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Theses of Doctoral (PhD) Dissertation

UNDERSTANDING UNCERTAINTY IN FUTURES RESEARCH AND INNOVATION STUDIES

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1 Antecedents to the research

Risk research classically concentrates to calculable uncertainty. Meanwhile exploration of the full scale of uncertainty is getting more and more important. Research on future shifted more and more from forecasting to assuming an open future. These approaches that take into account the hypothesis of open future are called Futures Studies. Especially Technology Foresight, that specialised itself to serve for governmental needs, tries to differentiate itself in terms of institutionalisation and methodology.

Technology foresight serves for innovation policy. It developed together with the changing needs of the latter. Its leading researchers gave a summarising account of this development in 2008. Simultaneously, they set the basic tasks for further development of 'foresight'. In the same time, attention has been more and more concentrated to development of such tools like Environmental scanning, weak signs, wild cards and analysis of expectation cycles.

There is an immense development in involving public participation in the development of knowledge of uncertain situations. This connects to the democratisation of regulation toward participatory democracy.

Roadmapping became acknowledged method in long range planning. Roadmaps were prepared for example for 'hydrogen economy'. It becomes obvious that exploring roadmaps as communication tools is fully missing, if you make a search of the special literature.

Genesis of emerging technologies as radical innovations raises basic regulation problems, for the usual legal regulation can not function because of the emerging radical uncertainties. Principle of precaution has been developed in different variants. Some sort of precaution would allow that a co-operation between those who develop the technologies and their critics realises

2 Goals

Goal of the dissertation is to make a critical summary of those investigations which intend to uncover and manage the whole scale of uncertainty. That is why I investigate into the actual tasks in the field of 'technology foresight'. This investigation is partly descriptive, partly critically analysing. Investigation has to demonstrate, on the one side, the state-of-the art where I follow the existence of basic uncertainty. On the other side, it has to demonstrate

what sorts of further tasks are possible to solve and what sorts of starting point should be outlined to their solution.

Because of its comprehensive importance, development of the instruments uncovering the basic forms of essential uncertainties and development of methods of their management in societally acceptable manner have special scientific and political importance. This topic is unique for its future dimension and also for its steadily growing weight in the global innovation race.

But both futures studies and innovation research remain partly in debt in this respect, meanwhile the basic uncertainties become everyday issues, because of the growing complexity of the societal processes. Surprising crises are already everyday reality, even when it sounds very paradoxical.

3 Investigation methods

My method is essentially interdisciplinary and utilises the newest results of the so called 'science-technology-society studies'. I utilise, but with different weights, all the three investigation possibilities (the theoretical, the case studies, the historical).

First of all, I criticise, from the theoretical and methodological point of view, such general approaches like 'technology foresight' and such instruments of great importance like 'environment scanning', scenario construction or roadmapping. I add to this with critical analytical investigation into such especially important issues like the 'hydrogen economy' and the regulation of emerging technologies.

I utilise historical overview both with the theoretical research and the study on the practical case. This allows that I can reach basic theoretical and methodological conclusions. I enclose an Appendix to the dissertation. First, I summarise critical weaknesses of recent histories of risk. I add some statements on the characteristics of roadmaps, completing the description made in the dissertation that was very short by necessity. At the end I summarise the results of the research made together with a South-Korean PhD student on the historical development of the 'hydrogen economy' as critical case of the long term planning in Hungary and the South-Korean Republic.

4 Summary

My dissertation deals with investigation and management tools of 'deep uncertainty'. This is a basic task for futures research and management. We can speak about 'deep uncertainty' when the preconditions are missing to make calculations of risks with predictive intention. It is an invaluable result how calculability was raised in the field of risk, but it is also essential for futures research and innovation research to reach the highest possible rationality in describing and managing 'deep uncertainties'.

I critically investigate in my dissertation first into 'foresight' efforts, then more widely, methods of 'environment scanning', 'weak signs', 'wild cards'. I emphasise the special importance of 'unbelievable scenarios' in future studies. Public participation is of highest importance both in the uncovering as well as management of 'deep uncertainties', especially participation of 'concerned groups'. 'Precautionary principle' gets special importance in dealing with 'deep uncertainty'. I point to the fact that correct interpretation of the 'precautionary principle' always involves forecare as being precautionary for preserving some of our values.

