Agrilink

AGRICULTURAL KNOWLEDGE: LINKING FARMERS, ADVISORS AND RESEARCHERS TO BOOST INNOVATION

AGRILINK'S MULTI-LEVEL CONCEPTUAL FRAMEWORK

THEORY PRIMER: **24) SCIENCE AND TECHNOLOGY STUDIES**

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AgriLink

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AgriLink's multi-level conceptual framework

Theory primer: 24) Science and Technology Studies

The elaboration of this Conceptual Framework has been coordinated by **The James Hutton Institute**, leader of AgriLink's WP2.

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This document presents the multi-level conceptual framework of the research and innovation project AgriLink. It is a living document.

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It has gone through a transdisciplinary process, with implication of both practitioners and researchers in writing, editing or reviewing the manuscript. This participation has been organised within AgriLink's consortium and beyond, with the involvement of members of the International Advisory Board of the project, including members of the Working Group on Agricultural Knowledge and Innovation System of the Standing Committee on Agricultural Research of the European Commission.

Theory Primers

The purpose of the primers is to provide AgriLink consortium members with an introduction to each topic, which outlines the key points and identifies options for further reading. The primers have also served to demonstrate the wide range of expertise in the consortium, and to highlight the specific research interests of consortium members. Primers are intended to act as a **foundation for academic journal articles, and an early opportunity for collaboration between consortium members**.

24) Science and Technology Studies

Author: Anda Adamsone-Fiskovica

1.0 General Overview of the Theory or Approach

1.1 Summary of the Theory, Approach or Topic

Based on disciplines like philosophy and history of science and technology, sociology of science and technology, sociology of scientific knowledge, innovation studies etc., the late 20th century saw the formation of a general interdisciplinary field of science and technology studies (STS) or social studies of science and technology (S&T). This discipline joins researchers from various branches of science sharing interest in processes occurring in the sphere of S&T and their impact on society (and vice versa), focusing on investigation of science as a social phenomenon. STS scholars aim to reveal the ways S&T shape human life and how society and culture influence the development of S&T both historically and nowadays. STS research covers a wide diversity of topic ranging from written and unwritten norms governing science, to the processes of scientific knowledge (co)creation and technological innovation, to public engagement in S&T development. Theoretical approaches developed within the frame of the disciplinary sphere of STS (also sociology of science and technology) int. al. focus on issues of institutionalisation, public understanding, public communication, and governance of science. STS generally provides an academic platform for investigation and critical reflections on the diverse social, cultural, economic and political processes taking place both within the scientific community and in a wider society regarding the developments in the domain of science and technology.

1.2 Major authors and their disciplines

STS represents a very broad and diverse interdisciplinary field bringing together sociologists, anthropologists, historians, philosophers, political scientists, communication specialists and other researchers and practitioners interested in the social aspects of science and technology, int. al. placing the scientific expertise in a wider social, historical and philosophical context. (See, for instance, the website of the European Association for the Study of Science and Technology (EASST): https://easst.net/).

1.3 Key references

Bucchi, M. (2009). *Beyond Technocracy: Science, Politics and Citizens*, Dordrecht, London, Springer, 2009.

Hackett, E.J., Amsterdamska, O., Lynch. M.E., Wajcman, J. (eds.) (2007). *The Handbook of Science and Technology Studies*, Cambridge, Mass., The MIT Press.

Hess, D. (1997). *Science Studies: An Advanced Introduction*, New York, New York University Press.

Nowotny, H., Scott, P. and M. Gibbons (2001). *Re-thinking Science: Knowledge and the Public in an Age of Uncertainty*, Cambridge, Polity Press.

Irwin, A., Wynne, B. (eds.) (1996). *Misunderstanding Science?: The Public Reconstruction of Science and Technology*. Cambridge University Press.

