional questions emerged, which helped to

develop the questionnaire. Interviewees used words, concepts in a particular way, which gave the opportunity to probe the meanings of them. The survey questions were grouped into five sections: 1.) to segment the population into three groups (already organic farmer, in-process and thinking-about-it); 2.) to understand the initial state (where do you come from?) 3.) to identify the reasons behind becoming organic farmer (push); 4.) to understand the achieved or desired state (where did you go?); 5.) to identify the influencing factors of the change (pull). From the perspective of decision-making, it is important to distinguish the three groups of respondents. Those who are already organic farmers answer the questionnaire after making a decision. For the in-progress group, the decision is made, but not necessarily acted upon, and may or may not be reversible. The thinking-about-it group may still be evaluating potential alternatives. The survey was validated with an eight-member focus group consisting of representatives from the three identified groups. The focus group in this setting was used to pre-test the survey questions (Morgan, 1997; Cyr, 2019). The objective was to craft, validate context specific questions of the survey. As a result, some of the survey questions and answers were revised, to ensure all dimensions of a particular topic were covered in the survey. Approaching people to share, reveal their own personal life-stories, feelings, thoughts, emotions we had to consider trust and vulnerability.

Counterurbanization is conspicuous in Hungary today. Despite this, measuring the exact population, those who selected organic farming as a new S-curve is difficult since records are rarely kept. We estimated the size of the population that selected organic farming as a new "S-curve" by: (i.) Gathering data from the organizers of the "Gyüttment" festival in Hungary. "Gyüttment" festival is an annual knowledge-sharing event for city-to-rural migrants. It focuses on topics ranging from sustainability, permaculture, and social enterprise. In 2018 the festival had approximately 4000 attendees According to the Pareto rule, 20% of 4000 people would mean an estimate of 800 people who start farming when they move to rural areas. The organizers estimated the population to be around 1500. (ii.) Counting the followers of three social media groups: "Gyüttment" (12970 followers on 2019.05.02), "Permakultúra: agrár+" (7989 members on 2019.05.02) and "Ökológiai gazdálkodás - Organic farming" (3908 members on 2019.05.02). (iii.) Gathering data from the professional organization, Ökológiai Mezőgazdasági Kutatóintézet (ÖMKi) Közhasznú Nonprofit Kft., a representative of the Hungarian organic agriculture, a partner of two international organizations: FIBL (Forschungsinstitut für Biologischen Landbau) and IFOAM (International Federation of Organic Agriculture Movements). In ÖMKI's on-farm network there are dozens of organic farmers from non-agrarian professions who choose

farming as their next “S-curve”. Using these inputs with a conservative approach, we estimated 1000-1500 people who choose organic farming in Hungary as their new “S-curve”, over a 5-year period from 2014–2019.

The data collection was performed by targeted email sent by the Newcomers to Rural festival organizers, followed by sharing the survey on the mentioned social media groups. We received a total of 95 responses as of January 2019. Considering the estimated size of the population and the response rate the findings from the dataset are not generalizable. However, we considered the dataset as a starting point for an initial attempt to understand the phenomenon, to identify commonalities in the mindsets of those who select or consider to select organic farming as their next S-curve. Therefore, the results of the current study could be considered as the starting point for future enquiries, either for additional data-collection, or alternatively for refinement of the aspects of the decision-making.

In the data analysis two methods were used: Varimax Factor Analysis to identify the factors which describe the phenomenon and a Knowledge Based System to reveal the logical relationships between the aspirations.

Knowledge Based Systems as a field of Artificial Intelligence have been evolving for decades, with application in several industries, different areas, fields (Wagner, 2017). Knowledge representation techniques also range from rules to cognitive maps, frames (Gavrilova & Leshcheva, 2015; Wagner, 2017). When working with Knowledge Based System the knowledge acquisition process starts with the formulation of the aspects of the decision. Aspects of the decision or aspirations, as defined by March (1991), are called attributes in the Knowledge Based System. The attributes and their values are given by the expert, decision maker. In this sense, an attribute is a decision criterion. Once the attributes and their values are defined, the next step is to acquire the cases including the outcome for each of them. The knowledge acquisition process for the knowledge base in this study consisted of building the survey, validating the survey and the coding of the responses. Through this process, we brought the aspirations and their levels to light. To represent knowledge, the Knowledge Based System uses symbolic logic, in which knowledge is expressed by logical statements, if-then rules between the attributes.

The Knowledge Based System used in our research has Case Based Reasoning functionality. It infers the if-then rules using an entropy-gain method. The attributes are taken one-by-one to form subsets according to their values. Their strength in making an order is measured by an entropy-gain (informativity) calculating algorithm (ID3) (Quinlan, 1986). The result of the Cased Based Reasoning is the Case-Based Graph or induction tree which describes the

rules induced from the identified cases (Velencei, 2017). The most informative attribute is chosen as the root of the induction tree and the first level subsets are formed according to the most informative attribute's values. These subsets are further divided using the same algorithm until all subsets are homogenous. When a homogenous subset is formed it is not divided further; it becomes a leaf of the graph. The benefit of the Case Based Reasoning is that the number of attributes is reduced, and only the most informative attributes remain. In the Case Based Reasoning process several attributes can be considered as benchmark attributes. The benchmark attributes are those which are evaluated based on the rest of the attributes. From the results of Case Based Reasoning, the important aspects of the decision can be determined using reduction by extracting the rules from the induction tree. Reductive Reasoning, which follows Case Based Reasoning, aims to describe the phenomenon at hand with the smallest number of attributes implemented according to the fitness function as defined by Tam & Cheung (2000).

An overview of our approach to understand the mindset patterns of newcomers to organic farming is presented in the Figure 2.1.

.

Figure 2.1: Approach to identify mindset patterns for newcomers to organic farming

The steps of our empirical study were: data collection; attribute and value assignment; data evaluation with factor analysis and Knowledge Based System considering several benchmark attributes. The responses from the survey were coded for factor analysis.

Similarly, for the analysis with Knowledge Based System the responses were translated into succinct attributes and values.

The attributes and their assigned values for the Knowledge Based System:

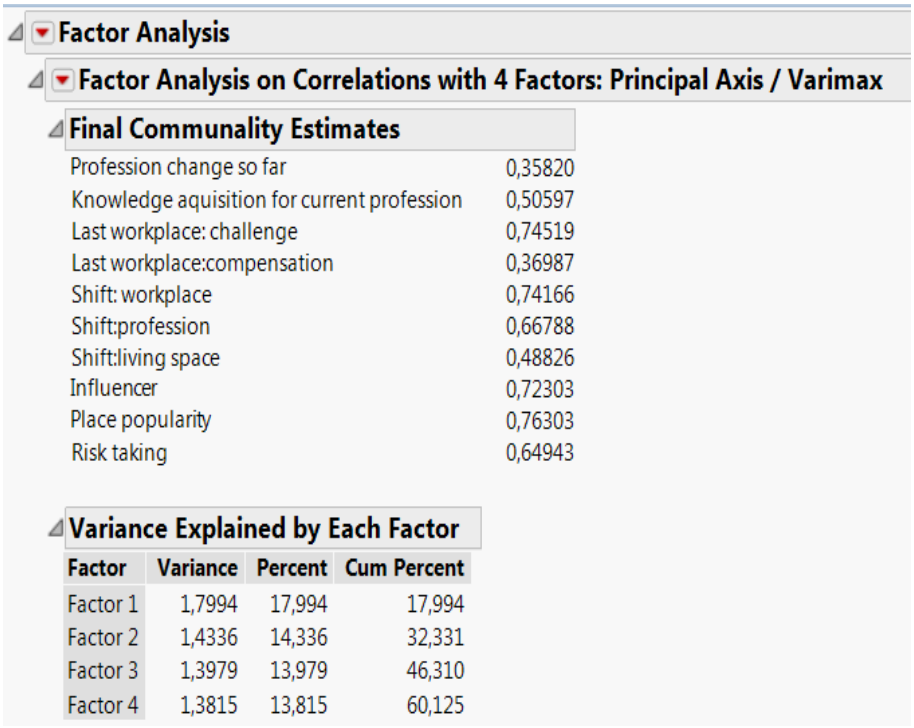
1. Organic farmer: already organic farmer, in-process, thinking-about-it
2. Number of workplace changes: more than four times, less than four times, none
3. Dominant profession selection: by accident/chance, heard about it, experienced it, I don't change a workplace, I don't have a conception
4. Profession change so far: close-once, close-several times, none, distant-once, distant-several times
5. Knowledge acquisition for current profession: autodidact, learning by doing, school system, course, all learning types
6. Reason for change: burnout, family, had enough of the city, company bankruptcy, health
7. Last workplace: challenge: bored for a long time, bored recently, just right, worried
8. Last workplace: personal relationships: opportunist, all right, conflict with the boss
9. Last workplace: compensation: underpaid, limited, proper but unreliable, satisfied
10. Shift: workplace good example, blue ocean, challenge, I don't change a workplace, I don't have a conception
11. Shit: profession: irrelevant but something different, I don't have an idea, I have experience with
12. Shift: living space: self-supplying(passive), homestead, village, edge of the city
13. Influencer: community, friends, family
14. Place popularity: it has fantasia, popular neighborhood, not popular, all the same
15. Risk taking: golden mean, risk taker, risk averse

2.4. Results: Mindset patterns to select organic farming as a new S-curve

2.4.1. Results of factor analysis

Our proposition was that the mindset patterns of those who selected organic farming as a new S-curve can be understood by defining the aspirations and their values. After coding the survey results, we started the assessment with factor analysis performed on the whole dataset. The first results indicated that the phenomenon can be described with fifteen factors, meaning that the model is ill-structured. The second factor analysis was performed on a reduced dataset by excluding the sample of the thinking-about-it category. This reduced dataset was used in a subsequent analysis, thus, the first question to segment the population

became extraneous. The factor analysis for the shortlist (the population consisting of already organic farmer and in-process) with settings (Principal axis/Varimax, 4 factors) could describe 49% of the phenomenon. Consequently, the following questions were excluded before the next evaluation: dominant profession selection, reason for change, number of workplace changes, last workplace, and personal relationships. The third factor analysis was performed on the reduced dataset and reduced set of questions with the settings (Principal Axis/Varimax, 4 factors), which led to 60% of the phenomenon being described with four identified factors, presented on Figure 2.2.



Factor Analysis

Factor Analysis on Correlations with 4 Factors: Principal Axis / Varimax

Final Communality Estimates

Profession change so far	0,35820
Knowledge aquisition for current profession	0,50597
Last workplace: challenge	0,74519
Last workplace:compensation	0,36987
Shift: workplace	0,74166
Shift:profession	0,66788
Shift:living space	0,48826
Influencer	0,72303
Place popularity	0,76303
Risk taking	0,64943

Variance Explained by Each Factor

Factor	Variance	Percent	Cum Percent
Factor 1	1,7994	17,994	17,994
Factor 2	1,4336	14,336	32,331
Factor 3	1,3979	13,979	46,310
Factor 4	1,3815	13,815	60,125

Figure 2.2: Principal Axis/Varimax/4 factors

The identified factors were named as follows: Factor 1 – Place definition consisting of two aspirations Shift: living space and Profession change so far; Factor 2 – Influence consisting of two aspirations Place popularity and Influencer; Factor 3 – Change inclination consisting of two aspirations Shift: workplace and Risk taking; Factor4 – Initial state consisting of two aspirations Shift: profession and Last workplace: challenge. Factor analysis showed that in the case of such complex phenomenon, only partial justification (60%) is possible. An important finding of this analysis, consistent with the literature, is that the decision(s) to change profession and/or lifestyle in the case of the newcomers to organic farming are more complex than the commonly mythologized rural-idyll narrative or change in quality of life (Bijker, Haartsen, & Strijker, 2012; Stockdale, 2014). As the phenomenon is so new, no strong rule-sets were priorly shaped, and the identified four factors describe it

only partially. However, we were not content with this outcome, since it did not lead us any closer to revealing the decision maker's mindset. Central to our thesis was that understanding the newcomer's to organic farming mindset is essential to understanding the phenomenon. Consequently, we searched for a method with which we can refine the previous results. Henceforth, we present the results of the supplemented analysis with Knowledge Based System. With Knowledge Based System, several different acceptable mindset patterns were unfolded by considering different attributes as benchmark attributes for the three groups (1) already organic farmer, (2) in-process, (3) thinking-about-it. It would be superfluous to present all, so we limit the presentation of the models for the newcomer's to organic farming mindset patterns to three benchmark attributes: reason for change, shift: living space, knowledge acquisition for current profession.

2.4.2. Mindset patterns for Reason for change

The decision to move from one S-curve to a new one either by changing lifestyle or profession is a decision where previous experiences are rare. In factor analysis the reason for change was excluded. Therefore, in the analysis with Knowledge Based System, we considered it as a benchmark attribute to get an insight in the mindset patterns behind the reasons to become newcomer to organic farming.

Firstly, we considered the group: already organic farmer. Figure 2.3 is a representation of the rules in a form of an induction tree. The "if- then" rules are read from the root of the graph towards each leaf. One representation of the mindset patterns for the already organic farmer group can be done with five attributes: Last workplace: compensation, Shift: workplace, Place popularity, Last workplace: challenge, Knowledge acquisition for current profession.

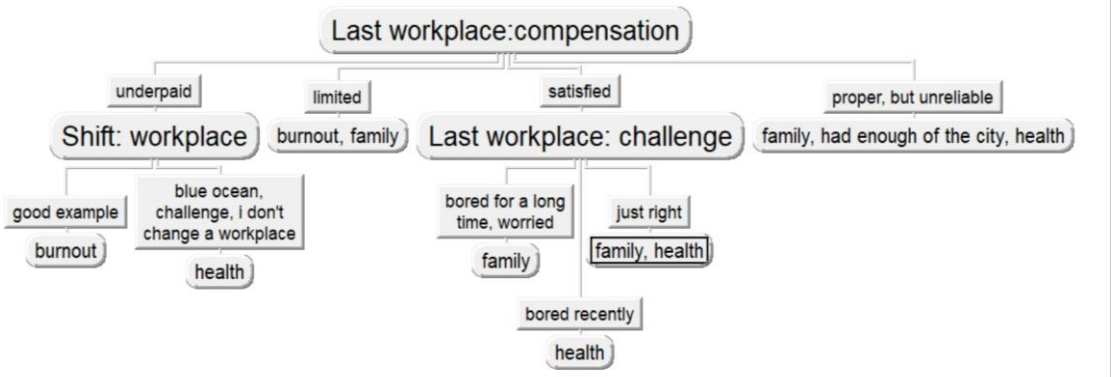
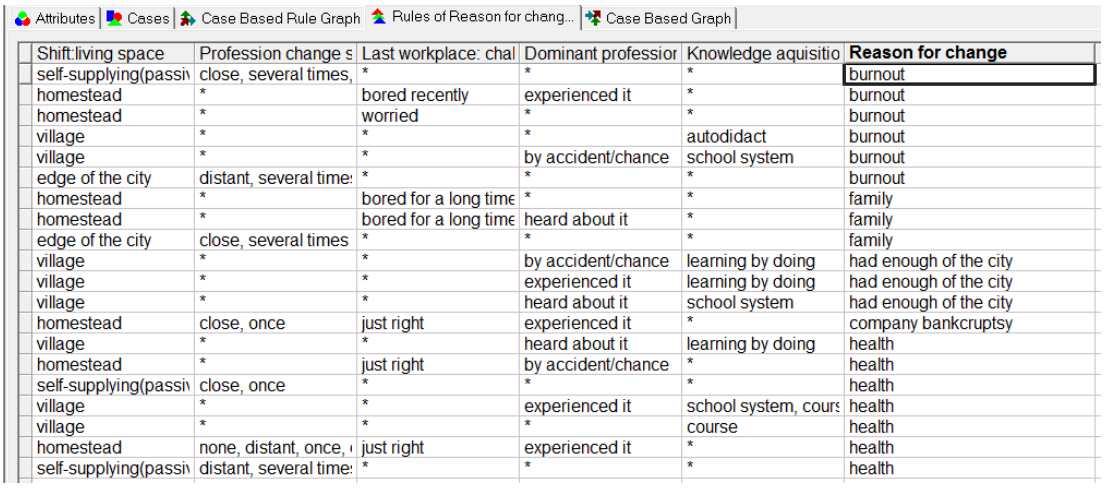


Figure 2.3: Induction tree for Reason for change as benchmark attribute, group: already organic farmer

Two examples of if-then rules from the induction, representing the mindset patterns for the newcomers to organic farming can be read as follows:

if Last workplace: compensation is “underpaid” and
Shift: workplace is “good example”
then Reason for change is “burnout”.
if Last workplace: compensation is “satisfied” and
Last workplace: challenge is “bored recently”
then Reason for change is “health”.

Secondly, in the analysis of the attribute Reason for change for the group in-process the following attributes were identified in one representation of the mindset patterns: Shift: living space, Profession change so far, Last workplace: challenge, Dominant profession selection, Knowledge acquisition for current profession. Figure 2.4. represents the in-then rules in a tabular form. The values of the attributes are read from left to right. Asterisk (*) means that the attribute does influence the rule.


Attributes | Cases | Case Based Rule Graph | Rules of Reason for chang... | Case Based Graph

Shift:living space	Profession change s	Last workplace: chal	Dominant professior	Knowledge aquisitio	**Reason for change**
self-supplying(passiv	close, several times,	*	*	*	burnout
homestead	*	bored recently	experienced it	*	burnout
homestead	*	worried	*	*	burnout
village	*	*	*	autodidact	burnout
village	*	*	by accident/chance	school system	burnout
edge of the city	distant, several time:	*	*	*	burnout
homestead	*	bored for a long time	*	*	family
homestead	*	bored for a long time	heard about it	*	family
edge of the city	close, several times	*	*	*	family
village	*	*	by accident/chance	learning by doing	had enough of the city
village	*	*	experienced it	learning by doing	had enough of the city
village	*	*	heard about it	school system	had enough of the city
homestead	close, once	just right	experienced it	*	company bankcruptsy
village	*	*	heard about it	learning by doing	health
homestead	*	just right	by accident/chance	*	health
self-supplying(passiv	close, once	*	*	*	health
village	*	*	experienced it	school system, cours	health
village	*	*	*	course	health
homestead	none, distant, once,	just right	experienced it	*	health
self-supplying(passiv	distant, several time:	*	*	*	health

Figure 2.4: Rules for Reason for change, group: in-process

Examples of if-then rules for the group in-process for Reason for change 2nd from the top and 3rd from the bottom:

if Shift: Living space is “homestead” and
Last workplace: challenge is “bored recently” and
Dominant profession selection is “experienced it”
then Reason for change is “burnout”.
if Shift: Living space is “village” and

Knowledge acquisition for current profession is “course”
then Reason for change is “health”.

Thirdly, the analysis of the attribute Reason for change as a benchmark for the group thinking-about-it demonstrated that no recognizable pattern could be identified. The models from the Knowledge Based System showed that for this group there is an evolving mindset pattern that is scattered and disorganized. One model consisted of the following six attributes: Number of workplace changes, Knowledge acquisition for the current profession, Shift: workplace, Shift: living space, Place popularity, Influencer. Analysis of the Reason for change attribute for the three groups demonstrated different patterns. For those who are already organic farmers the most common reasons identified were family and health. For the individuals in the groups in-process and thinking-about-it the main reasons for the change were health or burnout. Those who are in-process have very vivid memories of burnout. The same applies to the thinking-about-it group. There can be different explanations for these results. One can be that, for the population already organic farmer, the results reflect the true reasons for the change. On the other hand, one can argue that since the responses consider memories from the past, they might have forgotten burnout as their “true” reason for the change. From this, results that the responses in the survey are loosely connected to the event. Rather, they reveal memories, which are inherently flawed. One impediment we observed was that push factors (reasons for leaving) were more prevalent than pull factors for those who have recently made the change. One can argue that the reason behind this is that they have not yet experienced the positive impacts of the change.

2.4.3. Mindset patterns for Shift: living place

To get an insight in the living place selection, we considered the Shift: living space as a benchmark attribute for the three identified groups. The Shift: living space attribute reflects the aspiration of the physical living space. The induction tree displayed on Figure 2.5 is one representation of the mindset patterns for those who are already organic farmers. The if-then rules were derived from the following attributes: Profession change so far, Reason for change, Shift: workplace, Last workplace: challenge, Knowledge acquisition for current profession.

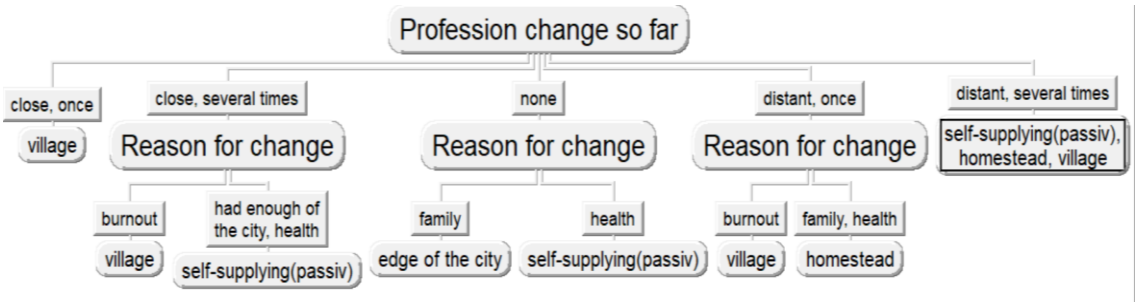


Figure 2.5: Induction tree for Shift: living space as benchmark attribute, group: already organic farmer

Example of mindset patterns for the Shift: living space for the group already organic farmer from the induction tree can be read as follows:

if Profession change so far is “none” and

Reason for change is “family”

then Shift: living space is “edge of the city”.

if Profession change so far is “none” and

Reason for change is “health”

then Shift: living space is “self-supplying(passive)”.

if Profession change so far is “distant, once” and

Reason for change is either (“family”, “health”)

then Shift: living space is “homestead”.

Mindset patterns in the induction tree for the group in-process for Shift: living space attribute are visible on Figure 2.6. The following five attributes were selected to describe the if-then rules: Reason for change, Profession change so far, Shift: profession, Last workplace: challenge, Knowledge acquisition for current profession.

Figure 2.6: Induction tree for Shift: living space as benchmark attribute, group: in-process

Examples of mindset patterns with if-then rules for the Shift: living space considered as benchmark attribute for the in-process population are as follows:

if Reason of change is “burnout” and
Profession change so far is either (“close, several times”, “none”)
then Shift: living space is “self-supplying(passive)”.
if Reason for change is “family” and
Shift profession is “I don’t have an idea”
then Shift: living space is “edge of the city”.
if Reason for change is “had enough of the city”
then Shift: living space is “village”.
if Reason for change is “health” and
Last workplace: challenge is “worried”
then Shift: living space is “village”.

Compared to the previous group, those who are in-process to become newcomers to organic farming the mindset patterns were described by ambiguous rules. One argument could be that those who are in-process did not fully experience the change yet, which makes it harder to reveal the aspects of their decision.

Shift: living space as benchmark attribute for the group thinking-about-it was defined by the following five attributes: Profession change so far, Shift: workplace, Reason for change, Influencer, Knowledge acquisition for current profession. Examples of mindset patterns for

selecting self-supplying (passive) living space for the group thinking-about-it from the induction tree were defined as follows:

if Profession change so far is “none” and
Shift: workplace is “good example” and
Knowledge acquisition for current profession is “learning by doing”
then Shift: living space is “self-supplying(passive)”.
if Profession change so far is “distant, once” and
Reason for change is “health” and
Knowledge acquisition for current profession is “learning by doing”
then Shift: living space is “self-supplying (passive)”.
if Profession change so far is “distant, once” and
Reason for change is “health” and
Knowledge acquisition for current profession is “learning by doing”
then Shift: living space” is “self-supplying(passive)”.

From the induction tree it was revealed that the attribute Influencer in this representation does not have an impact to select the living space as self-supplying(passive). Two additional examples of if-then rules considering the Influencer attribute were identified as follows:

if Profession change so far is either (“none”, “distant, once”) and
Shift: workplace is “I don’t change a workplace” and
Influencer is “community”
then Shift: living space is “homestead”.
if Profession change so far is either (“none”, “distant, once”) and
Shift: workplace is “I don’t change a workplace” and
Reason for change is “family” and
Influencer is “friends”
then Shift: living space is “edge of the city”.