I investigate into the importance of roadmapping in long term strategic planning. Roadmap show the best road in cases of good calculability, while roadmapping will itself be a part of providing for some road in case of 'deep uncertainty', of 'open future'. Any roadmap requires to commit some standpoint concerning construction and realisation of a self-realising foresight. Communication and rhetorical role of a roadmap is especially important in such cases. A special paradox exists. 'Deep uncertainty' certainly influences long term strategic planning critically, because you can construct a roadmap only when you have some goal or goal-vision at least. With this the long term accomodation will be restricted. On the other side, roadmaps, at their nodes, uncover 'deep uncertainties'. Roadmaps formulate expert opinions in such cases if the task would be assessed to be able to be solved. This is expressed with their rhetoric too. It is unavoidable to make a full-fledged explication and critical investigation of these expert opinions to provide for the realisation of the limited but essential task of roadmaps.

I explore a case from the practice. I demonstrate with the plan of realising a 'hydrogen economy' that this is a recent commitment to a 50 year long comprehensive effort. In this case it is of special importance to see what sorts of damages and benefits emerge when, on the base of this recent selection decision, the chosen alternative is seen as unique. Roadmaps get a basic role in this commitment. Long term strategic planning prefers more flexible strategies

already. I also demonstrate that on the highest levels of decision makers and experts an army of unacceptable argumentation tools are deployed, to help transforming the plan of a hydrogen economy into a self-realising 'game'.

There is 'deep uncertainty' in the field of emerging innovations. This is essential problem for the regulation dimension too, because it is impossible to order proportional reward or punishment to well-known actions. Self-regulation remains in such cases for development. This means the priority of co-operation among the participants being in critical opposition. It raises to working out a 'code of behaviour', as the emerging self-regulation in the field of nanotech shows a case for. The emerging self-regulation of this field provides for an exemplar for self-regulation of any emergence phase of any emerging technology. I interpret this in my dissertation with some criticism.

5 New scientific results

My dissertation traces the newest tendencies in futures research and innovation studies and – management. The newest tendencies in risk research make their basis. Goal of the dissertation is to investigate into the manner the descriptive-analytical and management task of 'essential uncertainty' realise in futures research and innovation research.

I vindicate some right of originality with the descriptive summary of the state-of-the art with every issue. These are my summaries of the processes and situations. I summarise my results in 6 theses and two sub-theses. They express the new scientific results in a comprised way.

Theses

Thesis 1: Taking into account ‘deep uncertainty’ is essential to meet the recent societal and technological challenges adequately. Precaution, a rational answer to meet ‘deep uncertainty’ when first meeting it, is forecare. Successful radical innovations demonstrate how some sort of ‘deep uncertainties’ can be turned even into issues of quantitative risk takings.

(Chapter 1)

Publications: [1] [7] [8][18][19] [26] [34]

Thesis 2: Notwithstanding its all development, ‘Foresight’ as research under conditions of ‘incertitude’ shows basic problems from the point of view of methodology. These are only partially awoken to consciousness. The ‘future-oriented technology analysis’ is a trial to renew the approach, but basic weaknesses remain. Concerning the task that an up-to-date ‘technology foresight’ has to solve in serving for the already recognised newest generation of innovation policy it is unavoidable to take into account the appropriate exploration of ‘deep uncertainty’, strengthening public participation, and realisation of technology assessment as a ‘double fictitious’ but systematic speculation on futures.

(Chapter 2)

Publications: [24] [28]

Thesis 3: A series of renewing and new instruments appear in the instrumentarium of futures studies. All these group around the problem of ‘deep uncertainty’. There is an interpretation and definition chaos in the fields of environment scanning, weak signals and wild cards, as I demonstrate. A new period of futures research is announced with the recently reached new knowledge of ‘impossible scenarios’ as special wild cards. Dissemination of this new methodology is rather backward, notwithstanding the pioneering role of introducing ‘impossible scenarios’. With this futures studies set limits to itself.