1.4 Brief history of how the theory has developed and been applied

Origins of STS can be traced back to the beginning of the 20th century and the idea of the social origins of knowledge (socially agreed rules/principles governing the actions and reasoning of different societies), which lead to the development of the sociology of knowledge int. al. represented by Emile Durkheim, Karl Mannheim, Max Scheler and Karl Marx. The 1940ties-50ties witnessed a pronounced interest in science as a specific domain of knowledge and system of rules that gave birth to the (traditional or institutional) sociology of science founded by Robert King Merton focusing on the organisational and functional aspects of science (incl. scientometrics). An important turning point in this analysis was marked by shifting attention to the conditions of scientific knowledge production stimulated by ideas developed by scholars in philosophy and history science in the 1960ties (e.g. Karl Popper, Thomas Kuhn). Their social analysis of scientific knowledge emphasised the temporal status of this knowledge in a given society and/or period of time, whereby they are prone to be replaced by new knowledge either in evolutionary or revolutionary way (paradigm shift). These ideas set the ground for a renewed interest in the sociology knowledge represented by representatives of the so-called phenomenological sociology of knowledge (e.g. Peter Berger and Thomas Luckmann) looking into the ways different kinds of knowledge (incl. scientific one) gain their status in a society.

Since 1970ties there has been a further shift towards sociological analysis of the very contents of science (concepts, data, theories, methods) in the framework of the so-called new sociology of science or sociology of scientific knowledge (e.g. “Edinburgh school”, “Bath school”), dealing specifically with the role of social and historical conditions determining the fate of competing scientific ideas and the social construction of scientific facts (e.g. Steven Shapin, David Bloor, Barry Barnes, Harry Collins, Bruno Latour, Steve Woolgar, Karin Knorr Cetina). The 1980ties were characterised by the so-called technological turn in STS aiming to apply the afore-mentioned ideas also to the domain of technology by means of analysing the technological change, process and outcome of technological innovation, its societal implications (e.g. theories of social shaping of technology, social construction of technology; Donald MacKenzie and Judy Wajcman, Viebe Bijker, Trevor Pinch, Thomas P. Hughes).

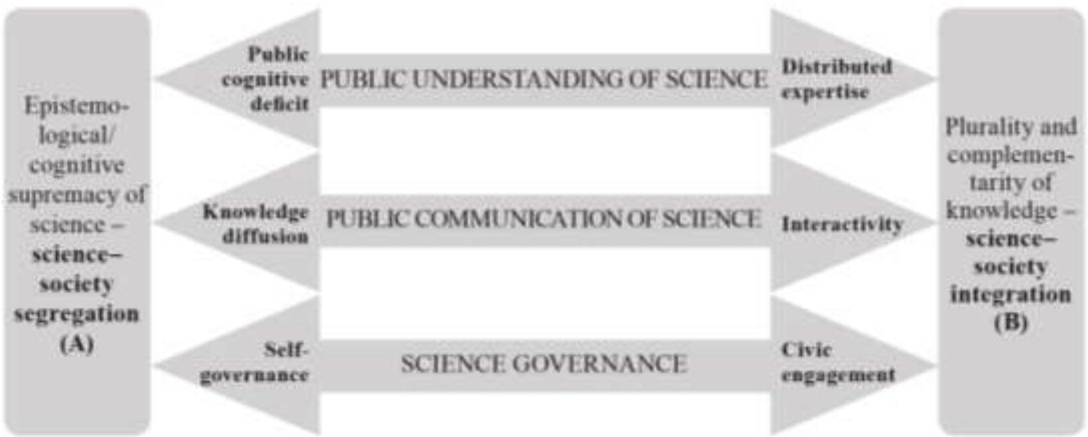
An important role in STS research nowadays is played by studies on public understanding of science and technology (incl. the relation between lay and expert knowledge) as well as public communication of S&T, citizen engagement and governance of S&T (e.g. John Durant, Brian Wynne, Martin Bauer, Alan Irwin, Sheila Jasanoff, Bruce Lewenstein, Massimiano Bucchi). There has been a gradual shift from the traditional positivist to the more critical interpretative approach in the treatment of science-society relations, which implies a move away from expert monopoly over what counts as valid and useful knowledge towards wider stakeholder engagement in setting the research agenda and contributing to the production of scientific knowledge. This reasoning has thus provided room for more interactive and dialogue-based practices of knowledge co-creating and more democratic forms of science governance.