From these patterns results, that those who are in the thinking-about-it stage have disordered reasoning as they do not have experience yet. Using the Knowledge Based System we concluded that the reasoning of this group is complex. This can be considered an important result since it highlights whose mindset patterns are worthwhile for study. The attribute Influencer is not the most informative attribute but still decisive. From the current

dataset those who were only thinking about the change were influenced by the narratives, and this could influence their decisions more than anything else.

2.4.4. Mindset patterns for Knowledge acquisition for current profession

For the analysis of the Knowledge acquisition for current profession attribute as a benchmark, we considered the three different populations in separate knowledge bases. Knowledge acquisition for current profession has a different meaning for each of the three groups. For those who are already organic farmers means knowledge increase in farming. For those who are in-process or only thinking-about-it this attribute reflects a different meaning: the knowledge increase in their current profession. Although this topic is highly interesting, the knowledge acquisition process in the presented research was studied with limitations.

Using Case Based Reasoning for Knowledge acquisition for current profession as the benchmark for the already organic farmer group the if-then rules could be described with the following three attributes: Influencer, Reason for change, Risk taking. It is surprising that the mindset pattern for knowledge acquisition was described by Influencer in the case of those who are already organic farmers. There were several mindset patterns which meant that there was no "single truth" or single way that newcomers to organic farming increase their knowledge. Figure 2.7 is one representation of the mindset patterns in the form of an induction tree for the Knowledge acquisition for current profession attribute.

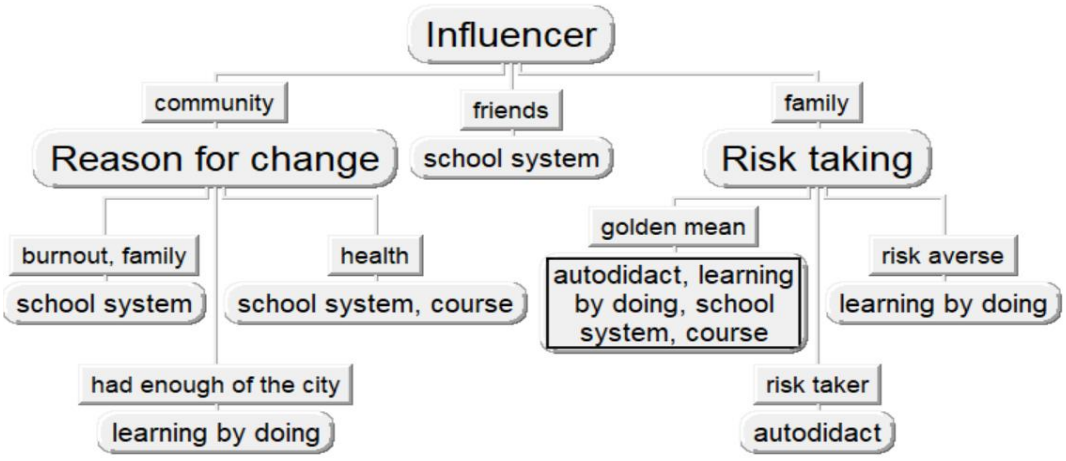


Figure 2.7: Induction tree for Knowledge acquisition as benchmark attribute, group: already organic farmer

If-then rules for the knowledge acquisition for current profession attribute can be read as follows:

if Influencer is "community" and

Reason for change is “had enough of the city”

then Knowledge acquisition for current profession is “learning by doing”.

if Influencer is “friends”

then Knowledge acquisition for current profession is “school system”.

if Influencer is “family” and

Risk taking is “risk taker”

then Knowledge acquisition for current profession is “autodidact”.

In this study, the risk attitude was selected as an attribute with three values (risk-taker, golden mean, risk-averse) without detailing the different contexts of risk-taking, therefore, addressing one’s own perception on general risk-taking behavior. Tversky & Kahneman (1981) describe situations when choices involving gains are risk-averse and choices involving losses are risk-taking, noting that the relative attractiveness of the options varies when the decision problem is framed in different ways. If one does not have the experience, or cannot use another’s experiences – since others don’t have the same experience or get the same results – then prior success or failure cannot influence aspirations. As soon as these experiences happen aspirations can be adapted into the decision-making process for future newcomers to organic farming. Nevertheless, the risk is unknown, and the aspiration levels of the risk averse newcomer to organic farming develop in a different way than for those who are willing to take risks, and for those who are ready to explore the unknown. In this scenario, risk-taking is an important factor, but we cannot use induction in the inference of the risk levels of a decision alternative. However, we can say that the risk-averse newcomer to organic farming fears the unknown compared with the risk-taker or those who prefer the golden mean. In our analysis of risk-taking as a benchmark attribute, we found that for all three groups the results of the Case Based Reasoning were ill-structured rule-sets. We argue that this is due to self-control reasons. Case Based Reasoning considering knowledge acquisition for current profession as benchmark attribute for the remaining two datasets: in-process and thinking-about-it produced complicated induction trees. Only a few common mindset patterns were revealed, therefore we can conclude that these groups are still looking for the knowledge increase in many ways. Mindset patterns for newcomers to organic farming highlight that autodidact learning is a way considered for knowledge increase. Therefore, we argue that transdisciplinary co-production of knowledge in organic farming (Vandermeulen & Van Huylenbroeck, 2008; Aeberhard & Rist, 2009) in today’s networked, digital age is an area to be explored in future research.

2.5. Discussion and concluding remarks

Traditionally, research into counterurbanization and rural in-migrant trends focuses on the reason to migrate; to focus on the individual process of decision making itself is rare. In doing so, understanding that newcomers to organic farming are part of several complex systems like Mother Nature, World Wide Web, social networks, economy – to name a few – is paramount to understanding the inherent complexity and interconnectivity of the environment in which they make their decisions. Kahneman (2013) provided several evidences that one cannot estimate the size of the population, consequently a number estimated intuitively cannot be validated by rational thinking process, reasoning. According to their studies these apparently analytical estimates are always biased, as stated by them we think metaphorically, on the other hand statistics requires us to think about many things at the same time, which is not the way System 1 works. Our overconfidence is the bottleneck to acknowledge our ignorance and the uncertainty of the world we live in. Therefore, in this study and everywhere else, the results from surveys have to be handled with care and responsibility. The results of this study add to the literature by understanding that the three stages of decision-making as described by Simon (1977) are relevant and have to be considered in the study of mindset patterns as people in different stages have different expectations, aspirations, and are influenced by different narratives. Therefore, splitting the responses according to the three groups: (i.) already organic farmer, (ii.) in-process, (iii.) thinking-about-it was essential to understand the factors and reveal the mindset patterns with the Knowledge Based System. Those who are already organic farmers have left their previous profession and/or lifestyle, they are already on the new S-curve. Those who are in-process they are just starting on the new S-curve, the decision has been made which may or may not be reversible. For those who are only thinking-about-it the mindset patterns are scattered, aspirations are only forming, and they can be almost classified as dreamers. From the received responses, it became apparent that the respondents that had concerns with the questions from the survey were those who did not take the time to think through the available options. The mindset patterns presented here help us to understand the reason for the change, living space selection, and the paths to knowledge increase for the newcomers to organic farming. They model the change from one S-curve to another, namely to become newcomer to organic farming in Hungary. The if-then rules are not generalizable across all cases; they are only valid for the examined cases. Our results should be validated inside these boundaries. Adding new cases to the existing dataset through future research, could reveal new rules. It is important to highlight that the reasoning in several of the mindset patterns

was reduced to 2-5 attributes, which indicates that in these cases rules were formed, set. Our aim was to search for the understanding of an emerging phenomenon: the appearance of the newcomer to organic farming, where, based on the survey, we attempted to order their intuitive knowledge and aspirations. For those interested in the phenomenon future research is suggested in several areas, like in mindset pattern changes on a personal level through longitudinal studies or, alternatively, into the phenomenon on social and/or organizational level. From the received responses we encountered the concept of solastalgia. Solastalgia is a neologism created to describe the discomfort, worry and existential distress caused by environmental changes. This area could be a research topic for future elaboration as a possible motive in the move to rural. Another area for further exploration could be the role of the "influencer". We propose to consider narratives (Bruner, 2004) and thought styles (Fleck, 1979) in the exploration of the influencer's role. Furthermore, knowledge acquisition for the newcomers to farming addressed in our paper with limitations is another area of research to be considered. We do not generalize, but search for an explanation of a phenomenon which triggers thinking and/or action

Acknowledgement, statements

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author's contact:

Enikő Varga *
Doctoral School of Regional Sciences and Business Administration
Széchenyi University, Győr, Hungary, Address: H-9026 Győr, Egyetem sqare 1
https://orcid.org/0000-0002-5559-872X
e-mail: varga.eniko@sze.hu

DSc. Zoltán Baracskai
Széchenyi University, Győr, Hungary, Address: H-9026 Győr, Egyetem sqare 1
https://orcid.org/0000-0002-1450-8484
e-mail: baracskai.zoltan@sze.hu

3. Global versus local knowledge in DIY economy

Varga, E. (2017) 'Global versus local knowledge in DIY economy', in Yongqiang, L., Hunjet, A., and Roncevic, A. (eds) *Economic and Social Development (Book of Proceedings)*. Prague: Varazdin Development and Entrepreneurship Agency, Varazdin, Croatia, pp. 437–442. Available at: https://bib.irb.hr/datoteka/983301.Book_of_Proceedings_esdPrague_2017.pdf#page=446.

Author information (for the time when the research was conducted):
Széchenyi University, Győr, Hungary

ABSTRACT
According to Charles Handy (Handy, 2015) whether we like it or not we are forced to move into a DIY (Do It Yourself) economy. Farmers of this new DIY economy, who use the tools and means of the information age for problem solving, best practice sharing, or implementing new business models from the rise of the collaborative consumption can be called cyber farmers. To solve problems in real life we look for information, knowledge in many ways by formal, informal learning, experience sharing. The wide spread of information technology, social media globally has a significant impact on the knowledge sharing, experience mining. The knowledge gathered from the available sources over the internet is accidental also the application of this knowledge locally in a global environment raises many questions. Nicholas Carr (2016) in one of his blogs talks about the illusion of knowledge, how the internet is making us shallow, but at the same time giving us the illusion that our knowledge is deep. In today's environment with around 8000 disciplines, by specializing in one or couple would mean to ignore more than 7990 (Nicolescu, 2002). This leads to the need of transdisciplinary approach, which would mean to not only look at certain problems from one or more disciplines, but go beyond the disciplines. In the process to mind, validate the knowledge available globally the following have to be considered (1) consistency of the accessible knowledge; this relates to the notion of internal validity, (2) relevance of the consistent knowledge; this relates to the notion of construct validity and (3) applicability of the relevant knowledge; this relates to the notion of external validity. The aim of this paper is to show a model for cyber farmers to help their learning process in the DIY economy.

Keywords: applicability of knowledge, consistency of knowledge, relevance of knowledge, transdisciplinarity, DIY economy.

3.1. Background of the topic

We are assembling our own furniture at home, printing our own boarding cards, self-paying for the merchandise in the shop, filling in our own car at the gas station. Charles Handy (2015) called this economy as the Do It Yourself economy, which puts us in control of our own affairs, at the same time saves money. Our homes are becoming work hubs not only for those who work remote or in home-offices, but many people find new ways of income with the rising opportunities in the sharing economy. Nowadays we are seeing more and more gardening in the backyard, community gardens being established in cities, which cannot be considered solely as a new fashion but a potential result of the DIY economy.

One of the effects of the information revolution according to Rachel Botsman (2017) is that we live in a world of collaborative consumption, where with the help of different portals we share, exchange goods, services. Examples of these portals would be to swap DVDs (swaptree), share cars (uber), sell goods (e-bay), provide accommodation (airbnb, couchsurfing), match the land with the borrower (landshare), etc. We don't want to possess things, we want the experience what it fulfils (we don't need the DVD, we would like to watch the movie).

We live in a global village where the ties which used to happen face–to-face in the past, nowadays happen in the cyber space-time. At the same time technology takes us back to the times of bargaining, changing, swapping, sharing but with fundamental differences. We are witnessing the creation of a collaborative economy of what's mine is yours, of the access is better than ownership. According to Botsman (2017) the collaborative economy is an economic system that unlocks the value of underused assets through platforms that match "haves" with "wants" in ways that enable greater efficiency and access.

Pink (2005) in his book - A whole new mind – describes the evolution of the society as progressing from the society of farmers (agriculture age), to a society of factory workers (industrial age), followed by the society of the knowledge workers (information age). According to Pink we are entering now the conceptual age, the age of creators and empathizers, pattern recognizers and meaning makers. In other words, "we have moved from an economy built on people's backs to an economy built on people's left brains to what is emerging today: an economy and society built more and more on people's right brains"(Pink, 2005, p.25). Could one define the Do It Yourself economy, conceptual age, collaborative consumption as different levels of reality of the environment we live in?

3.2. Learning process model for Cyber-Professionals

According to Pink (2005) to survive in the conceptual age all players, whether individuals or organizations should examine the following questions:

1.) can someone do it cheaper in a global environment;

2.) can a computer do it faster;

3.) is what I am offering a demand in the age of abundance?

The six aptitudes or "six senses" required for anyone to be successful are: design, story, symphony, empathy, play and meaning. It is not enough to create a product, service, lifestyle that is functional; today it is economically crucial that something is also beautiful, emotionally engaging (design). The ability to contextualize, emotionalize are very important to show something in the context of something else (story). Industrial and Informational age required specialization, but in today's world the ability to put the pieces together (symphony), seeing the big picture, being able to combine the pieces into something whole new, ability to synthesize not only analyze. In our world of information overload, advanced analytic tools logic is not enough, understanding relationships, people and empathy is important (empathy). There are times where seriousness is required, but in the conceptual age we all need humor, games, laughter, we need to play (play). In the pursue of meaning more and more emphasis is on purpose, spiritual fulfilment (meaning). The conceptual age requires a new form of thinking, a new approach to life, which Pink calls as "high concept" and "high touch". "High concept involves the capacity to detect patterns and opportunities, to create artistic and emotional beauty, to craft a satisfying narrative, and to combine seemingly unrelated ideas into something new. High touch involves the ability to empathize with others, to understand the subtleties of human interaction, to find joy in one's self and to elicit it in others, and to stretch beyond the quotidian in pursuit of purpose and meaning" (Pink, 2005, p.24).

Famers of this new DIY economy, who use the tools and means of the information age for problem solving, best practice sharing, new business models from the rise of the collaborative consumption can be called cyber farmers. Similarly, one can define the "cyber cook", "cyber sewer" and so on, who not only use the internet to explore the opportunities of the sharing economy, but for problem solving, looking for new ideas, knowledge. On the other side of the coin assembling our own furniture, decorating our own house, growing vegetables in the backyard requires knowledge, skills which we did not acquire during our formal education and only a few of us can claim that are knowledgeable in many areas we are forced to be by the DIY economy. One example for knowledge sharing for the Do-it-

yourself economy is IKEA. One can find many ideas from how to sew a cushion cover, how to refresh an old furniture, to how to make a present for Valentine's Day, to name a few (http://www.ikea.com/gb/en/ideas/). To solve problems, challenges raised during our everyday life we look for new knowledge in many ways, by reading books, asking experts, searching the internet, use social media just to name a few. Real life problems cannot be tied to one or couple of disciplines. By specializing in one or couple of disciplines in today's environment would mean to ignore more than 7900 other disciplines, which leads to the need of transdisciplinary approach for the cyber-farmers to address real life problems. Multidisciplinary approach means to study a topic not in just one discipline, but in many other disciplines at the same time. Interdisciplinary approach means the transfer of methods from one discipline to another. Transdisciplinarity means to study that which is at once between the disciplines, across the different disciplines and beyond all disciplines. "This transdisciplinary approach will be an indispensable complement to the disciplinary approach, because it will mean the emergence of continually connected beings who are able to adapt themselves to the changing exigencies of professional life, and who are endowed with a permanent flexibility which is always oriented toward the actualization of their interior abilities" (Nicolescu, 2002, p.123).

Nicolescu describes the four pillars of the new transdisciplinary education as being: learning to know, learning to do, learning to live together and learning to be. Learning to know means the capability to establish bridges between different disciplines and our interior capacities (consistency of knowledge). Learning to do means mastering a profession or a craft with the theoretical and practical knowledge required for it. In the transdisciplinary approach learning to do means apprenticeship in creativity. In this context "to make" has the meaning of creating novelty, surfacing one's creative potentialities. Learning to live together does not mean only to comply with the norms, rules, tolerating differences, but he stresses that in order for the norms of a collective to be respected, they must be validated by the interior experience of each being. Learning to be appears to be an enigma, we know how to exist, but how can we learn to be? "Learning to be also means learning to know and to respect that which joins the Subject and Object" (Nicolescu, 2002, p.123).

Figure 3.1: Pillars of education according to Nicolescu

"We could say that the transdisciplinary educative process is the catalyst for the emergence of a new, more mature transdisciplinary self, couched in the transdisciplinary methodology" (Gibbs, 2015, p.21).

Technology reshapes the co-construction of knowledge, the information revolution led to the theory of connectivism. He describes different knowledge types as

- knowing about (news, concepts of a discipline, etc.)
- knowing to do (drive a car, manage a project, solve a mathematical problem, etc.)
- knowing to be (to be an ethical person, to be a doctor, to feel, etc.)
- knowing where (find knowledge when needed, web search, database search, in organization, knowledgeable people)
- knowing to transform (to align with reality, to recombine, to innovate, to think). (Siemens, 2006, pp.10-11)

Figure 3.2: Knowledge types according to Siemens

One can draw similarities between the Nicolescuian approach to education and Siemens' categorization of knowledge types. Although Nicolescu describes learning and Siemens talks about the knowledge types, but the similarities in the "learning what" – "knowing about", "learning to do" – "knowing to do", "learning to be" – "knowing to be" have to be acknowledged. Differences to be noted are in the "knowing where" and "knowing to transform". According to Nicolescu "learning to do" is how we can learn the ways to create novelty, innovate. Siemens considers novelty creation as part of knowing to transform. Despite of similarities and the differences of Nicolescuian approach to education and Siemens's categorization of knowledge types today the information revolution opened new ways to "knowing where". Connectivism theory does not consider learning as a product, but rather as a continuous process. "We no longer seek to possess all needed knowledge personally. We must store it in our friends or within technology" (Siemens, 2006, p.52). As Charles Handy said: "In life and in work, we learn things when we need them, not before we need them"(Handy, 1998, p.217).

Informal learning is focused on knowing, corresponding to the ability to interpret knowledge. The ever increasing of freely available, accessible information leads to the decrease of the reliability of the knowledge. "New knowledge is doubtful, as it is not yet verified" (Baracskai, Velencei and Dörfler, 2005a). This is acceptable in informal learning, where the question is not if the new knowledge is true or false (binary logic), but whether someone can interpret it here and there (Velencei, 2014). "The informal learning of tomorrow will be located on the other end of the continuum, in the realm of the Shallows, where it is acceptable to know a little about many things. Experiential learners engaging in such informal learning will only be learning what they are passionate about, therefore I can call my learners Passionate Learners. If formal learning is a "walk through the zoo" where zookeepers show the paved way, the increasingly informal and social learning is a "walk through the savannah"" (Velencei, 2014). Nicholas Carr (2011) in his book "The Shallows: What the Internet is Doing to Our Brains" describes how the achievements of the information technology distracts us from focusing on one thing at a time. The overload of the information available on the World Wide Web, also the structure of the content (hyperlinks, videos, pictures, etc.) makes us to continually browse and quick-scan the contents. Cyber-professionals are passionate learners and at the same time Shallows (Carr, 2011). They are looking for knowledge in their life, work when they need (know when) and what they need (know what). Their informal learning (Velencei, 2014) process is characterized by transdisciplinary approach in the Nicolescuian context. Specific to one's social and digital

reality the “know-how” is supplemented with the “know-where-to-look” as well as with ”know-how-to-interpret” (Velencei, 2014).

For cyber-farmers, cyber-professionals the internet is a learning ecology, where one can learn from experts informally, formally or in communities In the learning refreshing once the new knowledge is identified the following phases of contextualization can be considered: validate the consistency of the accessible knowledge, validate the relevance of the consistent knowledge followed by the validation of the applicability of the relevant (Velencei *et al.*, 2016).

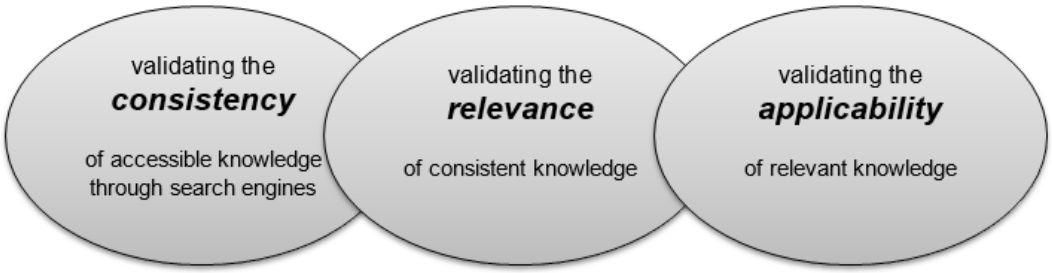


Figure 3.3: Learning process model for cyber-professionals

In the global village knowledge flows real-time, global conversations happen in “cyber–space-time” (Nicolescu, 2002), new information changes markets in minutes. Is the new knowledge consistent, are there any contradictions, connections to the existing knowledge? We must develop skills to filter information that is consistent. The validation of the consistency of the accessible knowledge relates to the internal validity. In the phase of validating the relevance the consistent knowledge has to be connected to the problem at hand, to the decision. Relevance is the requirement for the adoption or use, if something is not relevant it will not be used (Siemens, 2006). Validating the relevance of the consistent knowledge relates to the notion of construct validity. When one experiences knowledge in application leaves the theoretical understanding of knowledge. The relevant knowledge is examined with reference to the problem, to the decision alternatives. Is the relevant knowledge applicable locally? Validating the applicability of the relevant knowledge relates to external validity (Velencei, Baracskai, Dörfler, Stierand, 2016).

3.3. Conclusion

Today we live in the era of abundance, not only in terms of goods, services but also the accessible information over in the internet. Cyber-professionals of the Do-It-Yourself economy, who use the internet as a learning ecology look for new knowledge when they need them, they look for knowledge which is applicable locally for the problem, decision at

hand. Competing in a global environment, but also facing local challenges has to be considered in today's knowledge refreshing. The learning model for the cyber-professionals described in this paper can be considered as a starting point to be further elaborated with knowledge based expert system.

4. Cyber DIY: Learner expectation patterns in new knowledge selection and validation

Varga, E[1]. and Baracskai, Z[2]. (2018) 'Cyber DIY: Learner expectation patterns in new knowledge', in Van der Meer, H., Enthoven, G., and Schiuma, G. (eds) *Proceedings IFKAD 2018*. Delft, Netherlands, pp. 1866–1874.

Author information (for the time when the research was conducted):

[1]Széchenyi University, Győr, Hungary

[2]Széchenyi University, Győr, Hungary

Structured Abstract

Purpose – The aim of this paper is to explore and map the role and characteristics of narratives in the learning process for "organic cyber farmers" using the internet as a learning ecology. Though the economy of today gives much more autonomous freedom and possibility for personal projects and activity, it is impossible to experience everything one would need directly. Rather, one must leverage connections and use the tools of information technology to find new knowledge, experience. Our species has, as far as we know, always used narratives, stories and myths to make sense of the world and to organize and transfer information

Design/methodology/approach – The first-hand experiential stories identified through the knowledge acquisition process were modelled with a Knowledge Based Expert System. Using Case Based Reasoning followed by Reductive Reasoning functionality, the most defining and informative learner expectations can be identified with the help of the KBS algorithms. Patterns can be built using "if...then" rules, which become a model of the reasoning process of the organic cyber farmer when validating relevant knowledge.

Originality/value –The presented case study provides an insight to the validation process of the relevant knowledge from narratological aspect by identifying, based on cases gathered, those attributes which make a narrative and knowledge element relevant. Further research by engaging several organic cyber farmers or potentially other DIYers in the study is suggested to test the robustness of the model built with the KBS.