(Chapter 3)

Publications:[4] [8] [18] [23] [28]

Thesis 4: ‘Concerned groups’ should get essential role in the exploration of the necessary and possible changes of directions of innovation dynamics. This role involves the working along a special cognitive and socio-political perspective. In this working the realisation of the cognitive role that is not substitutable, leads to a democratisation that overcomes what von Hippel conceptualises as ‘democratization of innovation’.

(Chapter 4)

Publications: [1] [8] [9] [17] [32] [36]

Thesis 5: Long term strategic roadmapping has basic limits that are not discussed. These roadmaps are trials to help in alignment of actors too. ‘Hydrogen economy’

shows problematic communication aspects both with its roadmaps and expert rhetorics.

Thesis 5.a: ‘Roadmaps promote commitment by that that the expert opinions assess ‘deep uncertainties’ as solvable problems. Simultaneously, with long term strategic radmaps there is an intermingled language. Often it is not clear how far does it present future extrapolation or a time series of normative requirements. They have strong rhetoric aspects as argumentation tools.

(Chapter 5)

Thesis 5.b: Strategic roadmaps for the ‘hydrogen economy’ intend to reinforce the commitment to the vision of HE. Roadmaps function as alignment instruments too. There is a widespread rhetoric around the expected HE. The same time, rhetoric for the ‘hydrogen economy’ uses numerous problematic argumentation modes in professional materials too.

(Chapter 6)

Publications: [2] [6] [11] [14] [15] [16] [24] [27] [29]

Thesis 6: A promising initiative is realising in the field of some sorts of nanotechs. This is a turn form the opposition of ‘innovators’ and ‘concerned groups’ to the critical strategic cooperation. Together with the Code of Conduct worked out by the EC this trial can provide for a model how a voluntary regulation for safe research in the field of emerging technologies can be realised.

(Chapter 7)

Publications: [2] [5] [10]

6 Scientific publications connected to the different theses

(and other publications)

Studies in edited books

1.

Ágnes Fésüs, Imre Hronszky
Farewell to Modernity in Technological Risk Research.
In: Loudin J, Schuch K (szerk.)
Innovation Cultures - Challenge and Learning Strategy.
Prague: Filosofia kiadó, 2009. pp. 97-118.

2.

Ágnes Fésüs, Imre Hronszky, Hyundo Choi
On roadmapping for the hydrogen economy
and the Korean and Hungarian hydrogen economy
In: Nelson Gordon, Hronszky Imre (szerk.)
An International Forum on Sustainability.
Budapest: Arisztotelész Publishing Co., 2008. pp. 2001-2015.

3.

Fésüs Ágnes, Hronszky Imre
Masterman paradigmája
In: Binzberger V, Fehér M, Zemplén G (szerk.)
Kuhn és a relativizmus.
Budapest: L'Harmattan Kiadó, 2007. pp. 129-144.
(Tudománytörténet és tudományfilozófia évkönyv)
(ISBN:978 963 9683 85 3)

4.

Ágnes Fésüs
Risk Metaphorized: Risk Perception, the Internet and Decision-Making
In: Galántai Zoltán, Hans-Joachim Petsche, Várkonyi László (szerk.)
Internet Security and Risk: Facetten eines Problems.
Berlin:2007. pp. 115-128.

5.

Hronszky Imre, Várkonyi László, Fésüs Ágnes
A technikatörténet tanításáról a BME-n
In: Vámos Éva, Dr Vámosné dr Vigyázó Lilly (szerk.)
Tanulmányok a természettudományok, a technika és az orvoslás köréből.
Budapest: MTESZ, 2007. pp. 219-232.

6.

Hronszky Imre, Fésüs Ágnes, Várkonyi László.
Szakértés és participáció a kockázatkommunikációban
In: Fábri Gy (szerk.)
Tudomány és média.
Budapest:2007. pp. 29-46.
Kiadó: Tudástársadalom Alapítvány

7.