While the domain of agricultural research and practice has not been the primary focus area of STS scholars, the ideas developed in this interdisciplinary field can and have been successfully applied also in studying the role of different stakeholders in the agricultural knowledge and innovation system. While more focused on the environmental issues, a notable example is represented by the seminal study by the STS scholar Brian Wynne on the clash between expert knowledge of scientists and the officially underestimated lay knowledge possessed by local sheep farmers in Northern England (Cumbria) when analysing and developing recommendations for managing the ecological and agricultural situation after the radioactive contamination of soil allegedly caused by the nuclear accident at Chernobil in 1986 (Wynne 1996).

1.5 Basic concepts

Social construction of science and technology; Expert-lay knowledge divide; Public understanding of science; Public communication of science; Science governance.

The diagram below represents a synthesis of the prevailing models in the domain of STS research regarding the conceptualisation of science-society relations in terms of public understanding of S&T, public communication of S&T, and S&T governance. While one spectrum of these bipolar models (A) is united by emphasis laid on epistemological and cognitive superiority of science over other forms of knowledge and their agents, its self-sufficiency and asociality, the other one (B) is characterised by the position that provides for complementarity of various forms of knowledge and agents, their equal significance and legitimacy in determining the progression of S&T, within the frame of different flexible competencies inherent to these groups of agents.



Source: Adamsone-Fiskovica, A., 2012: 13.

2.0 Application to the analysing the role of farm advisory services in innovation

2.1 Relevance to AgriLink Objectives

[tick relevant]	AgriLink Objectives
X	Develop a theoretical framework utilising a multi-level perspective to integrate sociological and economic theories with inputs from psychology and learning studies; and assess the functions played by advisory organisations in innovation dynamics at multiple levels (micro-, meso-, macro-levels) [WP1];
X	Assess the diversity of farmers' use of knowledge and services from both formal and informal sources (micro-AKIS), and how they translate this into changes on their own farms [WP2];
X	Develop and utilise cutting edge research methods to assess new advisory service models and their innovation potential [WP2];

	Identify thoroughly the roles of the R-FAS (regional FAS) in innovation development, evaluation, adoption and dissemination in various EU rural and agricultural contexts [WP2];
X	Test how various forms of (national and regional) governance and funding schemes of farm advice i) support (or not) farmers' micro-AKIS, ii) sustain the relation between research, advice, farmers and facilitate knowledge assemblage iii) enable evaluation of the (positive and negative) effects of innovation for sustainable development of agriculture [WP4];
	Assess the effectiveness of formal support to agricultural advisory organisations forming the R-FAS by combining quantitative and qualitative methods, with a focus on the EU-FAS policy instrument (the first and second version of the regulation) and by relating them to other findings of AgriLink. [WP4].
	At the applied level, the objectives of AgriLink are to:
X	Develop recommendations to enhance farm advisory systems from a multi-level perspective, from the viewpoint of farmers' access to knowledge and services (micro-AKIS) up to the question of governance, also recommending supports to encourage advisors to utilise specific tools, methods to better link science and practice, encourage life-long learning and interactivity between advisors [WP5];
	Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink's recommendations in this process [WP5];
X	Test and validate innovative advisory tools and services to better connect research and practice [WP3];
X	Develop new learning and interaction methods for fruitful exchanges between farmers, researchers and advisors, with a focus on advisors' needs for new skills and new roles [WP3];
X	Guarantee the quality of practitioners' involvement throughout the project to support the identification of best fit practices for various types of farm advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6].