Practical implications – The DIY economy means that more and more people are turning back to their local communities, sourcing goods and services locally, which opens-up potential for today's organic cyber farmers. The presented model highlights those attributes that are the most informative in a narrative and knowledge element accessed over the internet

when looking for organic farming practices. Research in ecological economics argue the need of reinforcing transdisciplinary research in organic agriculture, they highlight the interdependency of knowledge in science and society, the co-production of knowledge between the actors of this area of agriculture: science- society and policy. The learning from this initial model can be leveraged in the design and delivery of content by professionals or farmers regarding organic farming practices, thus re-enabling the transdisciplinary co-production of knowledge between science, practitioners and policy makers in organic agriculture.

Keywords – learning in digital age, case-based reasoning, DIY economy

Paper type – Academic Research Paper

Authors' short bio

Prof. Zoltán Baracskai - is an Associate Professor at the Széchenyi István University, Győr, Hungary and holds part-time and visiting professorial positions at several universities in Hungary, Croatia, Bosnia and Romania. His interest is focused on the mindset of the decision maker. He has written 16 books and 100+ conference and journal papers on these topics. Zoltán and his team developed the Doctus Knowledge Based System shell to support executive decision takers. He conducted 100+ consultancy projects where decision support was provided using Doctus KBS and worked on many of these projects as a knowledge engineer. Over the last few decades Zoltán designed a dozen postgraduate schools and degree courses.

Enikő Varga - joined the Doctoral School of Regional Sciences and Business Administration, Széchenyi University, Győr, Hungary in 2016. She holds an MBA and an MSc. in Electrical Engineering. During the several years of experience in Information Technology she had the opportunity to participate in many global projects as project leader or subject matter expert.

4.1. Introduction

Fox (2014) describes three different waves of Do It Yourself (DIY). The current DIY paradigm is characterized by people designing, making, selling goods covering a very broad area. In the first wave of DIY, so called subsistence DIY, people grow what they eat, make what they wear, what they need. In the second wave of DIY (industrial DIY) people buy kits and assemble their furniture (IKEA furniture). The third wave of DIY, leveraging the digital revolution, enables people not only to design, but make and/or sell their goods using the internet. Several websites assist, enable DIYers to design their own products (Shapeways, Thingiverse), make and/or sell the goods (Shapeways, Kraftwurx, Etsy), facilitate crowd

funding of the DIY projects (Kickstarter, Crowdcube) or alternatively enable learning, knowledge sharing, an example of such a portal is Craftsy, the so – called "Craft University".

Norton et al. (2012) studied the IKEA effect – the increased valuation of the self-made products, they found that labor increases valuation for "do-it-yourselfers" as well as novices. Research found that our constructions, creations, products are more valuable than items which are identical but constructed by someone else. Research on the IKEA effect suggested different explanations of the phenomena, such as signal of competence (Norton et al., 2012), effort justification (Norton et al., 2012) and ownership (Kanngiesser & Hood, 2014). The literature review on DIYers and IKEA effect underlies the phenomena we are witnessing, namely that DIY paradigm is not only penetrating in the areas driven by manufacturers (IKEA- where one is required to assemble the furniture), but in several other areas, professions as well. Our findings in the literature review process suggests that leveraging the potentials of the internet as a learning ecology is becoming more and more a topic for the researchers as well. As an example, searching the ScienceDirect portal for the keyword "YouTube" the number of articles listed is increasing over time with focus on information gathering, knowledge refreshing.

We live in a connected world, where according to Siemens (2006) a highly connected network must see learning as a continuous, flowing process where one does not seek to possess all needed knowledge personally, but leverages the connections, personal network, digital social network and IT technology to access whatever is needed, when it is needed. The aim of the current paper is to explore the use of internet as a learning ecology for the organic cyber farmer as a DIY learner, considering the narratological aspects of the new knowledge validation process.

4.2. DIY narratives

The already discussed DIY waves can be described by different learning methods, processes. On the other hand, the role and the nature of the narratives in the knowledge refreshing process in the different DIY waves not only changed over time, but were complemented by new types as well. The first wave of DIY has been characterized mainly by master-apprentice relationships, the experience in certain professions (ex. farming) was gained through imitation, learning by doing. According to the five-stage skill acquisition model (Dreyfus- Dreyfus, 1980), the practitioner goes through the following stages: novice, competence, proficiency, expertise and mastery. In this wave of DIY narratives are mostly explicit in form of customs, beliefs, myths, tales. The second wave of DIY or so-called industrial DIY is characterized by formal learning, experience for example in arts and crafts

is gained at school as part of the undergraduate curriculum. The third wave of DIY is characterized by leveraging the internet not only as a learning ecology, but to design, make and sell the products. Using the internet as a learning ecology do-it-yourselfers are faced with the challenges of validation of the consistency, relevancy and applicability of the information, knowledge, experience found on the web. Platforms like Crafts, which provide on-line courses for DIYers in several professions through video courses enable novices to experience different professions. The relationship between the novice and the virtual master is a unidirectional relationship, different from the master-apprentice relationship characteristic in the first wave of DIY.

Bruner (1986) argues that we organize our experiences and our memory of events, happenings mainly in form of narratives, stories, myths, reasons for doing or not doing. In Bruner's view knowledge is distributed beyond one's head to include friends, people to whom one has access to, notes taken, books one has on one's shelves. He proposes two ways of knowing, such as "paradigmatic knowing", which uses reasoned analysis, logical proof and empirical observations and "narrative knowledge" created, constructed through stories told about experiences and meaning created from these experiences. "Narrative knowledge" is used to help sense-making of the complexity of human lives. Von Krogh et al. (2000) point out that narrative knowledge is the main bearer of knowledge in contemporary societies, narratives are a common way of communication, people tell stories to entertain, to teach, learn, ask for interpretation and to give one. Denning (2005) suggests that knowledge-sharing stories should include explanation as well as great contextual details, he suggests that stories should have a well-defined beginning, a process of series of actions and an end which summarizes the results. Brophy (2009) claims that narratives help one to "enter" the experiences of other people, thus enable to compare one's own understanding with that of others, hence enable to gain a deeper insight on the different actions to be taken in given circumstances. Brown et al.(2005) in their work "Storytelling in organizations" use the following metaphor to describe practice, experience and narratives in knowledge management. „It turns out that knowledge is partly tacit and it's social and it resides in practice. Practice provides the rails that knowledge travels on, and narrative is the vehicle that runs on those rails. That's why narrative plays an unexpectedly large role in all aspects of knowledge in an organization." (Brown et al., 2005, pp.54). They argue that "understanding" is basically socially constructed with others, therefore one "knows" something when one can integrate into one's conceptual framework, thinking and behavior and actions. "…most what we know today has been learned by talking things over with other

people of working together on shared problem solving. So, we are constructing understanding all the time, in conversation or through narratives. We are personalizing it through telling stories, and in so doing we are constructing it for ourselves." (Brown et al., 2005, pp.64).

4.3. Approach to modelling DIYer's mindset

In the current paper we present a pilot research aimed to identify, synthesize the notions, concepts for a future more elaborate research on DIY learning patterns. We limited the research at this stage of the process to organic farming, namely to DIY aquaponics, therefore we present a knowledge base built with Doctus Knowledge Based system (www.doctuskbs.com) modelling the search for new knowledge on DIY aquaponics for an organic cyber farmer in Hungary. Doctus Knowledge based System (KBS) (Baracskai et al., 2005) supports three types of reasoning, namely Case Based Reasoning (CBR) or inductive reasoning, Rule Based Reasoning (RB) or deductive reasoning and Reductive Reasoning (RR) which always follows Case Based Reasoning aimed to describe the decision at hand with the smallest number of attributes. In the current study Case Based Reasoning (CBR) and Reductive Reasoning (RR) are used to build the model of the mindset of the organic cyber farmer in the search process for new knowledge over the internet.

As a first step 26 attributes and their values were identified to describe the new DIY knowledge acquisition process followed by the modelling of the 18 cases gathered. Example of attributes and their values defined during the knowledge engineering process: conflict in story (harmony, partial harmony, disharmony), subtext of story/atmosphere (monotonous, monotonous with interesting hints, rambler, dynamic), ranking (somewhat popular, very popular, top of the list), balance of two realities/own and narrator (very different, somewhat close, close), narrator (homodiegetic narrator, heterodiegetic narrator, interview). Using Case Based Reasoning of Doctus KBS shell the most informative attributes, learner expectations were identified by considering two different attributes as benchmarks. Doctus KBS Reductive Reasoning functionality was used to generate a new knowledge base using the identified most informative attributes, thus reflecting the learner's expectation with "if… then" rules. The most informative attributes in this sense describe the identified new knowledge, experience from narratological point of view.

4.4. Conceptual model of new knowledge selection

The knowledge base built during the knowledge engineering process through the identification of the attributes and the cases is a representation of the organic cyber farmer's

thinking process, mindset during the search for DIY aquaponics practices on the internet. By building the knowledge base we create a conceptual model. At this stage of the process Doctus KBS is a presentation tool of the farmer's reasoning. We can say that those interested in the phenomenon (namely how to find relevant DIY knowledge on the internet) can look at this conceptual model and judge if the model is relevant for their phenomena at hand. We also intend to use the results of the current pilot study for future research in DIY learner's expectations, mindset. Doctus KBS Reductive Reasoning is designed to identify based on the most informative attributes those rules which describe the decision maker's mindset, thinking pattern. Doctus KBS shells allows to select different attributes as "benchmarks", in other words as attributes representing the phenomena, decision at hand.

In building of our first conceptual model we considered as benchmark the attribute "Narratives on YouTube (Aquaponics)". Using Doctus KBS Case Based Reasoning the most informative attributes identified with this setting are displayed on Figure 4.1. This is one of the many patterns which describe the knowledge, reasoning of the decision taker, in our case the organic cyber farmer when looking for new DIY knowledge on the web. One can notice that out of the 26 attributes identified, the thinking process, mindset of the decision taker can be described with only 5. This knowledge is in the long-term memory of the decision taker, but the 7±2 capacity of the working memory does not allow to explicitly formulate all of them. Therefore, we can say that the model with the attributes, expectations displayed on Figure 4.1. is one of those patterns which can represent the decision taker's working memory at a given moment, situation.

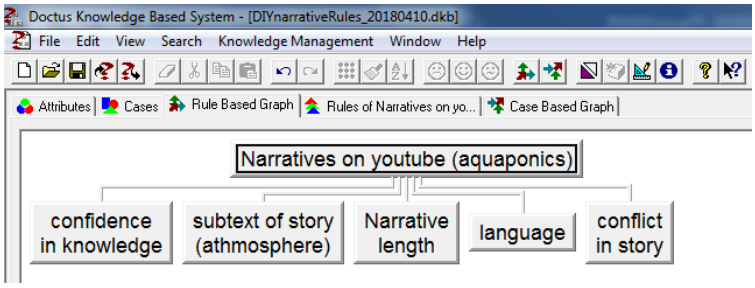
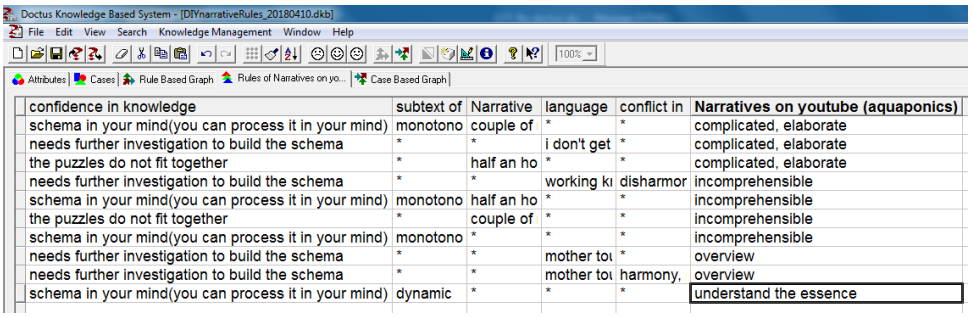


Figure 4.1: Case Based Reasoning

Reductive Reasoning functionality of Doctus KBS always follows CBR used to generate a new knowledge base with the reduced number of attributes. In the current case we selected those 7±2 attributes which describe the decision taker's reasoning based on highest informativity. Reductive Reasoning identifies the if-then rules between the attributes as shown on Figure 4.2.



confidence in knowledge	subtext of	Narrative	language	conflict in	Narratives on youtube (aquaponics)
schema in your mind(you can process it in your mind)	monotono	couple of	*	*	complicated, elaborate
needs further investigation to build the schema	*	*	i don't get	*	complicated, elaborate
the puzzles do not fit together	*	half an ho	*	*	complicated, elaborate
needs further investigation to build the schema	*	*	working ki	disharmor	incomprehensible
schema in your mind(you can process it in your mind)	monotono	half an ho	*	*	incomprehensible
the puzzles do not fit together	*	couple of	*	*	incomprehensible
schema in your mind(you can process it in your mind)	monotono	*	*	*	incomprehensible
needs further investigation to build the schema	*	*	mother tou	*	overview
needs further investigation to build the schema	*	*	mother tou	harmony,	overview
schema in your mind(you can process it in your mind)	dynamic	*	*	*	understand the essence

Figure 4.2: Reductive reasoning - rules of "Narratives on YouTube(Aquaponics)"

We can say that only one complex rule defines the “understand the essence” value of the attribute “Narratives on YouTube(aquaponics), in other words those narratives which lead to the understanding of the essence according to the organic farmer’s mindset. This complex rule can be read as follows:

if confidence in knowledge is “*schema in your mind*”
and **if** subtext of story/atmosphere is “*dynamic*”
and **if** narrative length is “*don’t care*”
and **if** language is “*don’t care*”
then narratives on YouTube (aquaponics) is “*understand the essence*”.

This complex rule simplifies the representation of the decision taker’s reasoning; therefore, the reduced knowledge base is a new conceptual model of the organic farmer’s thinking pattern. Doctus KBS can demonstrate that the same results, output can be obtained with the reduced number of attributes than with the originally identified knowledge base.

Alternatively, as a next step of the study we considered “Previous experience” as the benchmark attribute. In this situation we got a new set of informative attributes, which describe the knowledge base, the thinking pattern in a simpler way. As shown on Figure 4.3. the decision taker’s knowledge in his/her long-term memory can be described with only two attributes, namely with “balance of two realities” and “language”.

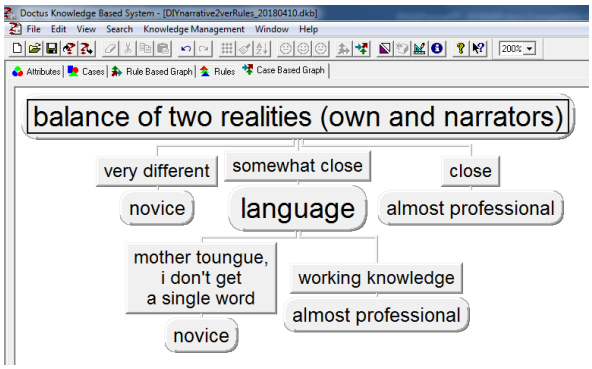
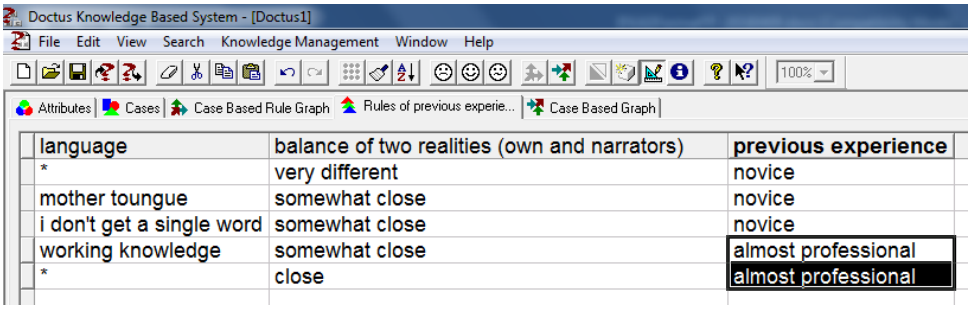


Figure 4.3: Case Based Reasoning "Previous experience"

Using Reductive Reasoning we can define the rules for the attribute "Previous experience" with the two most informative attributes as shown on Figure 4.4.



language	balance of two realities (own and narrators)	previous experience
*	very different	novice
mother toungue	somewhat close	novice
i don't get a single word	somewhat close	novice
working knowledge	somewhat close	almost professional
*	close	almost professional

Figure 4.4: Reductive Reasoning - Rules of "Previous experience"

In this case we can see that for the novice it is indifferent what is the language of the story, what matters the most is that the "balance of two realities (own and narrators)" to be very different. On the other hand, we can also say that for someone with previous experience "almost professional" language is not relevant, but the "balance of two realities (own and narrator)" must be close. This is a serious disclaimer of those conceptions, ideas according to which the extreme values of the phenomena define the attribute's extreme values. Our current research terminates with the qualitative validation of the resulted patterns from the Doctus KBS, which can vary based on the selected benchmark as demonstrated above, but we conclude our paper with the presented two conceptual models.

4.5. Conclusions

It is unquestionable that the DIY economy is here, people are looking for more affordable ways of living, care more and more about sustainability, and hence choose DIY not only when they are forced to (printing an air-ticket, assembling furniture) but for self-fulfillment, for pride and joy. Organic farmers can be considered as active participants of the DIY economy from many perspectives, one being knowledge refreshing, leveraging the means of technology for knowledge refreshing. This leads to the question of content building,

publishing regarding organic farming practices on the internet, not only by farmers, but also by researches and policy makers (Aeberhard et al., 2009). Our conceptual model, although limited in scope showed that if the “balance of two realities (own and narrator)” is “close” then there is no language barrier in knowledge sharing. Which leads us to the notion, idea that if scientist’s and practitioner’s levels of reality are close, then visualization of the knowledge can be one of the means to spread DIY ideas, new practices in organic farming without or limited language barriers. To communicate along visualized knowledge scientist, policy makers should step out from the boundaries of their original disciplines, go-beyond their disciplines. This means that everyone must have a deep understanding of their original discipline, from which a meta knowledge is formed, communicated, understood through metaphor or visualization.

“What we refer to with the `meta-' is a very high level of abstraction, something that we can call meta-level. At a high level of abstraction, where the details of reality dissolve, such knowledge loses direct touch with reality. However, it can be `concretized' by zooming into reality, and in this `concretization' the meta-knowledge can take radically different forms. For instance, it may take the form of some knowledge with reference to one reality and some different knowledge with reference to some other reality. For this reason, meta-knowledge does not consist of concepts but of meta-concepts, which are extremely high-density essences of many concepts.”(Baracskai, Dörfler, 2017, pp.74).

As we concluded Doctus KBS supports pattern recognition, identification, presentation but decision taker’s reasoning cannot be replaced with expert systems, artificial intelligence, we need the decision taker’s insight to identify, validate which pattern is relevant. Although the knowledge base was built with limited scope the learning from the presented model can be leveraged in future qualitative research in the area of transdisciplinary knowledge co-production between different parties not only in organic agriculture.

5. Cyber Farmer Informal Learning Through YouTube

Varga, E[1]. and Baracskai, Z[2]. (2020b) 'Cyber Farmer Informal Learning Through YouTube', in *Proceedings INTED 2020, 14th International Technology, Education and Development Conference*. Valencia, Spain, pp. 7560–7566. doi: doi: 10.21125/inted.2020.2029.

Author information (for the time when the research was conducted):

[1]Széchenyi University, Győr, Hungary

[2]Széchenyi University, Győr, Hungary

Abstract

Research highlights that nowadays new peasants or newcomers to farming not only change lifestyles but professions as well. They are well-educated people, though not in farming. To understand their ways of informal learning we initiated a study. We started by exploring their sources for knowledge increase. It was revealed that they use the internet as a learning ecology and one of the most preferred sources of learning content is YouTube. From here originates the concept of Cyber Farmer and the research question for the current study: understanding which YouTube videos they prefer, consider the most valuable.

Ten years ago, Chris Anderson published "The Long Tail: Why the future of business is selling less of more" and soon after followed the "Free: The future of radical price". Before long Nicolas Carr came out with two books: "The Shallows - What the internet is doing to our brains" and "The glass cage: how our computers are changing us". The concepts from these books consist the pillars of the conceptual framework for our research. The digital era is determined by the freely available tools and platforms used by the passionate amateurs for content production. When sharing their experiences these authors are not mindful of knowledge construction. Cyber Farmers browse YouTube for freely available contents published by shallows, they resemble with the shallow knowledge believers.

With Case Based Reasoning (CBR) algorithm we examined informal learning cases using for cyber farmers. We identified the most relevant attributes of the learning content based on the observed cases. We found that different content satisfies the beginner and the advanced learner. As a commonality it was revealed that those contents are acceptable by the Cyber Farmers in which the passionate amateur presents an operation. They consider a content trustworthy when the content maker displays the competency to perform the presented operation. We also suggest that based on these YouTube videos informal learners

will construct their understanding of the operation. However, they cannot formulate the aspirations which an informal learning content should satisfy. Conforming with professional content producer's requirements we identified several supplementary attributes to extend the conceptual model, based on which YouTube videos for informal learning by Cyber Farmers should be validated.

Keywords: Informal learning, shallow knowledge, YouTube content.

5.1. Introduction

Counterurbanization, moving to rural from urban areas is approached by researchers from different perspectives, Mitchell [1] argues that the concept is too broad to cover its depth of the meaning. She concludes that counterurbanization refers to three types of migration: ex-urbanization, displaced- urbanization and anti-urbanization. Ex-urbanization consists of the movement of individuals from the city who perceive a limited dream of the countryside. Displaced-urbanization consists of individuals or families who search for job opportunities in the rural environment attracted by the land and property prices. Anti-urbanization consists of individuals who reject the urban lifestyle. Anti-urbanization in literature was identified by (i.) "back to the land movement" (ii) relocation to enhance one's quality of life (iii.) retirement migration [1] [2] [3]. Milone and Ventura [4] talk about the appearance of a new farmer generation in Italy, they found that often people with non-agrarian degrees create land-based enterprises, whom they call "new peasants". The phenomena is observed widely [5][6] although there is no strict record of the population who moves to rural area, changes lifestyle and/or profession to become newcomer to farming. The newcomers to farming in many cases are well-educated people, but not in farming. In our study to understand their ways and sources of knowledge increase we found that they use the internet as a learning ecology. From here originates the concept of Cyber Farmer.

In the antiquity one can find 'Artes Vulgares' (latin for common arts) or 'Artes Serviles' (latin for servile arts) as a juxtaposition to 'Artes Liberales' (latin for liberal arts). 'Artes Liberales' signified knowledge that has no end other than itself. 'Artes Serviles' naming suggest inferiority, indicting knowledge needed to perform work. Due to the negative connotations of vulgar and servile, they were later renamed to 'Artes Mechanicae' (latin for mechanical arts, practical arts). In the 9th century John Scotus Eriugena divided 'Artes Mechanicae' into 'agricultura' (agriculture), 'architectura' (architecture), 'coquinaria' (cooking), 'mercatura' (trade), 'metallaria' (blacksmithing), 'militia' and 'venatoria' (warfare and hunting) and 'vestiaria' (tailoring/weaving). In the 12th century Hugh of St. Victor replaced 'agriculture', 'architectura', 'coquinaria' and 'mercatura' with navigation,

medicine and theatrical arts [7]. Today the number of disciplines it is considered to be around 8000 [8].

In formal education at bachelor level students specialize for the first time in a particular discipline. The graduates do not have a balanced knowledge they had at the end of secondary school, rather they have deep understanding of certain domains in disciplines related to their profession. This is the reason engineers cannot typically make sense any longer of what a sociology professor would say, but some of them will appreciate arts, paintings, music or be interested in history. In formal education the students acquire a web of concepts of the chosen discipline, concepts from the textbooks of the given discipline. In a well-designed undergraduate education, the students are able to develop the omitted concepts. This is possible if the web of concepts acquired by the students is dense and covers the big picture of the discipline. One can conclude that the undergraduate education is mainly mono-disciplinary. Considering master degree courses one can find that they are either mono-disciplinary or interdisciplinary. The emphasis in master degree courses shifts from the introduction of new concepts towards the relationships between the concepts and the big picture. However, one can argue that master coursers should be driven by the big picture of the discipline or problem area, not by concepts. In a well-designed masters course the students increase their understanding of the big picture of the discipline, without necessarily being conscious of the new concepts, details they have learned. However, this also means, that textbooks can be of limited help in these studies.