Ágnes Fésüs, Imre Hronszky
Von der Vorsicht zur Vorsorge – Abschied von der Moderne im Unsicherheitsmanagement
In: H-J Petsche, M Bartikova, A Kiepas (szerk.)
Erdacht, gemacht und in die Welt gestellt:
Technikkonzepte zwischen Risiko und Utopie.
Berlin:2006. p. 263-285
Kiadó: Trafo

8.

Fésüs Ágnes,
A bizonytalanságkezelés kulturális meghatározottsága
In: Molnár László, Tóth Attiláné (szerk.)
Globalizáció és innováció.
Budapest: Arisztotelész Publishing Co., 2005. pp. 38-46.

Articles in Periodica

Articles published in a foreign language in a foreign country

9.

Ágnes Fésüs, Imre Hronszky
Renewing and New Types of Innovation
TEORIE VEDY 30:(1) pp. 31-49. (2008)
Ide lehet: TEKSS, Teorie védy elfogadva 2010-re

Articles published in a foreign language in Hungary

10.

Ágnes Fésüs
Remarks on the Emerging Governance Landscape
of Emerging Nanotechnologies
PERIODICA POLYTECHNICA-SOCIAL AND MANAGEMENT SCIENCES (Megjelenés
alatt)

Hungarian

11.

Hronszky Imre, Várkonyi László, Fésüs Ágnes
Szakértés és participáció a kockázatkommunikációban:
Kockázatkommunikáció és szakértés az objektív tudomány jegyében
VILÁGOSSÁG 47:(6-7) pp. 3-14. (2006)
Same article in volume MTA Kommunikációs Intézet, Tudomány és média

Presentation published in a proceedings of an international conference

12.

Gábor Pörzse, Ágnes Fésüs
Governmental support for university based,
industry oriented research activities at Semmelweis University, Hungary
In: Triple Helix VII. Glasgow, Nagy-Britannia, 2009.06.17-2009.06.19.
Glasgow: Paper 3B5-5.

13.

Gábor Pörzse, Ágnes Fésüs
The university as a knowledge centre: Industry oriented research activities at Semmelweis
University, Hungary
In: The Proceedings of The XX ISPIM Conference. Bécs, Ausztria, 2009.06.21-2009.06.24.
Bécs:(ISBN:ISBN 978-952-214-767-7)

14.

Ágnes Fésüs, Imre Hronszky
Long-range strategical roadmaps: The case for a „hydrogen economy
In: Prof Dr Kocziszký György, Dr Koleszár Ágnes (szerk.)
VII. Nemzetközi Konferencia Miskolc-Lillafüred, 2009. Május 19-20.Miskolci Egyetem
Gazdaságtudományi Kar.
Miskolc-Lillafüred: Miskolci Egyetem Gazdaságtudományi Kar, 2009. pp. 166-172.

15.

Ágnes Fésüs:
Uncertainty vs. trend-building in the field of Hydrogen Economy.
8th Annual IAS-STs Conference “Critical Issues in Science and Technology Studies”
4th-5th May 2009. Graz, Austria.

16.

Ágnes Fésüs:
The ambivalent question of long-range roadmaps and reflexive transition in hydrogen
economy. 7th Annual IAS-STs Conference “Critical Issues in Science and Technology
Studies”
8th-9th May 2008, Graz, Austria.

17.

Imre Hronszky, László Várkonyi, Ágnes Fésüs

Renewing and New Types of Innovations

In: Prof Dr Kocziszky György, Somogyi Aliz (szerk.)

VI. Nemzetközi Konferencia a Közgazdász képzés megkezdésének 20. évfordulója alkalmából.

Miskolc-Lillafüred: Miskolci Egyetem Gazdaságtudományi Kar, 2007. pp. 135-142.

Presentation published in Hungarian

18.

Fésüs Ágnes

A kockázatkezelés kulturális aspektusai

In: Vámos Éva, Vámosné Vigyázó Lilly (szerk.)

Tanulmányok a természettudományok, a technika és az orvoslás köréből.

Budapest: MTESZ, 2007. pp. 209-218.

Könyvfejezet/Konferenciacikk/Tudományos

19.