Beyond obtaining degrees from formal education professionals also engage in knowledge refreshing. Some of them are formal (i.e. training, university lectures, classroom-based courses), however most of the knowledge refreshing takes place in informal settings. It is not surprising that a parallel "world" appeared, distant from the formal education, namely the informal learning. In the formal education the authenticity of the teacher is guaranteed by the institution. If one would question this than the fiction of legitimacy would be destroyed. Academic language is not the "mother tongue" of the students and practitioners, without which formal education would cease to exist. Every reference to "praxis" creates the appearance that the teacher is involved in it. This is a forced approach, which is extraneous to formal education, therefore unreal. If one tries to take a university lecture outside of the university walls, one can immediately notice that it is superfluous for the praxis. One cannot claim that the university lectures are needles, on contrary the are indispensable, since the students acquire the big picture and most importantly, they learn to learn. Our research considers those practitioners who are "over" a formal higher education. They urgently need

those operations of ‘Artes Mechanicae’ in another genre which are required ‘here and now’. Informal learning [9] in this sense can be considered more trans-functional, trans-disciplinary, which satisfies the curiosity of the learners ‘there and then’. Informal learning content can be considered more loosely structured, adapts in time, in space and in tools to the learner’s needs. The informal learning process is highly non-linear, ruled by the learner’s previous knowledge and preferences. Informal learners engage in learning what they are passionate about. We consider informal learning as the other end of the continuum, in the realm of shallows, where it is acceptable to know little about many things.

One can argue that formal learning is focused on learning, while informal learning is focused on knowing, to be able to interpret knowledge. The abundance of freely available knowledge raises the question of the reliability of knowledge. When one needs something done, one looks at experienced people to get the job done. The Cyber Farmers when they are involved in an operation of ‘Artes Mechanicae’ they believe in the model of the old craftsman. Unquestionably, this model changed as well. The “watch the master” also changed, one can argue that nowadays it turned into “watch the Artes Mechanicae’s practitioner”.

This type of informal learning fits the requirement of ‘bootstrapping’[10][11]. The Cyber Farmers need to ‘bootstrap’ in their problem-solving process, consuming relevant meta-knowledge from a variety of disciplines. Therefore, the research question for the current study is to understand which content they prefer, consider the most valuable in their quest for new knowledge.

5.2. Methodology of our pilot study

5.2.1. Conceptual model

Our study is based on the following concepts of the digital age: digital wisdom, free tools and platforms, passionate amateur, shallow knowledge and balancing human-computer interaction.

Prensky [12] [13] introduced the concepts of digital natives and digital immigrants, to describe the differences between young and elderly people in their use of information technology. As we move into the 21st century the distinction between the digital natives and immigrants becomes less relevant. Therefore, it is more pertinent to consider digital wisdom instead. Digital technology enables us to become not only smarter but wiser, to access cognitive power beyond our innate capacity. Although we have to consider the wisdom in the prudent use of technology to enhance our capabilities. According to Prensky [14] the brain of future wisdom seekers will be fundamentally different in organization and structure

than the brains of today. Digital tools available today already enhance our cognitive capabilities, like our memory. On the other hand, decision-making tools enhance judgment through data gathering. Without considering all the different definitions of wisdom in line with Prensky[14], we consider wisdom as the ability to find practical, creative, contextually appropriate and emotionally satisfying solutions to complicated human problems. Homo sapiens digital in this sense is characterized by accepting the digital enhancements as an integral fact of human existence and is digitally wise. Digitally wise is meant in the way of accessing the digital enhancements in complementing innate abilities and use of these enhancements. Digital wisdom can be and must be learnt and thought. Digitally wise know how to use particular technologies to enhance thinking and understanding.

More than ten years ago Chris Anderson published the book "The Long Tail: Why the future of business is selling less of more" [15]. Soon after another famous book was published by the same author "Free: The future of radical price" [16]. By applying the long tail theory to the software business, Anderson highlights that the theory applies well. Similarly, to other industries there is a head a tail of software. Microsoft being on one end and millions of programmers throughout the world on the other. One can think of the classic model of encyclopaedia as the head and Wikipedia, the user-created model as being on the tail. There are more entries in Wikipedia than no other encyclopaedia attempts to include. Wikipedia authors are enthusiastic, motivated and passionate about the subject they edit. The world of "peer production" enabled thousands of passionate amateurs to become content providers. This was possible by freely available tools and platforms to create content. This holds for learning content production as well. When the professional amateurs share their experience on the Internet, they are not mindful of knowledge construction. Before long Nicolas Carr also published two books: "The Shallows – What the internet is doing to our brains" [17] and "The glass cage: how are computers changing us" [18]. Carr describes how the achievements of the information technology distract us from focusing on one single thing at a time, to sustain our concentration over a longer period of time. Information overload urges us to continuously quick-scan contents, makes us shallows. In this sense we consider the Cyber Farmers shallow knowledge believers, they browse the internet for freely available contents published by passionate amateurs.

5.2.2. Case-Based Reasoning

In the current pilot study we used Case-Based Reasoning (CBR) [19]. CBR in practice is used when the domain expert is experienced enough (a few dozen cases with evaluations) and can articulate attributes of the decision but cannot define the importance, nor the rules

among them. This experience can be used to reveal the rules using induction, which is the symbolic version of CBR. When using CBR the first step is to identify the attributes and their values. This is followed by the case acquisition including the outcome for each of them. Cases in this sense can be anything that can be described with the identified attributes, by assigning one value of every attribute to each individual case. Different attributes can be selected as benchmark attributes. A benchmark attribute is the attribute chosen to understand the phenomenon. The CBR discovers the rules between the attributes which describe the cases from the expert's experience. The result is the Case-Based Graph, which describes the rules induced from the cases. To build the Case- Based Graph the attributes are taken one-by-one to form subsets according to their values. Their strength in making order is measured by an entropy-gain (informativity) calculating algorithm(ID3) [20]. The most informative attribute is chosen as the root of the graph and the first level subsets are formed according to its values. The subsets formed in this way are further divided by using the same algorithm until all subsets are homogeneous by the benchmark attribute's values. When a homogeneous subset is formed it is not further divided, it becomes the leaf of the graph. From the results of the induction the important aspects of the decision can be determined using reduction, by extracting the rules from the Case-Based- Graph.

5.3. Results

The knowledge acquisition process for the pilot study consisted of identification of the attributes and their values with Cyber Farmers in South-East of Hungary. As there is no validated questionnaire available to understand the quest for knowledge by Cyber Farmers, the pilot study revealed those questions which correlate mostly with the expected results. The pilot study was performed by following the steps: knowledge acquisition process to identify the aspirations and their values, identification of the cases, CBR with reductive reasoning, validation of the results with the Cyber Farmers. Through the knowledge acquisition process the following attributes were identified: relevancy, consistency, applicability, who recommends it, where is it, form, length of content, type of content, feedback (comments), own experience, implementation difficulty, implementation help needed, novelty, search time. After the attribute identification, the next step was to assign values to them. Without detailing all the different values, the following examples demonstrate the thought process of the Cyber Farmers involved: i.) relevancy attribute's values: not relevant, relevant with conditions, this is it; ii.) who recommends it attribute's values: unknown, friend, scientist, guru; iii.) type of content attribute's values: show an example, show the results, from beginning to end, do-it-yourself. Following the attribute

identification, value assignment 38 cases were identified. In Figure 5.1. the result of the CBR is displayed considering relevancy as the benchmark attribute.

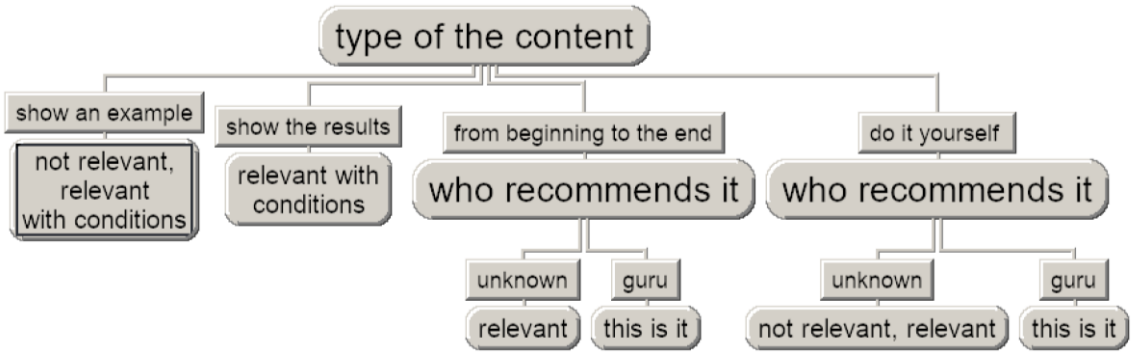


Figure 5.1: Case Based Graph

The Case-Based-Graph can be used to read the "if-then" rules between the attributes from the root of the graph towards each leaf. Couple of examples would read as follows:

i.) if type of content is "show an example" then relevancy is either "not relevant" or "relevant with conditions".

ii.) if type of content is "show the results" then relevancy is "relevant with conditions".

iii.) if type of content' is "from beginning to the end" and who recommends it is "guru" then relevancy is "this is it".

iv.) if type of content is "do-it-yourself" and who recommends it is "guru" then relevancy is "this is it".

With reductive reasoning the rules from the Case-Based-Graph can be induced. The rules for relevancy in the current pilot therefore are represented in tabular form as visible in Figure 5.2.

type of the content	who recomm	Relevancy
do it yourself	unknown	not rel relevar
show an example	*	no relevant w
show the results	*	relevant with c
from beginning to the end	unknown	relevant
from beginning to the end	guru	this is it
do it yourself	guru	this is it

Figure 5.2: Rules for relevancy attribute

From the results of the reductive reasoning it is visible that based on the examined cases a content is considered "this is it" in terms of relevancy when the type of content is either "do-it-yourself" or "from beginning to the end" and is recommended by the "guru". The current study has a well visible and hidden results. The rules from the knowledgebase represent the reasoning of the Cyber Farmers in their search for relevant content on the internet. Through

this knowledge acquisition process, the learner's aspirations were identified in their quest for knowledge or in other words in their "experience mining" process.

Donald Schön [21] introduced the concept of reflective practitioner. As a first step one has to look back at one's experience and what one learned from it, called reflection in action. By reflecting more than once on the same experience, one's interpretation changes, one learns new things every time. By improving, becoming better and better in what one is doing as well as reflecting on it one gets closer and closer, finally one is able to reflect on the experience as one is experiencing it. To achieve competence, one needs both education and reflective experience. There are two type of self-confidence, one which is originated from personality and the other as a result of competence. When someone is considered competent, that person undertakes knowledgeable action in a given situation, delivers a certain level of performance. Therefore, we can say that competent does not mean simply knowledgeable but means to put knowledge into action in a particular situation. Competence is not an entity, rather the dynamic relationship between knowledge, knower and context. Knowing has to be rooted in experience, education does not lead to competence in itself. By applying knowledge acquired through education in real life context, reflecting on the experience, iteratively moving between learning and experiencing is the process to achieve competence. According to Denning [22] [23] we remember stories better than facts. Bruner [24] concludes that we construct our memories in stories. Therefore, we argue that content creators should be good storytellers. In todays, digital era content creators have to have an understanding of the notion of shallows, have to understand the basic storyline requirements, they need to build trust to enable co-creation and be capable to leverage the freely available tools and platforms in content creation.

5.4. Conclusions

In-line with the long-tail theory we can consider TED talks as the head of the tail. Yearly 1 billion learners. Is it too much or too scarce? If we start our argument by claiming that TED talks are not mandatory to be watched like a mandatory subject in formal education, then we can consider it numerous. This type of informal learning was invented for those non-professionals who are curious. One of the most popular TED talks is "School kills creativity" by Sir Ken Robinson [25], viewed by more than 63 million. The contrary was experienced as well: educators' contempt and consider frivolous. It is not hard to guess that a vanishing percent of the viewers are educators. No-one objects the statement that there is a better speech than J. F. Kennedy's moon-landing. It lasted seventeen and half minutes. Today, with half century later, seventeen minutes is too much or too scarce? It depends. We contend that

the ppt. era is over. Nobody is interested in texts and enumerations called digital curriculum. For half a century, technocrats advocated the reform of the school system, but not much happened. We do not believe that after watching a thirteen minutes video one can write like Samuel Becket or can run like Shelly-Ann Fraser-Pryce. What we witnessed is that there are operations of 'Artes Mechanicae' which can be attained after watching a seventeen minutes amateur video. The digital natives only listen to the original. If they sense that the knowledge provider does not believe in the message, then they do not trust in it.

In the current study we searched for an acceptable answer for the following question: is it somehow attainable that the 'Artes Mechanicae' operation practitioner without learning screenwriting would be successful in the hand-over of the operation's praxis. The typical academic language [26] is unsuitable for the 'Artes Mechanicae's' operations hand-over.

The limitation of the current study was that the cases in the knowledge base were identified by those practitioners, Cyber Farmers from Hungary willing to participate in the research. Therefore, we did not receive an ordinary result, rather a better one, since the input comes from those who were willing to contribute. This willingness is an important attribute of the population, since those who learn from YouTube sooner or later share their own experiences through these platforms, thus become consumers and providers of informal learning content.

For the next step we elaborated the current knowledge base with additional attributes, through which we aim to understand better how does informal learning work through YouTube content, how is shallow knowledge used in practice. Another take away of the current study was that practitioners can achieve knowledge increase only through informal learning, which resulted from the time attributes: time available for the knowledge increase, search time as well as urgency of the knowledge needed 'there and then'.

6. A New Learning Process: The knowledge increase of Cyber Farmers in the digital age

Working paper:

Varga, E[1]. and Baracskai, Z[2]. (2020a) *A New Learning Process: The knowledge increase of Cyber Farmers in the digital age*.

Author information (for the time when the research was conducted):

[1]Széchenyi University, Győr, Hungary

[2]Széchenyi University, Győr, Hungary

Abstract

The freely available digital tools and platforms enable the learning content production of the passionate practitioners. The purpose of our conceptual model is to assist the understanding of the Cyber Farmers' tentative problem-solving process in the digital ecosystem. Research found that new peasants or newcomers to farming are well-educated people frequently with non-agrarian degrees. Born in the digital age, they prefer the Internet as a source of knowledge. From here originates the concept of Cyber Farmer. They acquire the needed knowledge then-and-there through informal learning. Through their tentative problem-solving process, they browse YouTube for freely available content published by the passionate practitioners, different from the instructional videos produced by professionals in studios following strict screenplays. In the era of shallow knowledge, they deepen their understanding only when it is needed. Therefore, the question of understanding the expectations of the shallows when they use the internet as a learning ecology became the focus of our attention. Through knowledge acquisition we built a conceptual model to illustrate the expectations and the logical connections between them.

Keywords: digital age, tentative problem solving, informal learning

6.1. Introduction

Research found that people often with non-agrarian background start farming enterprises (i Rico and Fuller, 2016; Milone and Ventura, 2019). The phenomenon is observed in several countries, although there is no strict record of the population who moves to rural areas, changes lifestyle and/or profession to become a newcomer to farming. Milone et al. (2018) identify four main characteristics of the new peasants, one of them being that their choices are not based on "rational", linear ways of thinking, rather on interactive, learning-by-doing process. In Hungary, newcomers to farming organize a yearly "Newcomers to rural"

(Gyüttment) festival to share best practices, knowledge, and experience about rural life. They are in many cases well-educated people, but not in farming, and use the internet as a learning ecology for increasing knowledge. From here originates the concept of Cyber Farmer. Without elaborating extensively the typology from the literature on real-virtual relationship Cyber Farmers belong to the group of place-cyber oriented individuals, who participate in social and/or professional virtual communities with varying levels of commitment (Misra and Stokols, 2012).

Tiwari et al. (2019) argue that social networking sites could be leveraged by government and social enterprises in building and maintenance of social capital and social cohesion in rural communities. Cristobal-Fransi et al. (2020) analyzed rural cooperatives in the digital, they argue that the future of the agriculture industry should focus on the innovation and use of the information and communication technologies.

According to Prensky (2009) the distinction between digital natives and immigrants – concepts introduced in earlier publications (Prensky, 2001a; 2001b) – becomes less relevant nowadays. Therefore, it is more important to view digital wisdom as one's ability to find practical, creative, contextually appropriate, emotionally satisfying solutions to everyday problems through the internet. Digital wisdom can and must be learnt to enable the use of particular technologies to enhance one's thinking and understanding, complementing innate abilities. Carr (2011, 2014) in his books talks about how the achievements of digital technology distract a person from focusing on one single thing at a time. The abundant information available on the web urges users to continuously quick-scan contents, making them "shallows", as Carr puts it. Anderson (2006, 2009) applies the long tail theory to software business by highlighting that, similarly to other industries, a head and a tail can be distinguished. For example, Microsoft is on one end, and millions of programmers on the other of the tail. Along the same argument, Encyclopedia Britannica is viewed as the head and Wikipedia, edited by the enthusiastic, motivated passionate professionals and amateurs, is on the other end. The freely available tools and platforms unlocked the potential for content creation for learning as well. As the head, one can think of the educational, instructional videos created by formal educators. The tail consists of the videos, blogs, and other contents shared by the passionate amateurs on the web. In line with the DIY (Do-It-Yourself) waves described by Fox (2014), Cyber Farmers are DIY believers; they browse the internet for freely available content published by passionate amateurs.

Teaching and learning should be separated; one should not assume that learners learn what teachers teach. Baracskai and Dörfler (2017) derive bootstrap learning from Popper's

tentative problem solving process (Popper, 1992), described as follows: P_1 – TT – EE – P_2. Where P_1, P_2 stand for problems, TT for a tentative theory, and EE for error elimination. Any of the three components could be a starting point of the tentative problem-solving process. In bootstrap learning meta-knowledge can connect to any of the three components (P, TT, EE) which changes how the learners see them. Cyber Farmers need to bootstrap in their problem-solving. Ever since their childhood, they had to pull themselves out of challenging situations. The previous generations were not able to assist them with the rapidly changing technology. Cyber Farmers had to find the required knowledge by themselves; they are pulled into the learning experience based on the problem, the knowledge gap they face then-and-there. As Handy said: "In life and in work, we learn things when we need them, not before we need them" (Handy, 1998, p.217). Informal learning happens through trial-and-error, through observing, asking an expert, experiencing, and reflecting on events. The learners therefore engage in the learning activities intended to close the knowledge gap or mitigate the performance challenge or problem. Cyber Farmers consume the meta knowledge relevant for the problem then-and-there from a variety of disciplines. One of the most recognized authors about informal learning, Cross (2007), argues that informal learning is not new, "it is a return to the natural way people learn: through conversations with one another, trying things out, and listening to stories. Learning is how people adapt to changing conditions, and things are changing faster than ever before" (Cross, 2007, p.12). Farmer's knowledge increase process, sources of knowledge is approached in literature from several perspectives. Oreszczyn et al. (2010) conclude that networks and communities of practice provide a useful lens through which to view farmers and their practices. Goulet (2013) in a case study of no-tillage development in France observed the knowledge production within farmers' community of practice. Landini et al. (2017) in their review on rural extensionists' in-service training argue the need to overcome the trandtional transfer-of-knowledge approach, rather facilitate the development of extenstionist communities of proactice, the horizontal exchange of knowledge and experience. Wójcik et al. (2019) in their analysis identified four types of knowledge sources: family-related, neighborhood-related, institution-related, media-related.

Literature on learning, teaching and education rarely considers the learning of the shallows (Carr, 2011). What contents from the Internet are considered consistent, relevant and applicable in informal learning? In the current study we presume that Cyber Farmers know how to learn, they have experience in learning in a profession different to farming. Their sources of knowledge are contents published by passionate practitioners on the

Internet. The questions to understand the aspirations, expectations towards learning, learning content, learning content provider became the focus of our attention. Therefore, the purpose of our conceptual model is to understand the Cyber Farmer's tentative problem-solving in the digital ecosystem. This paper is organized as follows: the introduction presents a short overview of the technological environment, introduces the concept of Cyber Farmer along with the description of the tentative problem-solving process. The next section describes the approach, methodological framework and the process to build the conceptual model for the Cyber Farmers' knowledge increase. The following section presents the key concepts and pillars of our conceptual model: learner, knowledge increase, freely available content on the internet, passionate practitioner along with the iterative knowledge acquisition process used to arrive at the conceptual model presented at this stage. We conclude the paper with final remarks.

6.2. Approach to Conceptual Model Building

In the conceptual model building for the way Cyber Farmer learn, we used a Knowledge Based System. Knowledge Based Systems as a field of Artificial intelligence have applications in several fields, functions, industries (Wagner, 2017). Knowledge representation techniques also range from cognitive maps and frames to if-then rules (Wagner, 2017; Gavrilova and Leshcheva, 2015) using different applications and technologies. Knowledge Based Systems represent knowledge using symbolic logic. Statements consist of self-defined terms by the expert connected through if-then rules. This type of reasoning is called Rules Based Reasoning or deductive reasoning. The knowledge acquisition process starts with the formulation of the aspects of the decision. Aspects of the decision or aspirations, as defined by March (1991) are called attributes in Knowledge Based Systems. The attributes and their values are defined by the expert themselves. Following the attribute identification in the case of Rules Based Reasoning, the if-then rules among the attributes are also articulated by the expert. The rules are validated and re-evaluated through cases, which lead to re-evaluation of certain attributes, values or rules. The knowledge acquisition process is illustrated on Figure 6.1., through which several models were built.

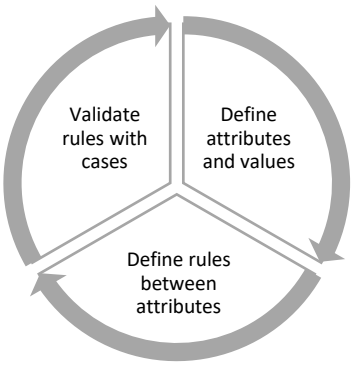


Figure 6.1: Knowledge Acquisition process with Knowledge Based System

Initially the attributes, values were defined along with the rules between them as illustrated in Figure 6.1., resulting in the initial model: M_1. The validation process of the rules with cases from the expert's experience lead to M_2, an improved model. The iterative process to build the conceptual model is illustrated in Figure 6.2, where M_n is the state where the process was stopped. Therefore, the resulting knowledge base is the conceptual model to represent the Cyber Farmers' knowledge increase in the digital age.

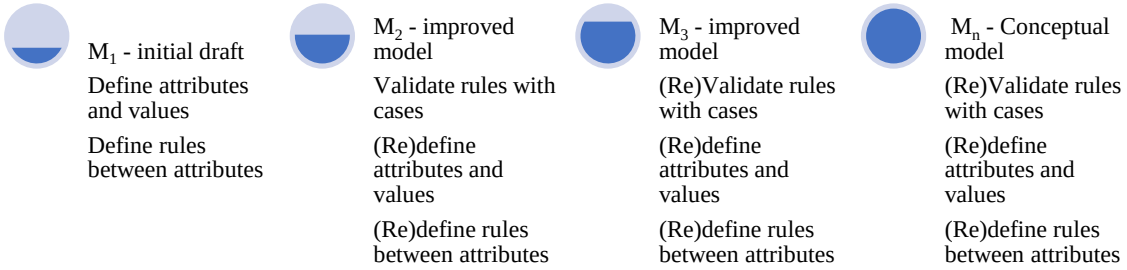


Figure 6.2: Process for developing conceptual model with Knowledge Based System

6.3. A Conceptual Model of Cyber Farmers' knowledge increase

The conceptual model of Cyber Farmers' informal learning in the digital age is built on four pillars. The first pillar is the learner: Cyber Farmers as transdisciplinary informal learners. They learned how to learn, however the new knowledge they need then-and-there in farming is not grounded. This leads us to define the second pillar as the learning process, the knowledge increase of Cyber Farmers. In their learning process they put the emphasis on the acquirement of the know-how to perform an operation, as well as efforts to understand, to assemble the big-picture. The third pillar therefore is the freely available learning content on the Internet. Cyber Farmers search solutions for operations for which learning content is published by passionate amateurs or practitioners. The learning contents

present the steps and how to perform an operation. The fourth pillar is the passionate practitioner as learning content provider. Cyber Farmers do not have clear aspirations, expectations in the quest for the needed knowledge then-and-there. Cyber Farmers learn what to learn through the process of learning itself. Accordingly, the conceptual model is based on the following: learner; learning process; learning content; learning content provider. The process to build the conceptual model of Cyber Farmers' knowledge increase is presented in section 6.3.5.

6.3.1. Cyber Farmers as transdisciplinary informal learners

One can argue that there are a number of differences between Fleck's (1979) concept of thought style and Kuhn's (1996) concept of paradigm on several different levels (Mößner, 2011). In Fleck's theory (Fleck, 1979) thought styles do not apply only to the realm of science, therefore facts in everyday life have similar developmental history. As the author puts it "Knowledge exists in the collective and is continually being revised." (Fleck, 1979, p.95) Research on co-production of knowledge in different areas considered Fleck's theory of thought collectives and thought styles as the conceptual framework (Aeberhard and Rist, 2009; Kläy et al., 2015). Knowledge co-production occurs when everyone steps out of their own disciplines and communicates on a meta-level (Baracskai and Dörfler, 2017). The disciplines we know today evolved throughout history; nowadays they are estimated to number around 8000 (Nicolescu, 2014a). Transdisciplinarity has been viewed as an effective means to address complex societal problems, which cross disciplinary boundaries (Horlick-Jones and Sime, 2004; Pohl, 2008; Popa et al., 2015; Polk, 2015; del Cerro Santamaría, 2015; Guimarães et al., 2019), although the notion of transdisciplinary is still debated in research. Klein (2015) highlights the increased interest in the approach across academic, public and private sectors. Gibbons et al. (2010) label transdisciplinary knowledge production as Mode 2 knowledge production in addition to Mode 1, which is discipline based. Mode 2 knowledge production draws upon the disciplinary and non-disciplinary sources of knowledge. Transdisciplinary co-production of knowledge in organic farming requires cooperation of practitioners, farmers, researchers and policy makers (Aeberhard and Rist, 2009).

Augsburg (2014) identified different characteristics of a transdisciplinary individual: acceptance of different levels of reality, openness to other views, risk taking and willingness to transgress boundaries, to learn and engage in creative inquiry. The capacity of an individual to transgress disciplinary or professional boundaries, in other words to "think outside box", is a fundamental characteristic of the transdisciplinary inquiry (Lawrence, 2015). By going beyond the disciplinary boundaries, transdisciplinarity represents an

original thought style (Darbellay, 2015). Šūmane et al. (2018) argue the importance of farmer's local knowledge, farmer's need to be recognized as co-authors of knowledge generation. They emphasize that knowledge networking and multi-actor knowledge networks are important in the knowledge creation for sustainable agriculture.

The "Cyber Farmer" concept differs from the well-known "farmer" concept in numerous areas, one being the process of knowledge acquisition. The farmer acquires the needed knowledge for farming from formal education and/or from learning-by-doing, on-the job-experience (Brédart and Stassart, 2017). Cyber Farmers do not have the time nor the desire to start formal education in agriculture. They require practical solutions then-and-there. The Cyber Farmer born in the digital age prefers the Internet as a source of knowledge. Cyber Farmers search for new knowledge not from one or multiple disciplines. They have a transdisciplinary approach. They look for solutions for real life problems which cannot be tied to one discipline (Nicolescu, 2014a). The Cyber Farmer has an expert level of knowledge from a profession different to farming, they acquire the needed knowledge then-and-there through informal learning.

6.3.2. The knowledge increase process of Cyber Farmers

Discussions and debates on the future of education happen in different forms and forums. Some argue that the emphasis shifts from knowledge-transmission to knowledge-acquisition and the ability of learners to apply knowledge in different contexts (Király and Géring, 2019). Policy makers, researchers and practitioners are all engaged in and envision formal education in different ways. Arguments on the future ontology of educational institutions highlight potential changes, where learning becomes increasingly informal, outside of the protective belt of the institution, in a space where knowledge is produced collectively in self-sustained networks (Dennis, Springbett and Walker, 2020).

Professionals engage in the refreshing of knowledge, some of them in a formal setting (training, university lectures, courses), however most of these happen in informal settings. A parallel world has appeared, distant to formal learning, and received the name informal learning. Studies on post-educational learning highlight the promotion and facilitation of adult education, learning via lifelong learning initiatives (Jenkins and Garvey, 2001). Learning is viewed as a part of work and work as a part of learning. Learning enables success in life, at work and in groups that matter to one's professional and private life. Thus, a combination of formal and informal learning is advocated, along with action- and experiential learning, as well as contextual or situated learning (Wenger, 1998; Guile, 2001). Informal learning happens intentionally or inadvertently, in an informal setting, without

evaluation of the learners. It is unofficial, unscheduled, impromptu, and never-ending. In Cross's (2007) definition informal learning is viewed as "...the unofficial, unscheduled, impromptu way people learn to do their jobs... Informal learning is like riding a bike; the rider [learner] chooses the destination, the speed, and the route"(Cross, 2007, p.236).

Formal learning is focused on teaching; informal learning is focused on knowing. Both formal and informal learning have an important role. Informal learning is personal, just-in-time and customized. Informal learners take responsibility for their learning and they are passionate learners. In today's connected environment learning is viewed as social. Social networks connect learners with family, friends, community, professional organizations, working teams, clubs, and alumni. The digital era unlocked the potential of extending the connections beyond physical networks to virtual networks as well. Therefore, learning comes from one's social connections whether physical or virtual. In this sense the learner is defined by whom one knows and interacts with. Informal learning happens in "learnscapes" (Cross, 2007). "Learnscapes" are learning ecologies that don't have boundaries. The internet in this sense is a learning ecology for the Cyber Farmers. There are no two identical "learnscapes". The internet as a learning ecology not only provides answers to weather conditions, but assures access to literature, news, arts, etc. Technology today enables the learners to have access to the abundant information when it is needed and where it is needed.

According to Siemens (2005), the importance of "know where" becomes one of the key concepts today. Nowadays it is not required to memorize everything, but it is important to know where to look for the required information. Bruner (1986) argues that we organize our experiences and memories of events mainly in the form of narratives, stories, myths, reasons for doing or not doing. He also views knowledge as distributed beyond one's head to include books, notes and friends. Knowledge is in our connection's heads. Today's learners have instant access to the abundant information on the Internet; the measure of their learning is an open-book exam. The "what can you do?" has been replaced with "what can you and your connections do?" The Internet is always accessible from almost anywhere. It is meant for learning. It is the learning platform of the present (Cross, 2007).

Cyber Farmers look for opportunities to increase their knowledge to satisfy their need of knowledge of the operations of '*Artes Mechanicae*' (Latin for Mechanical Arts, Practical Arts) (Simonyi, 1997) that are required then-and-there from another genre. Learning something at the moment of need combines learning along with and through the application of the new knowledge, which has a lasting effect.

The learning process according to Kolb and Fry (1974) begins with the (i.) here-and-now experience followed by (ii.) the collection of data about the experience. The collected observation data is then (iii.) analyzed and reflected on, which subsequently influence the (iv.) choice of new experiences and behaviors. Consequently, the four stages are referred to as: concrete experience, reflective observation, abstract conceptualization, and active experimentation. In line with experiential learning theory, concrete experiences provide information, which then serves as the basis for reflections, from which abstract concepts are formed. Depending on individual learning styles, previous knowledge and preference learners might choose different stages of the learning process as a starting point for knowledge increase. One might choose to begin learning by observing others performing the operation. Some might prefer to start by analyzing instructions from a book or alternatively jump right in and engage in active experimentation. The underlying insight of experiential learning theory (Kolb and Fry, 1974) is that learning is best facilitated by an integrated cyclical process.

6.3.3. Freely available learning content on the Internet

Learning is both a process of acquisition of knowledge and skills as well as a process of participation in communities of practice. Technology enabled the appearance of virtual communities of practice. Information and communication technology adoption in formal learning is a highly researched area (Bétrancourt and Benetos, 2018; Leahy et al., 2019),. Nowadays, social media for learning attracts the attention of many researchers (Mao, 2014; Hong et al., 2016; Moghavvemi et al., 2018; Warner-Søderholm et al., 2018). YouTube as a video-sharing website allows users to freely upload, share, view and rate videos along with comments. Learners, when using social media like YouTube content for knowledge increase have the choice of what, when, how and how long to study, which corresponds to the previously described characteristics of informal learning (Balakrishnan and Gan, 2016; Hong et al., 2016). The self-directed aspect of learning from YouTube content plays an important role in the effectiveness of the learning process. Learners have the ability to adapt learning from specific points in the video content, and they can easily return to any point or fast-forward depending on the learning process. According to Cross (2007), visual language translates across cultures. Therefore, even in formal learning, more time should be spent on visual literacy.

The abundance of freely available content on the Internet challenges the informal learners in the identification, selection and validation of applicable knowledge. The freely available tools, platforms and technologies make it possible for everyone to publish content on the

Internet, enabling those who want to share their experience and expertise to express themselves publicly through blogs and videos. The world of "peer production" enabled by technology allows the passionate practitioners, whether professionals or amateurs, to become content providers (Anderson, 2006). The "watch the master" model changed to the "watch the *Artes Mechanicae* practitioner" on the web.

6.3.4. The Passionate Practitioner as learning content provider

Informal learning content is loosely structured and adapts to the learner's needs in time, space and tools. Informal learning using the internet as a learning ecology is in the realm of the shallows (Carr, 2011), where it is acceptable to learn and know a little about a lot of things. Cetto et al. (2018) found that user roles in enterprise social networks differ based on their contribution to knowledge: givers, takers and matchers. They argue that matchers, those who both give and take, play a key role in organization. Studies on user participation in online communities highlight different user behaviors. One example being interaction around YouTube video content consumption defined as: interactive, passive or active (Malinen, 2015). The market is defined as ideal if the demand defines the supply. In the current phenomenon, the demand side saw the appearance of a well-educated digital native generation, who utilizes the era's brilliant invention: YouTube. On this market, the rawness and inexperience of the supply is visible. From this inexperience bursts forth the content and the willingness to share. Consequently, those who already acquired some knowledge are not capable or willing to create learning content which mirrors their knowledge. Regardless of this, there is an immense amount of information and knowledge available on the internet. One study on motivations of Wikipedia contributors found that internal self-concept motivation is the key motivator (Yang and Lai, 2010). Sharing ideas is at the same time both selfish and generous. When one explains something online, it clarifies one's own thinking (Cross, 2007).

6.3.5. The knowledge acquisition process to build the conceptual model

In the cyber world knowledge is needed instantly, in real-time. In this world according to Carr (2011) everyone is socialized to have shallow knowledge. All one needs to know is that "permaculture" exists and that this is the needed knowledge one is looking for. The abundance of freely available content on the internet is a challenge for the informal learners in the identification, selection and validation of applicable knowledge.

Up till now, the focus was on text-mining, data-mining. The question is will technology soon unlock the potential of "experience mining"? The Cyber Farmer learns by mining

others experiences shared on the Internet. We built the conceptual model for the Cyber Farmer's experience mining enabled by technology through concepts described in the previous sections: transdisciplinary informal learner, learning process, learning content, passionate practitioner. Additionally, to these concepts the validation process of the needed knowledge then-and-there was included as a building block. Through knowledge acquisition process the conceptual model was built in several iterations as described in the Approach to Conceptual Model Building section. To illustrate it, in the current paper we describe three stages: (M_1) initial draft of the attributes and their values to define the aspirations, (M_2) improved model with redefined attributes, values and rules among those attributes, (M_n) the resulting model after several iterations.

Initial model: M_1

The initial model M_1 was built through knowledge acquisition process, where the aspirations of the Cyber Farmers' informal learning were identified. In this process we examined which concepts and notions are clear, which have gone through their sensemaking. Through the definition of the aspirations, several notions and concepts emerged to describe the importance of the needed knowledge, from which we initially derived the Relevancy attribute with the values: not relevant, relevant with conditions, relevant and this is it. The notion of Consistency emerged to address the consistency of the learning content with the values: not consistent, partially consistent or consistent. The attribute Applicability was defined with the values: cannot do it, applied and share it with others. The implementation of the needed knowledge was described by three attributes: Implementation Difficulty, Implementation Cost and Implementation Help Needed. Corresponding to the era, the attribute Who Recommends It to describe the learning content provider was assigned with the values: unknown, friend, scientist or guru. In line with the connectivism theory the attribute Where Is It (source) was defined to describe the source of the knowledge, where it is found, with the following values: social media, textbook, blog, YouTube, training or community of practice. Communities of practice (CoP) represent a group sharing the same concern or passion for something they do, therefore by regular interaction they learn how to do it better (Wenger, 1998; Wenger, 2000; Goulet, 2013). In the knowledge acquisition process, the notion of time surfaced from many perspectives. On one hand, while this indicated the importance of this aspiration, on the other hand, it also showed the difficulty in describing time. Several meanings were assigned to the attribute Time: one to measure the effort in elapsed time to acquire the new knowledge, ranging from a couple of minutes

to a couple of weeks; the other to measure the time needed to search for the desired knowledge, ranging from a few seconds to a few days. The for-profit mindset of the farmers does not switch to a non-profit mindset in the case of Cyber Farmers, therefore this black-and-white world started to display different shades of grey. We know from experience that in the analysis of a decision's mindset, the decision maker evaluates not only the best and worst cases, but has, in every situation, an identified almost good and almost bad case as well. Naturally, the decision maker does not think in these expressions, but rather defines the dark and light grey areas based on the given aspiration/attribute. In the current example for the aspiration Relevancy, black is not relevant, white is this is it, light grey is relevant with conditions, and dark grey is relevant. Similarly, for the Time attribute, the values can be viewed as black for couple of weeks, white for couple of minutes, light grey as couple of hours, and dark grey as couple of days. Although it is possible to attribute different understandings to Content Type, the values for this attribute were agreed and assigned as: showing the results, from the beginning to the end (process), and keywords (concepts). The attribute Feedback, Comments is accessible, visible for certain sources, but for others it is invisible. The attribute Own Experience Regarding the Decision/solution at Hand value assignment depends on the learning phase of the learner. Initially, the values assigned to this attribute were: no experience, beginner and advanced. Novelty, similarly to Time, is viewed an important attribute but on the border of measurability. Then-and-there it was defined as the notion describing the perceived novelty for the Cyber Farmer who is searching for new knowledge. Therefore, for the aspiration Novelty, a looser definition was accepted, which was shortly re-defined as New Knowledge (chance for knowledge increase) with the values: improved solution, already implemented solution, traditional solution, or disruptive innovation. After the definition of the attributes and their values, the process to define the rules among these attributes was initiated. During the rule definition, the values of the attributes were re-defined, some initially viewed as important to describe the decision at hand were omitted, re-named, or new values assigned. At the same time, new concepts emerged.

Improved model: M_2

In the improved model M_2 the scope was reviewed to focus on YouTube content, therefore the attribute Where is it was omitted from the list. Although Relevancy, Feedback, Comments and New Knowledge (chance for knowledge increase) initially viewed as decisive, they were removed in the presented iteration from the knowledgebase.

As Simon (1971) notes, a wealth of information has created a poverty of attention. Initially the Time attribute defined as search time and time spent on learning were decisive aspirations in the conceptual model. Nevertheless, in the case of comprehension time the best case is when we understand the new needed knowledge immediately, instantly. Thus, aspirations which were initially viewed decisive in the age of shallow knowledge, where time is scarce, were re-evaluated and transformed into an aspiration describing the learner's Confidence in Informal Learning with values: the puzzles do not fit together, further investigation required to build, or schema in the learner's mind.

In summary, the changes to the initial state presented before were consisted of omitting attributes, redefining attributes and values, inserting new attributes and values, along the dependencies between them.

Omitted attributes from the previous M_1 model: Where Is It, Feedback, Comments, Relevancy, New Knowledge (chance to knowledge increase).

Inserted, new attributes were defined as follows:

- Learning content: Storyline with values: Unclear, Partially Clear, Clear
- Learning Content: Video Quality with values: Amateur/Beginner, Almost Professional, Professional
- Learning Content: Presents Pitfalls with values: Not Mentioned, Some Mentioned, Highlights Big Issues
- Learning Content: Story Development Process with values: Not consistent in time, Story not consistent with visual, Describes a process, Dynamic
- Learner vs. Content Producer: Balance of Two Realities (learner and protagonist) with values: Very Different, Somewhat Close, Close
- Learning Content: Conflict in the Story with values: Disharmony, Partial Harmony, Harmony
- Learner: Sensemaking with values: I don't get a single word, Working Knowledge, Mother Tongue

The redefined attributes compared to the initial model M_1 are summarized in Table 1.

Table 1

Redefined attributes and values

Attribute	Attribute Values	Redefined Attribute	Redefined Values	Change Type
Consistency	Not Consistent Partially Consistent, Consistent.	Learning content: Consistency (here and now)	Inconsistent, Partially Consistent, Consistent.	Rename attribute.
Applicability	Cannot do It, Applied, Share it with others.	Learning content: Applicability (here and now)	Cannot do It, Applied, Share It with Others.	Rename attribute.
Implementation Difficulty	Easy-piece of cake, Takes some time, Difficult, Cannot estimate.	Operation Implementation Complexity	Need Expert, Cyber Farmers Co-Working, Do-It-Yourself.	Merge and redefine attributes, redefine values.
Implementation Cost	Low Hanging Fruit, Can afford it, Can't afford it, Cannot estimate.	Operation Implementation Complexity	Need Expert, Cyber Farmers Co-Working, Do-It-Yourself.	Merge and redefine attributes, redefine values.
Implementation Help Needed	Do-It-Yourself, Cyber Farmers Co-Working, Need Expert Involvement, Unsolved Must Buy, Not known.	Operation Implementation Complexity	Need Expert, Cyber Farmers Co-Working, Do-It-Yourself.	Merge and redefine attributes, redefine values.
Own Experience Regarding Decision at Hand/Solution at hand	No Experience, Beginner, Advanced, Professional.	Learner: Experience in Operation	No Experience, Beginner, Advanced, Professional.	Rename attribute.
Who recommends it	Unknown, Friend, Scientist, Guru.	Learning Content: Narrator Authenticity	I don't believe him/her, Doubtful, Authentic, I believe him/her.	Redefine attribute, redefine values.
Type of content	show the results, from beginning to end, key words, stage fever.	Learning content: Presentation Style	Does not present the operation, Unclear for me, Presents how-to.	Redefine attribute, redefine values.
Time	Couple of weeks, Couple of days, Couple of hours Couple of min.	Learner: Confidence in Informal Learning	The puzzles do not fit together, Further investigation required to build, Schema in learner's mind.	Merge and redefine attribute, redefine values.
Search time	Few Days, Few Min, Few Seconds.	Learner: Confidence in Informal Learning	The puzzles do not fit together, Further investigation required to build, Schema in learner's mind.	Merge and redefine attributes, redefine values.

Source: own elaboration.

The rule definition and the representation of the dependencies among the attributes in the Knowledge Base System are achieved with a decision tree, i.e. a rule-based graph presented in Figure 6.3.

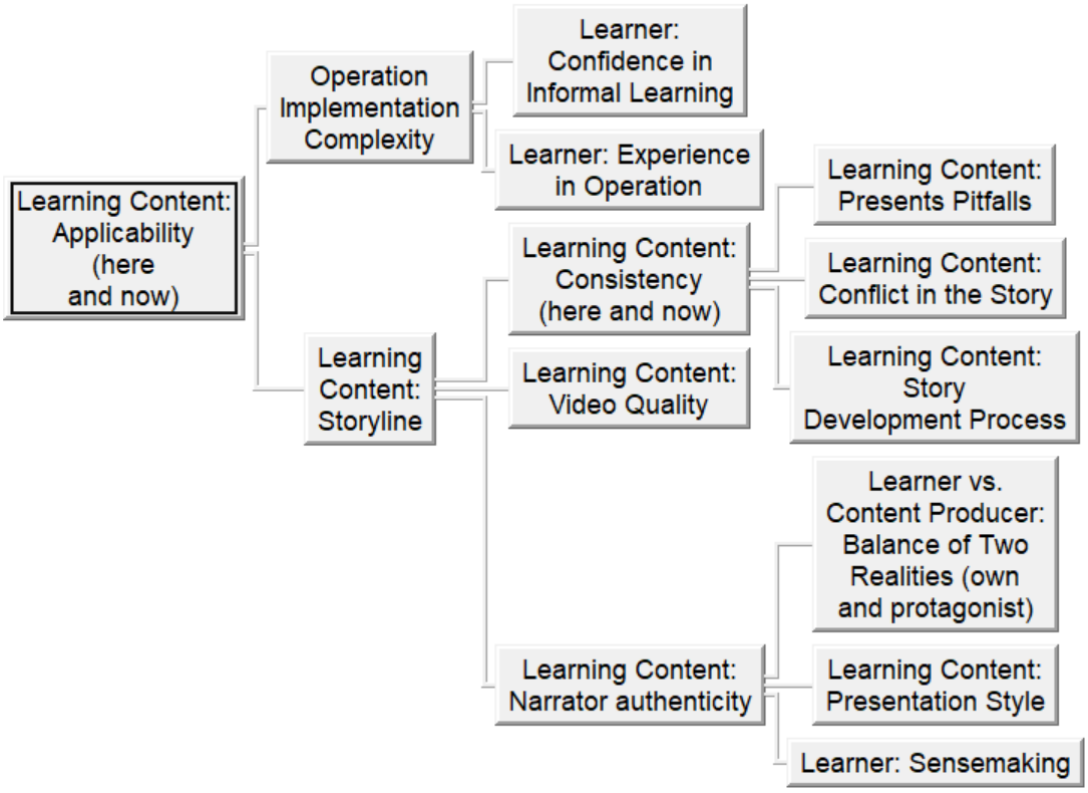


Figure 6.3: Improved model (M_2), Rule Based Graph for Learning Content: Applicability (here and now)

In the presented state Learning Content: Applicability (here and now) was defined as dependent on two attributes: Operation implementation complexity and Learning Content: Storyline. The Operation Implementation Complexity was defined as dependent on Learner Confidence in Informal Learning and Learner: Experience in Operation. Learning Content Consistency (here and now) was defined as dependent on the attributes: Learning Content: Present Pitfalls, Learning Content: Conflict in story, Learning Content: Story development process. At this phase of the process, the Learning Content: Narrator Authenticity was defined as dependent on three attributes: Learner vs. Content producer: balance of two realities (own and protagonist), Learning Content: Presentation Style, Learner: Sensemaking.

The Knowledge Based System presents the rules among the attributes in a tabular form. We present the rules with the position of the attribute's values. Rule i-j in this sense represents a rule, based on two attributes' values, the value in position i for the first and value in position j for the second. Therefore Rule 1-1 would mean taking the initial values

for the two attributes. When the rule is determined by more attributes, then R i-j-k for example would mean taking, for the first attribute, the value in position i, for the second the value on position j, and for the third attribute, the value on position k.

In the current knowledgebase the number of values for the attributes range from 2 to 4. In Figure 6.4 the rules for Applicability attribute are displayed.

Learning Content: Storyline	Unclear	Partially Clear	Clear
Operation Implementation Complexity			
Need Expert	Cannot Do It	Applied	Applied
Cyber Farmers Co-working	Cannot Do It	Applied	Share It With Others
Do-It-Yourself	Cannot Do It	Applied	Share It With Others

Figure 6.4: Improved model (M_2), Rules of Learning Content: Applicability (here and now)

The rules for the Applicability attribute can be read as follows:

Rule 1-1:

if Operation Implementation Complexity is “Need Expert” and

Learning Content: Storyline is “Unclear”

then Learning Content: Applicability (here and now) is “Cannot Do It”.

Rule 3-3:

if Operation implementation complexity is “Do-It-Yourself” and

Learning Content: Storyline is “Clear”

then Learning Content: Applicability (here and now) is “Share It with Others”.