Fésüs Ágnes

A metafora helye a kockázatkezelésben

In: Kristóf Tamás, Tóth Attiláné (szerk.)

Globális és hazai problémák tegnaptól holnapig: VI. Magyar (Jubileumi) Jövőkutatási Konferencia anyagai. Győr, Magyarország, 2006.10.06-2006.10.07.

Budapest:pp. 136-140.

Diploma works

20.

Fésüs Ágnes

Kockázat és irodalom

ELTE Összehasonlító Irodalomtudományi Tanszék, Budapest,
2006

21.

Fésüs Ágnes

Új lehetőségek és források a kockázatelemzésben

BME Innovációmenedzsment és Technikatörténet Tanszék, Budapest,
2005

22.

Fésüs Ágnes

Arany János: Murány ostroma,
2004

Other activity non on the level of publication (still not published presentations at conferences)

23.
2009 Hronszky Imre, Fésüs Ágnes: Innovációkutatási eszközök Jövőképek, gyenge jelek keresése és úttérképek (Instruments of innovation studies, Futures scenarios, weak signals and roadmaps), at the Postgraduate course on...of the Semmelweis University, 2009
24.
2009 Ágnes Fésüs, Imre Hronszky; On history of Roadmapping and scenario building. XXIII International Congress of History of Science and Technology, Symposium S93 History of Prospective Technology Studies, Budapest, Július.
25.
2009 Hronszky Imre; Fésüs Ágnes: Jövőképek és úttérképek, Magyar UNESCO Bizottság COMEST ülése, Május
26.
2008 Ágnes Fésüs, Imre Hronszky: On Rationality of Precaution, International workshop on Topoi der Rationalitaet, Univ. Potsdam, Potsdam
27.
2008 Ágnes Fésüs, Imre Hronszky: *Raising the reflexivity of long-range roadmaps for facilitating the transition to hydrogen economy*. In: „A jövő energiaforrásai”. A Magyarországi Francia Nagykövetség Együttműködési és Kulturális Osztálya, Budapest, Április
28.
2007 Ágnes Fésüs, Imre Hronszky. László Várkonyi: *Foresight, expectations, prognostic or normative understanding of roadmapping or what else?* Forum on Sustainable Technological Development in a Globalising World 5th workshop (Foresight, Roadmapping and Governance), Budapest, December.
29.
2007 Ágnes Fésüs, Imre Hronszky Hyundo Choi, Tünde Kállay: *Toward Comparative Investigation of an Emerging Industry Hydrogen in Korea and Hungary*. Forum on sustainability, Institute of Florida Tech.nemzetközi konferenciája, Melbourne, Florida
30.
2006 Fésüs Á.: *A kockázatkezelés kulturális aspektusai*, METESZ, Budapest.
31.
2006 Hronszky, I.; Várkonyi, L.; Fésüs, Á.,: *Szakértés és participáció a kockázatkommunikációban*, MTA Elnökség előadás sorozata, Tudás és

társadalom kommunikációja kutatási program az NKFP Jedlik Ányos pályázat támogatásával

32.

2006 Imre Hronszky; László Várkonyi; Ágnes Fésüs : *Expertise and participation in risk communication*. Dubrovnik, Inter-University Centre for Post-Graduate Studies.

33.

2006 Fésüs Á.: *A metafora funkciója a kockázatmenedzsmentben* BME PHD TDK.

34.

2005 Ágnes Fésüs, Imre Hronszky: *Qualitative aspects of uncertainty situations, precautionary principle – what can we learn from everyday people?*, *Innovation cultures, challenge and learning strategy, nemzetközi konferencia* a Cseh Tudományos Akadémia szervezésében, Prága

35.

2004 BME TDK
Fésüs Ágnes: *A bizonytalanságmenedzsment implicit forrásai*. [1. hely]
Fésüs Ágnes: *Nők a parlamentben*. [2. hely]

Publications: accepted but not published yet

36.

Ágnes Fésüs, Imre Hronszky
Toward “Innovation of Innovation” by “Taking European Knowledge Society Seriously”
Teorie Vědy, accepted for publication, to be published in 2010