Conceptual model: M_n

The final list of attributes presented in the current paper was defined as referring to the following areas: Needed Knowledge, Learning Content (LC), Learning Content Provider (LCP) and Learning Process (LP). The values for the Needed Knowledge: Operation Relevancy were initially defined as: not relevant, relevant with conditions and this is it. At one time this attribute was omitted from the knowledgebase. In the iterative process, an attribute was finally recognized as decisive for the conceptual model. The values for this attribute in the iterative process of knowledge acquisition were finally set to: irrelevant, partially relevant and relevant. One can argue that more values could be assigned to the attribute LC: Consistency (then-and-there), but in the current study the agreed values were: not consistent, partially consistent and consistent. Needed Knowledge: Operation Applicability (then-and-there) attribute’s values in the iterative process evolved from cannot

do it, applied and shared with others to not applicable then-and-there, partially applicable then-and-there, and applicable then-and-there. To describe the implementation ability, the attribute was finally defined as Needed knowledge: Operation implementation ability with the values: need expert/more knowledge, Cyber Farmers' Co-working, and Do-It-Yourself. As a result, the attributes in the conceptual model are as follows:

Attributes related to Needed Knowledge:

- Needed Knowledge: Operation Applicability(then-and-there) with values: Not Applicable, Partially Applicable, Applicable
- Needed Knowledge: Operation Implementation Ability with values: Need Expert/More Knowledge, Cyber Farmers Co-working, Do-It-Yourself
- Needed Knowledge: Operation Relevancy with values: Irrelevant, Partially Relevant, Relevant

Attributes related to Learning Content (LC):

- LC: Consistency (then-and-there) with values: Inconsistent, Partially Consistent, Consistent
- LC: Presents Pitfalls with values: Not Mentioned, Some Mentioned, Highlights Big Issues
- LC: Story Development Process with values: Story not consistent in time, Story not consistent with visual, Describes a process, Dynamic
- LC: Conflict in Story with values: Disharmony, Partial Harmony, Harmony

Attributes related to Learning Content Provider (LCP):

- LCP: Authenticity with values: Not Authentic, Doubtful, Authentic
- LCP: Video Production Ability with values: Amateur/Beginner, Almost Professional, Professional
- LCP: Operation Presentation with values: Does not present, Not completely clear, Presents how-to
- LCP: Presentation Style with values: One does not get a single word, One thinks understands it, One understands it

Attributes related to Learning Process (Kolb's Learning theory):

- Concrete Experience in Operation (doing/having an experience) with values: No Experience, Beginner, Advanced
- Abstract Conceptualization (concluding/learning from the experience) with values: The puzzles do not fit together, Schema in learner's mind

- Reflective Observation (reviewing/reflecting on experience) with values: Black Box, Eureka
- Active experimentation (testing) with values: Similar, Identical

The Rule Based Graph for the attribute Needed Knowledge: Operation Applicability (then-and-there) is presented in Figure 6.5.

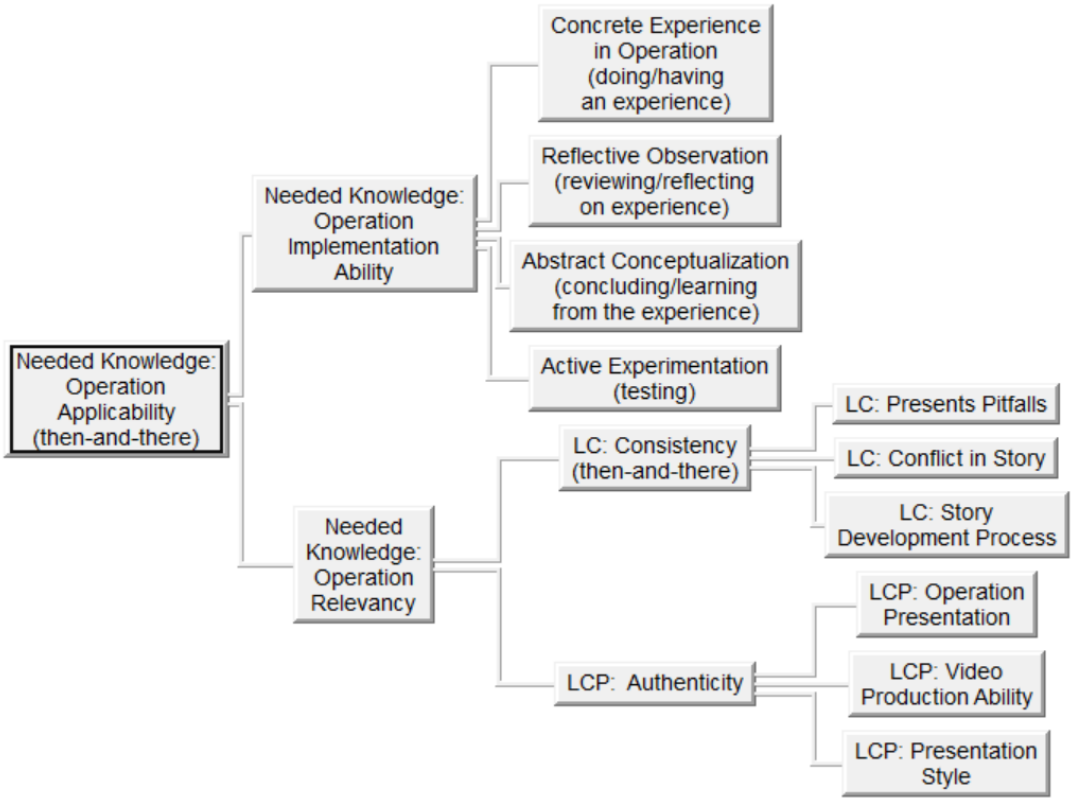


Figure 6.5: Conceptual Model (M_n), Rule Based Graph for Needed Knowledge: Operation Applicability (then-and-there)

From the decision tree it is visible that the Needed Knowledge: Operation Applicability (then-and-there) is dependent on two attributes: Needed Knowledge: Operation Implementation Ability and Needed Knowledge: Operation Relevancy.

The Needed Knowledge: Operation Relevancy is dependent on learning content consistency and learning content provider authenticity.

The Needed Knowledge: Operation Implementation Ability is described with attributes derived from experiential learning theory (Kolb and Fry, 1974). The tabular view of the if-then rules for Needed Knowledge: Operation Applicability (then-and-there) is presented in Figure 6.6.

Needed Knowledge: Operation Implementation Ability	Need Expert/More Knowledge	Cyber Farmers Co-working	Do-It-Yourself
Needed Knowledge: Operation Relevancy			
Irrelevant	Not Applicable	Not Applicable	Not Applicable
Partially Relevant	Not Applicable	Partially Applicable	Partially Applicable
Relevant	Partially Applicable	Partially Applicable	Applicable

Figure 6.6: Conceptual Model (M_n), Rules of Needed Knowledge: Operation Applicability (then-and-there)

Rule 1-1:

if Needed Knowledge: Operation Relevancy is “Irrelevant” and

Needed Knowledge: Operation Implementation Ability is “Need Expert/More Knowledge”

then Needed Knowledge: Operation Applicability(then-and-there) is “Not Applicable”.

Rule 2-2:

if Needed Knowledge: Operation Relevancy is “Partially Relevant” and

Needed Knowledge: Operation Implementation Ability is “Cyber Farmers Co-working”

then Needed Knowledge: Operation Applicability (then-and-there) is “Partially Applicable”.

Rule 3-3:

if Needed Knowledge: Operation Relevancy is “Relevant” and

Needed Knowledge: Operation Implementation Ability is “Do-It Yourself”

then Needed Knowledge: Operation Applicability (then-and-there) is “Applicable”.

Rules for Needed Knowledge: Operation Implementation Ability in a tabular form is presented in Figure 6.7.

		Active Experimentation	Similar	Identical
Concrete Experience in Operation	Abstract Conceptualization (conc	Reflective Observation (re		
No Experience	The puzzles do not fit together	Black Box	Need Expert/More Knowledge	Need Expert/More Knowledge
No Experience	The puzzles do not fit together	Eureka	Need Expert/More Knowledge	Need Expert/More Knowledge
No Experience	Schema in learner's mind	Black Box	Need Expert/More Knowledge	Need Expert/More Knowledge
No Experience	Schema in learner's mind	Eureka	Need Expert/More Knowledge	Cyber Farmers Co-working
Beginner	The puzzles do not fit together	Black Box	Need Expert/More Knowledge	Need Expert/More Knowledge
Beginner	The puzzles do not fit together	Eureka	Need Expert/More Knowledge	Cyber Farmers Co-working
Beginner	Schema in learner's mind	Black Box	Cyber Farmers Co-working	Cyber Farmers Co-working
Beginner	Schema in learner's mind	Eureka	Cyber Farmers Co-working	Do-It-Yourself
Advanced	The puzzles do not fit together	Black Box	Need Expert/More Knowledge	Need Expert/More Knowledge
Advanced	The puzzles do not fit together	Eureka	Need Expert/More Knowledge	Do-It-Yourself
Advanced	Schema in learner's mind	Black Box	Cyber Farmers Co-working	Cyber Farmers Co-working
Advanced	Schema in learner's mind	Eureka	Cyber Farmers Co-working	Do-It-Yourself

Figure 6.7: Conceptual Model (M_n), Rules of Needed Knowledge: Operation Implementation Ability

Rule 1-1-1-1:

if Concrete Experience in Operation (doing/having an experience is “No Experience” and

Abstract Conceptualization (concluding/learning from experience) is “The puzzles do not fit together” and

Reflective Observation (reviewing/reflecting on experience) is “Black Box” and

Active experimentation (Testing) is “Similar”

then Needed Knowledge: Operation Implementation Ability is “Need Expert/More Knowledge”.

Rule 2-2-2-1:

if Concrete Experience in operation (doing/having an experience is “beginner” and

Abstract Conceptualization (concluding/learning from experience) is “Schema in learner’s mind” and

Reflective Observation (reviewing/reflecting on experience) is “Eureka” and

Active experimentation (Testing) is “Similar”

then Needed Knowledge: Operation Implementation Ability is “Cyber Farmers Co-working”.

Rule 3-2-2-2:

if Concrete Experience in operation (doing/having an experience is “Advanced” and

Abstract Conceptualization (concluding/learning from experience) is “Schema in learner’s mind” and

Reflective Observation (reviewing/reflecting on experience) is “Eureka” and

Active experimentation (Testing) is “Identical”

then Needed Knowledge: Operation implementation ability is “Do-It-Yourself”.

Rules for Needed Knowledge: Relevancy are displayed in Figure 6.8.

LC: Consistency (then-and-there)	Inconsistent	Partially Consistent	Consistent
LCP: Authenticity			
Not Authentic	Irrelevant	Irrelevant	Partially Relevant
Doubtful	Irrelevant	Partially Relevant	Partially Relevant
Authentic	Partially Relevant	Relevant	Relevant

Figure 6.8: Conceptual Model (M_n), Rules for Needed Knowledge: Relevancy

Rule 2-3:

if LCP: Authenticity is “Doubtful” and

LC: Consistency (then-and-there) is “Consistent”

then Needed Knowledge: Relevancy is “Partially Relevant”.

Rule 3-2:

if LCP: Authenticity is “Authentic” and

LC: Consistency (then-and-there) is “Partially Consistent”

then Needed Knowledge: Relevancy is “Relevant”.

Rules for LC: Consistency (then-and-there) are visible in Figure 6.9.

	LC: Conflict in Story	Disharmony	Partial Harmony	Harmony
LC: Story Development Process	LC: Presents Pitfalls			
Story not consistent in time	Not Mentioned	Inconsistent	Inconsistent	Inconsistent
Story not consistent in time	Some Mentioned	Partially Consistent	Partially Consistent	Partially Consistent
Story not consistent in time	Highlights Big Issues	Partially Consistent	Partially Consistent	Partially Consistent
Story not consistent with visual	Not Mentioned	Inconsistent	Inconsistent	Inconsistent
Story not consistent with visual	Some Mentioned	Partially Consistent	Partially Consistent	Partially Consistent
Story not consistent with visual	Highlights Big Issues	Partially Consistent	Partially Consistent	Partially Consistent
Describes a process	Not Mentioned	Partially Consistent	Partially Consistent	Partially Consistent
Describes a process	Some Mentioned	Partially Consistent	Partially Consistent	Partially Consistent
Describes a process	Highlights Big Issues	Partially Consistent	Consistent	Consistent
Dynamic	Not Mentioned	Partially Consistent	Partially Consistent	Partially Consistent
Dynamic	Some Mentioned	Partially Consistent	Partially Consistent	Partially Consistent
Dynamic	Highlights Big Issues	Consistent	Consistent	Consistent

Figure 6.9: Conceptual Model (M_n), Rules for LC: Consistency (then-and-there)

Rule 3-2-1:

if LC: Story Development Process is “describes a process” and

LC: Presents Pitfalls is “some mentioned”

LC: Conflict in Story is “disharmony”

then LC: Consistency (then-and-there) is “partially consistent”.

Rule 4-3-3:

if LC: Story Development Process is “dynamic” and

LC: Presents Pitfalls is “highlights big issues” and

LC: Conflict in Story is “harmony” and

then LC: Consistency (then-and-there) is “consistent”.

Rules for LCP: Authenticity are displayed in Figure 6.10.

	LCP: Operation Presentation	Does not present	Not completely clear	Presents how-to
LCP: Presentation Style	LCP: Video Production Ability			
One does not get a single word	Amateur/Beginner	Not Authentic	Not Authentic	Not Authentic
One does not get a single word	Almost Professional	Not Authentic	Not Authentic	Not Authentic
One does not get a single word	Professional	Not Authentic	Not Authentic	Doubtful
One thinks understands it	Amateur/Beginner	Not Authentic	Not Authentic	Authentic
One thinks understands it	Almost Professional	Doubtful	Doubtful	Authentic
One thinks understands it	Professional	Doubtful	Doubtful	Authentic
One understands it	Amateur/Beginner	Doubtful	Authentic	Authentic
One understands it	Almost Professional	Doubtful	Authentic	Authentic
One understands it	Professional	Doubtful	Authentic	Authentic

Figure 6.10: Conceptual Model (M_n), Rules for LCP: Authenticity

Rule 2-3-1:

if LCP: Presentation Style is “One thinks understands it” and

LCP: Video Production Ability is “Professional” and

LCP: Operation Presentation is “Does not present”

then LCP: Authenticity is “Doubtful”.

Rule 3-3-3:

if LCP: Presentation Style is “One understands it” and

LCP: Video Production Ability is “Professional” and

LCP: Operation Presentation is “Presents how-to”

then LCP: Authenticity is “Authentic”.

In the Cyber Farmers’ informal learning process, the aspirations, expectations regarding the needed knowledge are continuously forming throughout the learning process. The presented model for the Cyber Farmers’ tentative problem-solving process resulted from the iterative knowledge acquisition process.

6.4. Discussion

We built a conceptual model for the Cyber Farmer’s tentative problem-solving process in the digital ecosystem. Nowadays, choosing what to learn, from where to learn it and the sensemaking of the incoming information becomes an important question to be addressed through the lens of a shifting reality. A right answer today may be considered incorrect tomorrow. The presented conceptual model is not a synthesis of the different learning theories, although concepts emerged from several, such as experiential learning theory informal learning, connectivism, and communities of practice. Concepts furthermore emerged from the expert’s experiences, who formulated and re-formulated the attributes in the iterative knowledge acquisition process. Thus, the conceptual model is an integrated representation of the learner, the learning content, the learning content provider and the learning process for Cyber Farmers using the internet as a learning ecology. To observe the passionate practitioner, in line with connectivism theory it is central to reflect on the “know where”. Nowadays practitioners learn more in the “coffee rooms”, both virtual and physical. The “how to do my job” is discovered through informal learning by talking, observing others, through trial and error. Digital natives and immigrants are exposed to an abundance of knowledge accessible on the internet. In the age of shallow knowledge, learners become impatient. Therefore, we argue that the new learning process for the Cyber Farmer’s knowledge increase is a search process. It is important to note that the Cyber Farmers are mindful in their search for knowledge, they are not just surfing on the internet. As informal learners, they search for the knowledge required in the tentative problem-solving process then-and-there. It is unknown how they search for knowledge, but it is known if they are pleased with the learning content found on the internet. They have as many aspirations as needed for the decrease of their knowledge gap then-and-there. The Cyber Farmer’s informal learning is viewed trans-functional and transdisciplinary, which satisfies the interests of the learners then-and-there. We argue that the Cyber Farmer’s informal learning process fits the requirements of bootstrapping. Our conceptual model has some limitations. Although

Information and Communication Technology is used in education, the Cyber Farmer's informal learning through experience mining is a new phenomenon, without history. Therefore, induction could not be a method to study the phenomenon empirically. However, learning from the internet is known and observed. Another limitation is the semi-definition of the Cyber Farmer concept. Cyber Farmer is not a commonly recognized definition; it was initiated to describe the protagonist of the phenomenon. The presented conceptual model and knowledge base represent the current state of the research at this time. Will there be a future gamma version of the knowledge base? Remains to be seen. The conceptual model can be used to form a basis of understanding the approach to informal learning, which can be revised and adjusted by longitudinal study of the phenomenon. By monitoring the validity of the model and by refinement the attributes and rules, a more succinct model might be developed with time. As Cyber Farmers become more experienced in the search for applicable knowledge using digital technology, the aspirations of the learning process become more and more strong and pure. In this event, Case Based Reasoning and induction could be used to identify the most informative attributes for the Cyber Farmer's knowledge increase.

Acknowledgement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

7. Discussion and conclusion

The title of the current work, “Cyber Farmers’ informal learning” and the five problem areas making up the identified problem space evolved throughout our research journey, although without any significant or major changes.

Firstly, we aimed to understand the newcomer’s mindset in selecting organic farming through changing lifestyle or profession. Our approach of the phenomenon and the group was through involvement in activities organized for those interested in self-sustainability, permaculture, and moving to rural areas. The framework of the sigmoid curve or S-curve grounded our study for this area. We had to accept the inexistence of strict records in any form of those who change lifestyle and profession to become newcomers to farming. Our personal experience with changing professions was a good source of inspiration in the construction of a survey for our study. The survey comprised of five sections to describe the following areas: the stage of the decision making, initial state, push reasons, final state and pull reasons. Through the validation of the survey with a focus group we improved not only the style but content as well. Our findings were based on our previously mentioned observations and the survey responses we received in early 2019. Our proposed tentative solution of a push-pull model proved to be an appropriate approach. In the data collection process, we were faced with several impediments, which could be regarded as lessons and thus to be taken into account in future studies. Asking people to reveal their own personal feelings, thoughts, emotions, difficulties and personal life-stories without trust is challenging. Therefore, the responses should be handled with care. For example, in the focus group narratives flowed only after trust was established, when the group viewed us as belonging to them, sharing their values, concerns. The same trust could not be established through a personal introduction of a survey. This leads to the second impediment: how to motivate respondents to share their experience. Why would anyone tell their life-story to an outsider? According to Füredi (2002), when we encounter strangers, they are not only people we do not know, but people who we cannot trust. Although several personal stories are shared on the social media platforms, people post mostly their successes. To share failures, challenges and issues about changes in profession and lifestyle makes one vulnerable. Vulnerability can be recognized even if a survey is answered anonymously. In the survey we approached the push and pull reasons from several viewpoints. Based on the responses, it became clear that in the decision making neither the push nor the pull reasons could be clearly demarcated as the unequivocal factor. One interesting comment we received was that

the survey "suggested" push rather than pull. In this case the respondent emphasized steering towards a different aim instead of escape. By providing the possibility of free-text answers for some questions, our understanding of the mindsets was enriched with the notion of solastalgia. Solastalgia is a neologism created to describe the discomfort, worry and existential distress caused by environmental changes. Füredi (2002) argues that the concern with safety in the area of environmental issues is similarly intense to that in personal relations, driven by cultural forces. Surprisingly the number of scientific articles for this keyword on ScienceDirect portal at the time of writing the dissertation is less than 100. We conclude that solastalgia could be a fruitful research topic for future studies.

Without deeply engaging in the world of the narratives, we reflected on the thoughts of Appadurai (2016) on the "capacity to aspire". Aspirations are related to wants, choices and preferences in the economic disciplines. He argues the need for the repatriation of these concepts into the domain of culture. In this study we also explored who influenced the newcomers during their decision-making process. To understand this area, we had to study narratives, thought styles. Beside the pre-defined options for the "influencer" as family, friends and community, additionally we received answers like "no one" and "myself". The answer "no one" in the majority of the cases was provided by respondents who regarded themselves already organic farmers. Although, initially we did not accept these as valid options, we thought of two possible explanations for these answers. One explanation could be that the respondents did not find the provided pre-selections adequate. The second explanation could be that these responses underline the presumed bootstrap mindset of the newcomers to farming. However, these explanations would need further future validations. Although, the option of the free-text generated some difficulties in the coding of the responses for data analysis, both with factor analysis and case based reasoning, one interesting thought from the respondent caught our attention, a quote attributed to Gandhi: "You must be the change you want to see in the world."

Since the respondents were in different stages of the change in profession and/or lifestyle, the grouping of the responses accordingly demarcated the number of cases for each group. In our study additionally to the factor analysis with CBR we considered several attributes as benchmark attributes. Some of these reasonings are presented in the included paper for the three identified groups. However, the knowledge base built according to the attributes constituting the identified factors was not part of the article, which we present in Appendix2. The answers of those who are "already organic farmers" could be flawed by the fickleness of memories. Those who were in the "in-process" group at the time of answering the survey

might or might not have been able to alter their decisions since then. As a result we reflected on planning fallacy, which, according to Kahneman (2013), is that one usually makes a best-case scenario plan and assumes that the outcome will follow that plan, even when there are better options or alternatives. For those who are only "thinking about it", the responses were recorded for a future decision, which may or may not happen. During the interpretation of the mindset patterns for "thinking about it" group, several notions were emerged, as overconfidence and illusion of control. We argued that the scattered mindset patterns for this group almost classified them as dreamers.

The second problem area we addressed was the contemporary learning environment in the digital age. As a result, we draw a learning process model for knowledge increase using the internet as a learning ecology. In the exploration of the topic we reflected on connectivism theory and transdisciplinary education. Our model consisted of three validation steps: consistency, relevancy and applicability. In our subsequent studies we investigated the validation of the relevancy and applicability of the knowledge, by the Cyber Farmers. These are presented in the fourth and respectively in the fifth paper included in this dissertation.

For the third problem area, in our conference paper "Cyber DIY: learner expectation patterns in new knowledge selection and validation" we presented a pilot study. The aspirations, aspects of learning content selection to build "aquaponics" were identified by knowledge acquisition. Despite the limitations of the study, there were several inspiring observations made from it. For example, the aspiration "balance of two realities (own and narrator)" enabled the insight on how worldview influences knowledge selection and validation from the internet. This unmeasurable aspiration turned out to be one of the most informative attributes. Therefore, in this study and in following assessments of our research, the learner's identity played a central role. One of our findings was that in case the novices' reality was distant from the content provider's viewpoint, then language was not an informative attribute. From this we can conclude that visual content at the beginning of the learning curve helps the understanding.

When the "balance of the two realities (own and narrator)" is close, then language has an impact on deep understanding. For those, whose "previous experience" level is "almost professional" and the "balance of the two realities (own and narrator)" are close, language becomes irrelevant. According to these findings, for the novice and for the almost professional, language is not an informative attribute; rather the "balance of the two realities (own and narrator)" determines the learner's expectations. This recognition led us to the idea

that in the cases where the learner's and the visualized learning content provider's levels of reality are close, then knowledge on operations and practices could be transferred without language barriers. Despite its' limitations, the study brought us a new viewpoint on the approach for visualized learning content selection.

Our journey continued in the exploration of Cyber Farmer's informal learning by YouTube, as one of the main video sharing platforms of today's digital world. In the study of this problem area our aim was to understand the learning content selection from the web. According to the long-tail theory in the case of informal learning, TED talks represent the head, and the tail consists of videos published by passionate practitioners. We argued that videos as learning contents published by passionate practitioners are not generated by the demand. In our study we assumed the co-existence of several learning content types. Therefore, we defined "learning content type" as an attribute in our knowledge base with the following values: "show an example"; "show the results from beginning to the end"; and "do-it-yourself". We feel it appropriate restate that the values of these attributes represent the reasoning of those involved in the knowledge acquisition. In another setting, the values for this aspiration could be identified in a different manner. The informal learners firstly are faced with the abundance of available content on the internet, secondly with the pre-selection by the search engines, and finally they have to validate the pre-selected contents. In the conference paper "Cyber Farmer Informal Learning Through YouTube", we presented the identified patterns of relevant learning contents for Cyber Farmers. Our findings came from the Case Based Reasoning functionality of the Doctus KBS, which supports pattern recognition and the presentation of the decision maker's mindset through "if-then" rules. Although our research was limited in scope, there were few results to highlight. For example, from the knowledge base it became apparent the role of the passionate practitioner as learning content provider, sharing knowledge on how to perform operations. These identified patterns in our study framed the succeeding step of our research.

Lastly, we developed a model for informal learning of the Cyber Farmers in the digital age, in which we incorporated our results for the learning process, the learner's identity, learning content types and learning content providers. In our paper we presented the iterative knowledge acquisition process through which our conceptual model evolved. The Rule Based reasoning functionality of Doctus KBS enabled the presentation of the logical connections among the identified attributes with "if-then" rules. In order to describe the quest for knowledge – the Cyber Farmer's informal learning – the concept of experience mining emerged in our study. We conceptualized experience mining as the process to "mine"

other's experiences from the internet. This is in line with experiential learning theory, where prior experience influences the choice of new experiences. Additionally, to the model presented in the paper in Appendix 3 we show our working model for Organic Cyber Farmers' knowledge increase.

All five identified problem areas have their own respective limitations. In the presented papers we highlighted the limitations of each study; however, we feel necessary to reinforce some of them. The received responses for our study, to understand the mindset patterns of newcomers to organic farming, represent a snapshot in time for a limited group in Hungary. Since the time we performed our study, everyone's life has been impacted by events like the COVID-19 pandemic or concerns regarding the forecasted economic impacts of it. Longitudinal studies of individual lifeways would be an interesting way to approach the phenomenon in the future. All previously highlighted impediments could be viewed as limitations, one example being the undertaking of the respondents to our survey to provide honest answers. The survey in itself had its limitations. Although for some of the responses we allowed free text, the pre-defined options limited the answers and the freedom to reflect on those questions individually. The received free-text answers triggered further discussions and exploration of notions like solastalgia or degrowth, which initially were melted into the pre-defined values. Our results are not generalizable even for the Hungarian newcomers to rural population.

For the knowledge bases built to study the learner expectations and informal learning, the limitations were highlighted in the respective articles, though one important note to be made is the number of experts and cases examined. Following the presented iterative knowledge acquisition process, the conceptual models could be further refined. The models presented in the articles resulted from the included cases. Despite these limitations our models lead to conclusions that drove us further in our exploration to understand the phenomenon.

At the beginning of our exploration of the phenomenon, we conceptualized the "Organic Cyber Farmers" as counterubanizers, who choose farming as their new profession by venturing out from their original profession, and leverage the digital era in their tentative problem solving, knowledge refreshing and sharing.

With the presented papers (Chapter 2-6) we aimed to demonstrate our journey to understand the Cyber Farmer's reality. In the research of this rising, real phenomenon, our study is one of the first ones to address it with a transdisciplinary approach. The set of papers presented in this dissertation take concepts, frameworks, thoughts from several disciplines, for example as the foundations of our understandings on counterurbanization came from

sociology, social narratives from cultural anthropology, human decisions from behavioral economics, and learning models from cognitive psychology. The results and findings we had not only depended on the questions we posed, but also the tentative solutions we proposed and the approach we had.

Therefore, as we previously highlighted, the findings should not be viewed as making up a fifth of the answer each, but rather as waypoints shaping the path for us through concepts, conceptual frameworks, and the methods to formulate the topic of the subsequent area. Another researcher unquestionably would have formulated different problem areas. However, throughout this journey the originally identified problem areas were not fundamentally altered.

Modeling the mindset patterns and human behavior with KBS provided unique insight into the reasoning of the Organic Cyber Farmers in the following areas: decision-making to choose organic farming as a new profession, learner's expectation patterns in new knowledge selection, patterns in relevant learning content validation and mindset patterns of experience miners.

Reflecting back on the thesis – antithesis – synthesis we formulated, we assumed that newcomers to organic farming do not know what they should know. The antithesis was that they know that the needed knowledge is available, and as a synthesis we deduced that searching for knowledge can be learned.

At the end of our research we understood that our protagonist, the Organic Cyber Farmer comes from a different knowledge environment and requires to learn quickly how to perform certain operations. Additionally, we also understood "from where", "from whom" and "which" knowledge elements are acceptable, useful and applicable for the Organic Cyber Farmer. Based on our understandings, we propose to all practitioners to not disregard the more or less validated contents accessible on the YouTube necessary to perform the "Artes Mechanicae" operations. Organic Cyber Farmers do not have the time nor the spirit to undergo high-school or university level training. They understood that certain operations on their farm could be performed with knowledge acquired in an informal way. In short, we could say that, our work's implication is an encouragement.

We add to literature by showing that for an actual real problem there exists a contemporary solution; in other words, informal learning through YouTube in the digital age to bridge the Organic Cyber Farmers' knowledge gap is viable.

Our efforts for publication brought several lessons. The novelty of our research results wasn't questioned, but rather was challenged where to fit. Our work partially fits (and

misfits) within the scope of journals addressing digital technology or learning in the digital age and rural studies. Finally, we realized that rural studies were the closest fit in comparison to other journals' specializations. Our transdisciplinary approach was induced by the identification of the problem areas. However, journals with transdisciplinary focus (or scope) have rather a philosophical approach and are not concerned with our practical message.

In our studies, we did not search for a single truth, we did not generalize, but searched for an explanation of a phenomenon, which hopefully will trigger thinking and action. Acknowledging the limitations of our findings, the presented model still could serve as a foundation for re-thinking the transdisciplinary co-production of knowledge in organic farming among researchers, policy makers and practitioners in the digital age.

We agree with Taleb (2014), that to displace a story, a new story is needed. Metaphors and stories as the building blocks of meta-knowledge with connecting emotions are easier to remember. This thought accompanied us on our journey from decision making to Organic Cyber Farmer's informal learning. To restate Kahneman (2013), one thinks about one's future as anticipated memories. Finally, we recognize the currency of the second "S-curve" concept in our lives and in society. As Handy (2015) puts it in order to see a better society, the start has to be in our own lives. The Second Curve is our chance to demonstrate that we learnt from the past to create a better future.

8. Appendix

8.1. Appendix 1: A, non-A, T state (multivalent logic)

According to the axiom of non-contradiction from transdisciplinary methodology (Nicolescu, 2014a), the T-state realizes the unification of the contradictory pairs (A, non-A), represented with triangles. This unification takes place on a different level of reality, which at the same time is assigned with a new pair of contradictories (A^1, non- A^1). The terms of this logic and the dynamics associated with it are represented with a triangle. Nicolescu (2014a) argues that this T-state and the included middle is the hidden third. "This signifies that starting from a certain number of mutually exclusive pairs, one can construct a new theory which eliminates contradictions at a certain level of Reality, but this theory is only temporary because it inevitably leads, under the joint pressure of theory and experience, to the discovery of new pairs of contradictories, situated at new levels of Reality" (Nicolescu, 2014a, pp.48).

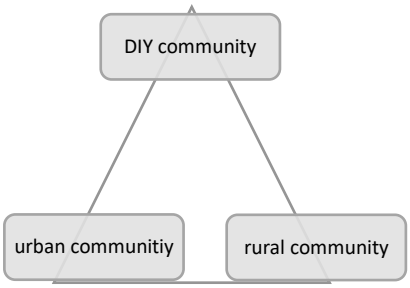


Figure 8.1: A: urban, non-A: rural, T: DIY community

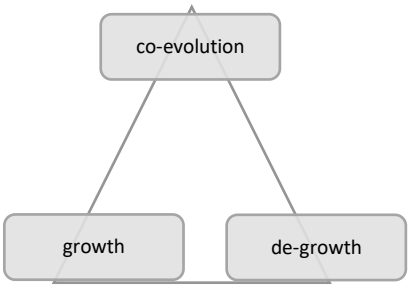


Figure 8.2: A: growth, non-A: de-growth, T: co-evolution

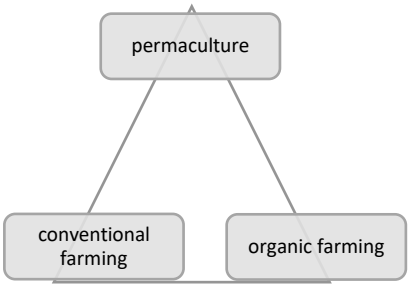


Figure 8.3: A: conventional farming, non-A: organic farming, T: permaculture

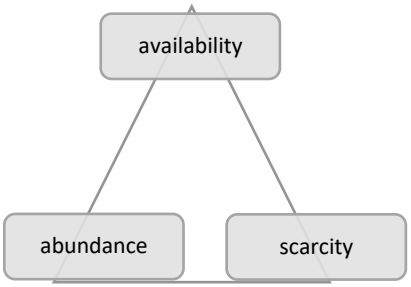


Figure 8.4: A: abundance, non-A: scarcity, T: availability

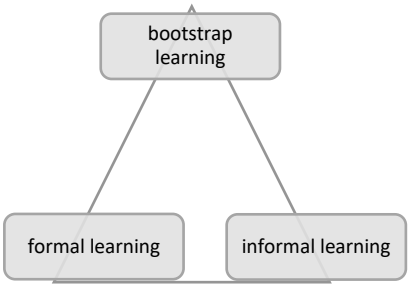


Figure 8.5: A: formal learning, non-A: informal learning, T: bootstrap learning

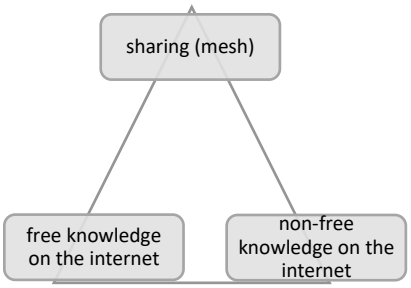


Figure 8.6: A: free knowledge on the Internet, non-A: non-free knowledge on the internet, T: sharing (mesh)

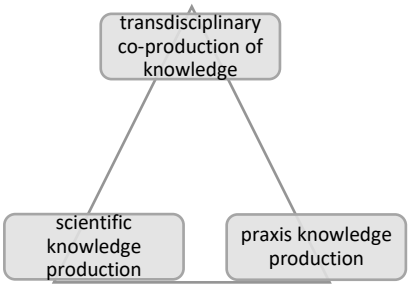


Figure 8.7: A: scientific knowledge production, non-A: praxis knowledge production, T: transdisciplinary co-production of knowledge

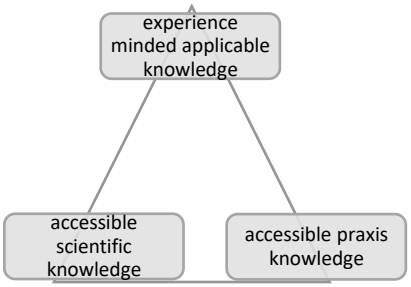


Figure 8.8: A: accessible scientific knowledge on the web, non-A: accessible praxis knowledge on the web, T: experience mined applicable knowledge on the web

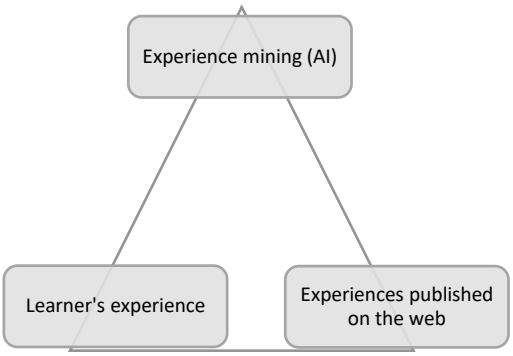


Figure 8.9: A: Learner's experience, non-A: Experience through search engine from the web, T: experience mining through AI

8.2. Appendix 2: Mindset patterns of newcomers to organic farming

The knowledge base with the attributes constituting the identified factors is presented in the Figure 8.10. The description of the attributes contains the factor identified, as an example F_1 indicating the attributes constituting factor 1.

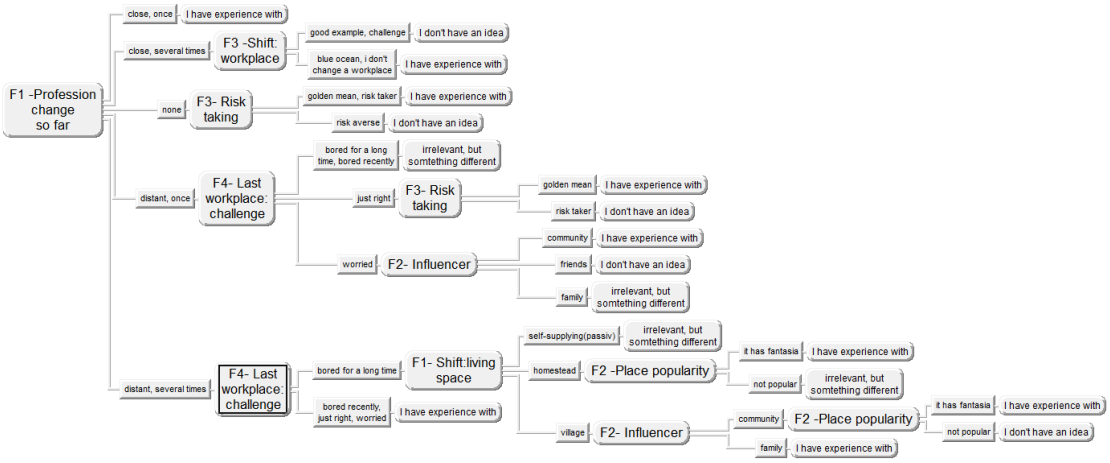
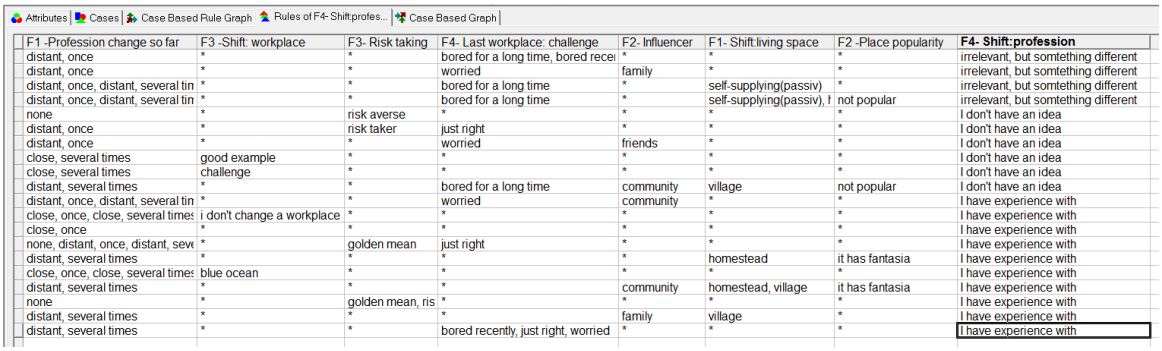


Figure 8.10: Knowledge Base with attributes from factor analysis

The logical connections between the attributes as a result of rule extraction is visible in Figure 8.11: Rules with attributes from factor analysis..



Attributes | Cases | Case Based Rule Graph | Rules of F4- Shift:profes... | Case Based Graph

F1 -Profession change so far	F3 -Shift: workplace	F3- Risk taking	F4- Last workplace: challenge	F2- Influencer	F1- Shift:living space	F2 -Place popularity	F4- Shift:profession
distant, once	*	*	bored for a long time, bored recei	*	*	*	irrelevant, but somtething different
distant, once	*	*	worried	family	*	*	irrelevant, but somtething different
distant, once, distant, several tin	*	*	bored for a long time	*	self-supplying(passiv)	*	irrelevant, but somtething different
distant, once, distant, several tin	*	*	bored for a long time	*	self-supplying(passiv), h	not popular	irrelevant, but somtething different
none	*	risk averse	*	*	*	*	I don't have an idea
distant, once	*	risk taker	just right	*	*	*	I don't have an idea
distant, once	*	*	worried	friends	*	*	I don't have an idea
close, several times	good example	*	*	*	*	*	I don't have an idea
close, several times	challenge	*	*	*	*	*	I don't have an idea
distant, several times	*	*	bored for a long time	community	village	not popular	I don't have an idea
distant, once, distant, several tin	*	*	worried	community	*	*	I have experience with
close, once, close, several times	i don't change a workplace	*	*	*	*	*	I have experience with
close, once	*	*	*	*	*	*	I have experience with
none, distant, once, distant, seve	*	golden mean	just right	*	*	*	I have experience with
distant, several times	*	*	*	*	homestead	it has fantasia	I have experience with
close, once, close, several times	blue ocean	*	*	*	*	*	I have experience with
distant, several times	*	*	*	community	homestead, village	it has fantasia	I have experience with
none	*	golden mean, ris	*	*	*	*	I have experience with
distant, several times	*	*	*	family	village	*	I have experience with
distant, several times	*	*	bored recently, just right, worried	*	*	*	I have experience with

Figure 8.11: Rules with attributes from factor analysis

Example of if-then rule for the identified factors:

if F1: Profession change so far is ‘distant, several times’ and

F4: Last workplace challenge is either ‘bored recently’, ‘just right’, ‘worried’

then F4: Shift profession is ‘I have experience with’.

8.3. Appendix 3: Conceptual model for Cyber Farmer's knowledge increase

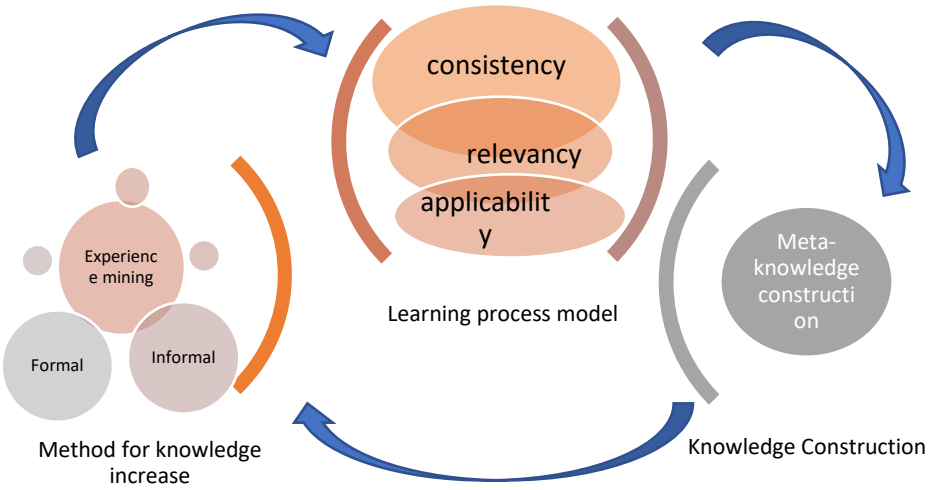


Figure 8.12: Conceptual model for Organic Cyber Farmer knowledge increase

References

Aeberhard, A. and Rist, S. (2009) ‘Transdisciplinary co-production of knowledge in the development of organic agriculture in Switzerland’, *Ecological Economics*, 68(4), pp. 1171–1181. doi: 10.1016/j.ecolecon.2008.08.008.

Anderson, C. (2006) *The Long Tail - Why the Future of Business is Selling Less of More*. Hyperion.

Anderson, C. (2009) *Free: The Future of a Radical Price*. London: Random House Business Books.

Appadurai, A. (2016) *Banking on words- The failure of language in the age of derivative finance*. Chicago and London: The University of Chicago Press.

Ariely, D. (2008) *Predictably Irrational. The hidden forces that shape our decisions*. New York: Harper Collins Publishers.

Augsburg, T. (2014) ‘Becoming transdisciplinary: The emergence of the transdisciplinary individual’, *World Futures*, 70(3–4), pp. 233–247. doi: 10.1080/02604027.2014.934639.

Bajmócy, P., Hosszú, S., Dudás, R. and Balizs, D. (2011) ‘New migration trends and their motivation in Hungary’, *Geographica Timisiensis*, 20(2), pp. 29–40.

Balakrishnan, V. and Gan, C. L. (2016) ‘Students’ learning styles and their effects on the use of social media technology for learning’, *Telematics and Informatics*, 33(3), pp. 808–821. doi: 10.1016/j.tele.2015.12.004.

Baracskai, Z. and Dörfler, V. (2017) ‘An Essay Concerning Human Decisions’, *Transdisciplinary Journal of Engineering & Science*, 8, pp. 69–80. doi: 10.22545/2017/00088.

Baracskai, Z., Velencei, J. and Dörfler, V. (2005a) ‘MABE Methodological Framework’, in *ECRM 2005: The 4th European Conference on Research Methodology for Business and Management Studies*. Université Paris-Dauphine, Paris, France.

Baracskai, Z., Velencei, J. and Dörfler, V. (2005b) ‘Reductive Reasoning’, *Montenegrin Journal of Economics*, 1(1), pp. 59–66.

Baracskai, Z., Velencei, J. and Dörfler, V. (2007) ‘The ES could probably know more: But man would not make better business decisions’, in. Bled, Slovenia.

Becker, C. (2006) ‘The human actor in ecological economics: Philosophical approach and research perspectives’, *Ecological Economics*, 60(1), pp. 17–23. doi: 10.1016/j.ecolecon.2005.12.016.

Bétrancourt, M. and Benetos, K. (2018) ‘Why and when does instructional video facilitate learning? A commentary to the special issue “developments and trends in learning with instructional video”’, *Computers in Human Behavior*, 89(471), p. 475. doi: 10.1016/j.chb.2018.08.035.

Bhide, A. (1992) ‘Bootstrap finance: the art of start-ups.’, *Harvard Business Review*, 70(6), pp. 108–116. doi: 10.1016/S0267-3649(00)88914-1.

Bijker, R. A., Haartsen, T. and Strijker, D. (2012) ‘Migration to less-popular rural areas in the Netherlands: Exploring the motivations’, *Journal of Rural Studies*, 28(4), pp. 490–498. doi: 10.1016/j.jrurstud.2012.07.003.

Botsman, R. (no date) *https://rachelbotsman.com/*. Available at: https://rachelbotsman.com/ (Accessed: 14 March 2017).

Bourdieu, P., Passeron, J.-C. and de Saint Martin, M. (1996) *Academic Discourse: Linguistic Misunderstanding and Professorial Power*. Palo Alto, California: Stanford University Press.

Brédart, D. and Stassart, P. M. (2017) ‘When farmers learn through dialog with their practices: A proposal for a theory of action for agricultural trajectories’, *Journal of Rural Studies*, 53, pp. 1–13. doi: 10.1016/j.jrurstud.2017.04.009.

Brophy, P. (2009) *Narrative-based Practice*. Surrey, England: Ashgate Publishing, Ltd.

Brown, D. L., Kulcsár, L. J., Kulcsár, L. and Obádovics, C. (2005) ‘Post-socialist restructuring and population redistribution in Hungary’, *Rural Sociology*, 70(3), pp. 336–359. doi: 10.1526/0036011054831170.

Brown, J. S., Denning, S., Groh, K. and Prusak, L. (2004) *Storytelling in Organizations: Why Storytelling Is Transforming 21st Century Organizations and Management*. Butterworth-Heinemann.

Brown, J. S., Denning, S., Groh, K. and Prusak, L. (2005) *Storytelling in Organizations: Why Storytelling Is Transforming 21st Century Organizations and Management*. Oxford, UK: Elsevier Butterworth-Heinemann.

Bruner, J. (1985) ‘Narrative and paradigmatic modes of thought’, *Learning and Teaching: The Ways of Knowing*. doi: 10.1016/j.jconhyd.2010.08.009.

Bruner, J. (1986) *Actual minds, possible worlds*. Cambridge, Massachusetts, London: Harvard University Press.

Bruner, J. (1997) ‘A narrative model of self-construction’, in *Annals of the New York Academy of Sciences*, pp. 145–161. doi: 10.1111/j.1749-6632.1997.tb48253.x.

Bruner, J. S. (2004) ‘Jerome Bruner Life as Narrative’, *Social Research*. doi: 10.1007/s10780-008-9039-2.

Carr, N. (2011) *The Shallows: What the internet is doing to our brains*. New York, London: W.W. Norton and Company.

Carr, N. (2014) *The glass cage: how our computers are changing us*. New York, London: W.W. Norton and Company.

Carr, N. (2016) *The illusion of knowledge*. Available at: http://www.roughtype.com/?p=5874 (Accessed: 15 September 2016).

del Cerro Santamaría, G. (2015) 'Transdisciplinary technological futures: An ethnographic research dialogue between social scientists and engineers', *Technology in Society*, 40, pp. 53–63. doi: 10.1016/j.techsoc.2014.10.005.

Cetto, A., Klier, M., Richter, A. and Zolitschka, J. F. (2018) '"Thanks for sharing"—Identifying users' roles based on knowledge contribution in Enterprise Social Networks', *Computer Networks*, 135, pp. 275–288. doi: 10.1016/j.comnet.2018.02.012.

Costanza, R. (1991) *Ecological Economics: the Science and Management of Sustainability*. New York: Columbia University Press.

Cristobal-Fransi, E., Montegut-Salla, Y., Ferrer-Rosell, B. and Daries, N. (2020) 'Rural cooperatives in the digital age: An analysis of the Internet presence and degree of maturity of agri-food cooperatives' e-commerce', *Journal of Rural Studies*. Pergamon, 74, pp. 55–66. doi: 10.1016/j.jrurstud.2019.11.011.

Cross, J. (2007) *Informal Learning. Rediscovering the natural pathways that inspire innovation and performance*. San Francisco, CA, USA: Pfeiffer.

Csurgó, B. (2013) *Vidéken lakni és vidéken élni*. Argumentum.

Cyr, J. (2019) *Focus Groups for the Social Science Researcher*. Cambridge University Press. doi: 10.1017/9781316987124.

Darbellay, F. (2015) 'Rethinking inter- and transdisciplinarity: Undisciplined knowledge and the emergence of a new thought style', *Futures*, 65, pp. 163–174. doi: 10.1016/j.futures.2014.10.009.

Denning, S. (2004) 'Telling Tales', *Harvard Business Review*, pp. 122-129+152. doi: 10.4324/9781315714622-12.

Denning, S. (2005) *The Leader's Guide to Storytelling: Mastering the Art and Discipline of Business Narrative*. Jossey-Bass.

Dennis, C. A., Springbett, O. and Walker, L. (2020) 'Further education college leaders: Securing the sector's future', *Futures*, 115. doi: 10.1016/j.futures.2019.102478.

Dörfler, V. and Baracskai, Z. (2017) ‘Fishing for meta-knowledge: A case for transdisciplinary validation’, in *IFKAD 2017: 12th International Forum on Knowledge Asset Dynamics*. Petersburg, Russia.

Dreyfuss, S. E. and Dreyfus, H. L. (1980) ‘A five-stage model of the mental activities involved in directed skill acquisition’, *Operations Research Center*, (February), pp. 1–18. doi: ADA084551.

Duke, B., Harper, G. and Johnston, M. (1966) ‘Connectivism as a Learning Theory for the Digital Age’, *International Journal of Instructional Technology and Distance Learning*, pp. 1–9.

Fleck, L. (1979) *Genesis and Development of a Scientific Fact*. Chicago: The University of Chicago Press.

Fox, S. (2014) ‘Third Wave Do-It-Yourself (DIY): Potential for prosumption, innovation, and entrepreneurship by local populations in regions without industrial manufacturing infrastructure’, *Technology in Society*, 39, pp. 18–30. doi: 10.1016/j.techsoc.2014.07.001.

Füredi, F. (2002) *Culture of fear - Risk taking and the morality of low expectation*. Revised ed. London, UK: Continuum London New York.

Gavrilova, T. A. and Leshcheva, I. A. (2015) ‘Ontology design and individual cognitive peculiarities: A pilot study’, *Expert Systems with Applications*, 42(8), pp. 3883–3892. doi: 10.1016/j.eswa.2015.01.008.

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. and Trow, M. (2010) *The new production of knowledge: the dynamics of science and research in contemporary societies*. London: SAGE Publications Ltd. doi: 10.4135/9781446221853.

Gibbs, P. (2015) *Transdisciplinary professional learning and practice, Springer*. London, UK. doi: 10.1007/978-3-319-11590-0.

Goulet, F. (2013) ‘Narratives of experience and production of knowledge within farmers’ groups’, *Journal of Rural Studies*, 32, pp. 439–447. doi: 10.1016/j.jrurstud.2013.09.006.

Guile, D. (2001) ‘Education and the economy: Rethinking the question of learning for the “knowledge” era’, *Futures*, pp. 469–482. doi: 10.1016/S0016-3287(00)00091-4.

Guimarães, M. H., Pohl, C., Bina, O. and Varanda, M. (2019) ‘Who is doing inter- and transdisciplinary research, and why? An empirical study of motivations, attitudes, skills, and behaviours’, *Futures*, 112. doi: 10.1016/j.futures.2019.102441.

Halfacree, K. (2008) ‘To revitalise counterurbanisation research? Recognising an international and fuller picture’, *Population, Space and Place*, 14(6), pp. 479–495. doi: 10.1002/psp.501.

Halfacree, K. (2012) ‘Heterolocal Identities? Counter-Urbanisation, Second Homes, and Rural Consumption in the Era of Mobilities’, *Population, Space and Place*, 18(2), pp. 209–224. doi: 10.1002/psp.665.

Handy, C. (1998) *The Hungry Spirit: Beyond Capitalism – A Quest for Purpose in the Modern World*. London: Arrow Books, UK.

Handy, C. (2015) *The Second Curve: Thoughts on Reinventing Society*. Random House UK.

Hong, J. C., Hwang, M. Y., Szeto, E., Tsai, C. R., Kuo, Y. C. and Hsu, W. Y. (2016) ‘Internet cognitive failure relevant to self-efficacy, learning interest, and satisfaction with social media learning’, *Computers in Human Behavior*, 55, pp. 214–222. doi: 10.1016/j.chb.2015.09.010.

Horlick-Jones, T. and Sime, J. (2004) ‘Living on the border: Knowledge, risk and transdisciplinarity’, *Futures*, 36(4), pp. 441–456. doi: 10.1016/j.futures.2003.10.006.

i Rico, N. M. and Fuller, A. M. (2016) ‘Newcomers to farming: Towards a new rurality in Europe’, *Documents d’Analisi Geografica*, 62(3), pp. 531–551. doi: 10.5565/rev/dag.376.

Ilcsikné Makra, Z., Bajmócy, P. and Balogh, A. (2018) ‘Villages on the edge of extinction-The Hungarian situation’, *Journal of Settlements and Spatial Planning*, 9(1), pp. 35–45. doi: 10.24193/JSSP.2018.1.04.

Jahn, T., Bergmann, M. and Keil, F. (2012) ‘Transdisciplinarity: Between mainstreaming and marginalization’, *Ecological Economics*, pp. 1–10. doi: 10.1016/j.ecolecon.2012.04.017.

Jenkins, A. and Garvey, R. (2001) ‘Developing human potential at work’, *Futures*, 33(6), pp. 461–467. doi: 10.1016/s0016-3287(00)00090-2.

Kahneman, D. (2013) *Thinking fast and slow*. New York: Farrar, Straus and Giroux.

Kanngiesser, P. and Hood, B. M. (2014) ‘Young children’s understanding of ownership rights for newly made objects’, *Cognitive Development*, 29(1), pp. 30–40. doi: 10.1016/j.cogdev.2013.09.003.

Király, G. and Géring, Z. (2019) ‘Editorial: Introduction to “Futures of Higher Education” special issue’, *Futures*, 111, pp. 123–129. doi: 10.1016/j.futures.2019.03.004.

Kläy, A., Zimmermann, A. B. and Schneider, F. (2015) ‘Rethinking science for sustainable development: Reflexive interaction for a paradigm transformation’, *Futures*, 65, pp. 72–85. doi: 10.1016/j.futures.2014.10.012.

Klein, J. T. (2015) ‘Reprint of “Discourses of transdisciplinarity: Looking back to the future”’, *Futures*, 65, pp. 10–16. doi: 10.1016/j.futures.2015.01.003.

Kolb, D. and Fry, R. (1974) ‘Toward an Applied Theory of Experiential Learning’, in Cooper, C. (ed.) *Theories of group process*. New York: Jon Wiley and Sons.

Von Krogh, G., Ichijo, K. and Nonaka, I. (2000) *Enabling Knowledge Creation: How To Unlock the Mystery of Tacit Knowledge and Release the Power of Innovation, Enabling Knowledge Creation: How to Unlock the Mystery of Tacit Knowledge and Release the Power of Innovation*. Oxford University Press. doi: 10.1093/acprof:oso/9780195126167.001.0001.

Kuhn, T. S. (1996) *The structure of scientific revolutions*. 3rd edn. Chicago and London: University of Chicago Press.

Landini, F., Brites, W. and Mathot y Rebolé, M. I. (2017) ‘Towards a new paradigm for rural extensionists’ in-service training’, *Journal of Rural Studies*. Pergamon, pp. 158–167. doi: 10.1016/j.jrurstud.2017.02.010.

Lawrence, R. J. (2015) ‘Advances in transdisciplinarity: Epistemologies, methodologies and processes’, *Futures*, pp. 1–9. doi: 10.1016/j.futures.2014.11.007.

Leahy, S. M., Holland, C. and Ward, F. (2019) ‘The digital frontier: Envisioning future technologies impact on the classroom’, *Futures*, 113. doi: 10.1016/j.futures.2019.04.009.

Malinen, S. (2015) ‘Understanding user participation in online communities: A systematic literature review of empirical studies’, *Computers in Human Behavior*, 46, pp. 228–238. doi: 10.1016/j.chb.2015.01.004.

Mao, J. (2014) ‘Social media for learning: A mixed methods study on high school students’ technology affordances and perspectives’, *Computers in Human Behavior*, 33, pp. 213–223. doi: 10.1016/j.chb.2014.01.002.

March, J. G. (1978) ‘Bounded Rationality, Ambiguity, and the Engineering of Choice’, *The Bell Journal of Economics*, 9(2), pp. 587–608. doi: 10.2307/3003600.

March, J. G. (1991) ‘How Decisions Happen in Organizations’, *Human–Computer Interaction*, 6(2), pp. 95–117. doi: 10.1207/s15327051hci0602_1.

March, J. G. and Simon, H. A. (1958) *Organizations*. Wiley.

Marsick, V. J. and Watkins, K. E. (2001) ‘Informal and Incidental Learning’, *New Directions for Adult and Continuing Education*, 2001(89), p. 25. doi: 10.1002/ace.5.

Max-Neef, M. A. (2005) ‘Foundations of transdisciplinarity’, *Ecological Economics*, 53(1), pp. 5–16. doi: 10.1016/j.ecolecon.2005.01.014.

Milone, P., Fuller, T., Ventura, F., van der Ploeg, J. D., Marsden, T., Schneider, S., Ye, J., Carolan, M. S., Scott, S. and Monllor I Rico, N. (2018) ‘Book review’, *Journal of Rural Studies*. Pergamon, 57, pp. 78–87. doi: 10.1016/j.jrurstud.2017.10.003.

Milone, P. and Ventura, F. (2019) ‘New generation farmers: Rediscovering the peasantry’, *Journal of Rural Studies*, 65, pp. 43–52. doi: 10.1016/j.jrurstud.2018.12.009.

Misra, S. and Stokols, D. (2012) ‘A typology of people-environment relationships in the Digital Age’, *Technology in Society*, 34(4), pp. 311–325. doi: 10.1016/j.techsoc.2012.10.003.

Mitchell, C. J. A. (2004) ‘Making sense of counterurbanization’, *Journal of Rural Studies*, 20(1), pp. 15–34. doi: 10.1016/S0743-0167(03)00031-7.

Moghavvemi, S., Sulaiman, A., Jaafar, N. I. and Kasem, N. (2018) ‘Social media as a complementary learning tool for teaching and learning: The case of youtube’, *International Journal of Management Education*, 16(1), pp. 37–42. doi: 10.1016/j.ijme.2017.12.001.

Morgan, D. (1997) ‘Focus Groups as Qualitative Research’. Thousand Oaks, California. doi: 10.4135/9781412984287.

Mößner, N. (2011) ‘Thought styles and paradigms-a comparative study of Ludwik Fleck and Thomas S. Kuhn’, *Studies in History and Philosophy of Science Part A*, 42(2), pp. 362–371. doi: 10.1016/j.shpsa.2010.12.002.

Ní Laoire, C. (2007) ‘The “green green grass of home”? Return migration to rural Ireland’, *Journal of Rural Studies*, 23(3), pp. 332–344. doi: 10.1016/j.jrurstud.2007.01.005.

Nicolescu, B. (2002) *Manifesto of Transdisciplinarity (Translated by Karen-Claire Voss). Suny Series in Western Esoteric Traditions. 2002, New York: SUNY Press*.

Nicolescu, B. (2005) ‘Towards Transdisciplinary Education’, *The Journal for Transdisciplinary Research in Southern Africa*. doi: 10.4102/td.v1i1.300.

Nicolescu, B. (2010) ‘Methodology of Transdisciplinarity – Levels of Reality , Logic of the Included Middle and Complexity’, *Transdisciplinary Journal of Engineering and Science*. doi: 10.1080/02604027.2014.934631.

Nicolescu, B. (2014a) *From Modernity to Cosmodernity: Science, Culture, and Spirituality*. Albany, NY: State University of New York Press.

Nicolescu, B. (2014b) ‘Multidisciplinarity, Interdisciplinarity, Indisciplinarity, and Transdisciplinarity: Similarities and Differences’, *RCC Perspectives*. Rachel Carson Center, (2), pp. 19–26. Available at: http://www.jstor.org/stable/26241230.

Norton, M. I., Mochon, D. and Ariely, D. (2012) ‘The IKEA effect: When labor leads to love’, *Journal of Consumer Psychology*, 22(3), pp. 453–460. doi: 10.1016/j.jcps.2011.08.002.

Oliveira, H. and Penha-Lopes, G. (2020) ‘Permaculture in Portugal: Social-ecological inventory of a re-ruralizing grassroots movement’, *European Countryside*, 12(1), pp. 30–52. doi: 10.2478/euco-2020-0002.

Oreszczyn, S., Lane, A. and Carr, S. (2010) ‘The role of networks of practice and webs of influencers on farmers’ engagement with and learning about agricultural innovations’, *Journal of Rural Studies*, 26(4), pp. 404–417. doi: 10.1016/j.jrurstud.2010.03.003.

Phillips, M. (2010) ‘Counterurbanisation and rural gentrification: An exploration of the terms’, *Population, Space and Place*, 16(6), pp. 539–558. doi: 10.1002/psp.570.

Pink, D. (2005) *Whole New Mind: Moving from the Information Age to the Conceptual Age.* New York: Riverhead Books.

Pohl, C. (2008) ‘From science to policy through transdisciplinary research’, *Environmental Science and Policy*, 11(1), pp. 46–53. doi: 10.1016/j.envsci.2007.06.001.

Polányi, M. (1962) *Personal Knowledge - Towards a post-critical phylosophy*. London, UK: Routledge.

Polk, M. (2015) ‘Transdisciplinary co-production: Designing and testing a transdisciplinary research framework for societal problem solving’, *Futures*. doi: 10.1016/j.futures.2014.11.001.

Popa, F., Guillermin, M. and Dedeurwaerdere, T. (2015) ‘A pragmatist approach to transdisciplinarity in sustainability research: From complex systems theory to reflexive science’, *Futures*, 65, pp. 45–56. doi: 10.1016/j.futures.2014.02.002.

Popper, K. R. (1992) *Unended quest: An intellectual autobiography*. New Editio. London, UK: Routledge.

Prensky, M. (2001a) ‘Digital Natives, Digital Immigrants Part 1’, *On the Horizon*, 9(5), pp. 1–6. doi: 10.1108/10748120110424816.

Prensky, M. (2001b) ‘Digital Natives, Digital Immigrants Part 2: Do They Really Think Differently?’, *On the Horizon*, 9(6), pp. 1–6. doi: 10.1108/10748120110424843.

Prensky, M. (2009) ‘H. sapiens digital: From digital immigrants and digital natives to digital wisdom’, *Innovate: Journal of Online Education*, 5(3), pp. 1–9. Available at: https://nsuworks.nova.edu/innovate/vol5/iss3/1/.

Quinlan, J. R. (1986) ‘Induction of Decision Trees’, *Machine Learning*, 1(1), pp. 81–106. doi: 10.1023/A:1022643204877.

Robinson, K. (2006) *Do schools kill creativity? TED Talk, TED.com*. Available at: https://www.ted.com/talks/sir_ken_robinson_do_schools_kill_creativity?language=en.

Saunders, M., Lewis, P. and Thornhill, A. (2007) *Research Methods for Business Students*. Fourth. Essex: Pearson Education Limited.

Schöll, R. and Binder, C. R. (2010) 'Comparison of farmers' mental models of the present and the future: A case study of pesticide use', *Futures*, 42(6), pp. 593–603. doi: 10.1016/j.futures.2010.04.030.

Schön, D. A. (1983) *The Reflective Practitioner: How Professionals Think in Action*. New York: Basic Books.

Seabrook, M. F. and Higgins, C. B. R. (1988) 'The role of the farmer's Self-Concept in determining farmer behaviour', *Agricultural Administration and Extension*, 30(2), pp. 99–108. doi: 10.1016/0269-7475(88)90119-5.

Shucksmith, M. (2018) 'Re-imagining the rural: From rural idyll to Good Countryside', *Journal of Rural Studies*, 59, pp. 163–172. doi: 10.1016/j.jrurstud.2016.07.019.

Siemens, G. (2005) 'Connectivism: A learning theory for the digital age', in *International Journal of Instructional Technology and Distance Learning*.

Siemens, G. (2006) *Knowing knowledge*. Lulu.

Simon, H. A. (1971) *Designing organizations for an information-rich world*. Available at: https://digitalcollections.library.cmu.edu/awweb/awarchive?type=file&item=33748 (Accessed: 25 March 2020).

Simon, H. A. (1977) *The New Science of Management Decision*. Upper Saddle River, NJ, USA: Prentice Hall PTR.

Šimon, M. (2014) 'Exploring counterurbanisation in a post-socialist context: Case of the Czech Republic', *Sociologia Ruralis*, 54(2), pp. 117–142. doi: 10.1111/j.1467-9523.2012.00576.x.

Simonyi, K. (1997) 'A hét szabad és a hét mechanikai művészet', *Ponticulus Hungaricus*, 1(1).

Smith, R. (2016) 'Why Every Startup Should Bootstrap', *Harvard Business Review*, 94(3), pp. 48–61.

Stockdale, A. (2014) 'Unravelling the migration decision-making process: English early retirees moving to rural mid-Wales', *Journal of Rural Studies*, 34, pp. 161–171. doi: 10.1016/j.jrurstud.2014.01.010.

Stockdale, A. and MacLeod, M. (2013) 'Pre-retirement age migration to remote rural areas', *Journal of Rural Studies*. Elsevier Ltd, 32, pp. 80–92. doi: 10.1016/j.jrurstud.2013.04.009.

Sulemana, I. and James, H. S. (2014) 'Farmer identity, ethical attitudes and environmental practices', *Ecological Economics*, 98, pp. 49–61. doi: 10.1016/j.ecolecon.2013.12.011.

Šūmane, S., Kunda, I., Knickel, K., Strauss, A., Tisenkopfs, T., Rios, I. des I., Rivera, M., Chebach, T. and Ashkenazy, A. (2018) 'Local and farmers' knowledge matters! How integrating informal and formal knowledge enhances sustainable and resilient agriculture', *Journal of Rural Studies*. Pergamon, 59, pp. 232–241. doi: 10.1016/j.jrurstud.2017.01.020.

Taleb, N. N. (2014) *Antifragile. Things that gain from disorder*. New York: Random House.

Tam, S. M. and Cheung, K. C. (2000) 'Genetic algorithm based defect identification system', *Expert Systems with Applications*. Elsevier Science Ltd, 18(1), pp. 17–25. doi: 10.1016/S0957-4174(99)00046-9.

Thaler, R. H. (2015) *Misbehaving- The making of behavioral economics*. New York: W.W. Norton and Company.

Thaler, R. H. and Sunstein, C. R. (2008) *Nudge- Improving decisions about health, wealth and happiness*. New Haven&London: Yale University Press.

Tiwari, S., Lane, M. and Alam, K. (2019) 'Do social networking sites build and maintain social capital online in rural communities?', *Journal of Rural Studies*. Pergamon, 66, pp. 1–10. doi: 10.1016/j.jrurstud.2019.01.029.

Tversky, A. and Kahneman, D. (1981) 'The Framing of Decisions and the Psychology of Choice', *Science*, 211(4481), pp. 453–458. doi: 10.1126/science.7455683.

Vandermeulen, V. and Van Huylenbroeck, G. (2008) 'Designing trans-disciplinary research to support policy formulation for sustainable agricultural development', *Ecological Economics*, 67(3), pp. 352–361. doi: 10.1016/j.ecolecon.2008.05.016.

Varga, E. (2017) 'Global versus local knowledge in DIY economy', in Yongqiang, L., Hunjet, A., and Roncevic, A. (eds) *Economic and Social Development (Book of Proceedings)*. Prague: Varazdin Development and Entrepreneurship Agency, Varazdin, Croatia, pp. 437–442. Available at: https://bib.irb.hr/datoteka/983301.Book_of_Proceedings_esdPrague_2017.pdf#page=446.

Varga, E. and Baracskai, Z. (2018) 'Cyber DIY: Learner expectation patterns in new knowledge', in Van der Meer, H., Enthoven, G., and Schiuma, G. (eds) *Proceedings IFKAD 2018*. Delft, Netherlands, pp. 1866–1874.

Varga, E. and Baracskai, Z. (2020a) *A New Learning Process: The knowledge increase of Cyber Farmers in the digital age*.

Varga, E. and Baracskai, Z. (2020b) 'Cyber Farmer Informal Learning Through YouTube', in *Proceedings INTED 2020, 14th International Technology, Education and Development Conference*. Valencia, Spain, pp. 7560–7566. doi: doi: 10.21125/inted.2020.2029.

Varga, E. and Baracskai, Z. (2020c) *Mindset patterns of newcomers to organic farming*.

Velencei, J. (2014) ‘Age of Shallows: Humour helps pay attention’, in *ICERI2014 Proceedings*. IATED (7th International Conference of Education, Research and Innovation), pp. 6208–6213.

Velencei, J. (2017) ‘Modeling the Reality of Decision Making with the Doctus Knowledge-based System’, in *Enterprise and Competitive Environment, Brno, Czechia: Mendel University in Brno*, pp. 865–871.

Velencei, J., Baracskai, Z., Dörfler, V. and Stierand, M. (2016) ‘Supporting the Competent Practitioner: Trans-Disciplinary Coaching with a Knowledge-Based Expert System’, *International Journal of Management Science and Business Administration*, 2(12), pp. 20–27. doi: 10.18775/ijmsba.1849-5664-5419.2014.212.1002.

Velencei, J., Dörfler, V., Baracskai, Z. and Szendrey, J. (2015) ‘Prelude for Experience Mining (Re-)Using Relevant Experience for Smart Decision Support’, in *International OFEL Conference on Governance, Management and Entrepreneurship*. Dubrovnik, Croatia.

Wagner, W. P. (2017) ‘Trends in expert system development: A longitudinal content analysis of over thirty years of expert system case studies’, *Expert Systems with Applications*, 76, pp. 85–96. doi: 10.1016/j.eswa.2017.01.028.

Warner-Søderholm, G., Bertsch, A., Sawe, E., Lee, D., Wolfe, T., Meyer, J., Engel, J. and Fatilua, U. N. (2018) ‘Who trusts social media?’, *Computers in Human Behavior*, 81, pp. 303–315. doi: 10.1016/j.chb.2017.12.026.

Wenger, E. (1998) *Communities of Practice: Learning, Meaning, and Identity*. Cambridge, UK: Cambridge University Press.

Wenger, E. (2000) ‘Communities of Practice and Social Learning Systems’, *Organization*, 7(2), pp. 225–246. doi: 10.1177/135050840072002.

Wenger, E. and Trayner-Wenger, B. (2015) ‘Communities of practice: a brief introduction’, *Communities of practice*, 15(5), pp. 1–8. doi: 10.2277/0521663636.

Wielinga, B., Sandberg, J. and Schreiber, G. (1997) ‘Methods and techniques for knowledge management: What has knowledge engineering to offer?’, *Expert Systems with Applications*, 13(1), pp. 73–84. doi: https://doi.org/10.1016/S0957-4174(97)00023-7.

Wójcik, M., Jeziorska-Biel, P. and Czapiewski, K. (2019) ‘Between words: A generational discussion about farming knowledge sources’, *Journal of Rural Studies*. Pergamon, 67, pp. 130–141. doi: 10.1016/j.jrurstud.2019.02.024.

Yang, H. L. and Lai, C. Y. (2010) ‘Motivations of Wikipedia content contributors’, *Computers in Human Behavior*, 26(6), pp. 1377–1383. doi: 10.1016/j.chb.2010.04.011.