2.2 How this can be applied/developed in AgriLink

The broader STS framework can be used to investigate the relations between different kinds of knowledge possessed by various stakeholder groups in the agricultural knowledge and innovation system and the way this knowledge (incl. science-based) is being validated, communicated and applied. It would be useful to draw on the vast insights from STS research on public communication of science and public understanding of science to assess and to develop efficient and inclusive communication tools in the domain of farm advisory services.

2.3 Research questions relevant to AgriLink

- What is the role played by and the status of scientific research as a source of knowledge for farmers and for agricultural advisors?
- What model of public communication of science (diffusion vs. dialogue-based) is underlying a given form of advisory service?

- How local/lay/folk knowledge (also feedback to advisors) of farmers is incorporated in the provision of farm advisory services and in setting the agricultural research agenda? Is there any room for a co-production of knowledge by different stakeholders?
- What are the factors facilitating and hindering farmer-advisor-researcher collaboration?

2.4 Methodological implications

Research carried out in the framework of STS employs a wide diversity of research methods – both quantitative and qualitative. Micro-sociological STS studies make more extensive use of in-depth interviews, participatory observations (in various communities, events), diaries. Other methods commonly used are focus group discussions, as well as document analysis (originating from both historical and modern sources) and discourse analysis. A common methodological approach is represented by case studies. STS research into public understanding and perception of science is also based on population surveys of various scales. Quantitative data analysis covers also the use of data on patents, scientific publications and other S&T indicators.

In the context of AgriLink the use of the more micro-sociological approaches and qualitative research methods to studying the formats and contents of interactions between various agents (as carriers of different kinds and forms of agricultural knowledge) could prove to be highly valuable.

2.5 Strengths and weaknesses/Sensitivities regarding use

The STS perspective requires the component of scientific (research-based) knowledge and/or technological innovation to be present in the domain under investigation, which should not be a problem in the case of farm advisory services that largely serve as an intermediary between agricultural research and practice and thereby represents an interesting arena for studying the involved processes of knowledge exchange.

2.6 Potential operational problems

Since the STS field covers a wide diversity of topics, approaches, perspectives, theories and authors, it would require selecting a more focused sub-set of key concepts (to some extent attempted in section 1.5) and match those to specific research questioned aimed to be addressed by AgriLink.

Optional Section 4: Recommended further reading

Adamsone-Fiskovica, A. (2012) *Science-society relations in Latvia: communicative practices and discourses*. English abstract of the PhD thesis. University of Latvia. https://www.researchgate.net/publication/267867479_ZINATNES_UN_SABIEDRIBAS_ATTIECIBAS_LATVIJA_Science-society_relations_in_Latvia_PhD_thesis

Barnes, B., Bloor, D. and J. Henry (1996). *Scientific Knowledge: A Sociological Analysis*, Chicago, University of Chicago Press.

Bauchspies, W.K., Croissant, J. and S. Restivo (2006). *Science, Technology and Society: A Sociological Approach*, Oxford, Blackwell Publishing.

Bauer, M. W. (2009). The evolution of public understanding of science – discourse and comparative evidence. In: *Science, Technology and Society* 14(2): 221-240.

Bensaude-Vincent, B. (2001). A genealogy of the increasing gap between science and the public. In: *Public Understanding of Science* 10(1): 99-113.

Berger, P. L., Luckmann, T. (1991 [1967]). *Social Construction of Reality: A Treatise in the Sociology of Knowledge*. Harmondsworth: Penguin books.

Biagioli, M. (ed.) (1999). *The Science Studies Reader*, New York, Routledge.

Bijker, W.E., Hughes, T.P. and T. Pinch (eds.) (1999). *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, Cambridge, Mass., MIT Press.

Bucchi, M., Trench, B. (eds.) (2014). *Routledge Handbook of Public Communication of Science and Technology*, 2nd ed., Routledge.

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., Trow, M. (2007 [1994]). *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London: SAGE Publications.

Gregory, J. and S. Miller (1998). *Science in Public: Communication, Culture, and Credibility*, Cambridge, Mass., Perseus Publishing.

Hess, D. (1997). *Science Studies: An Advanced Introduction*, New York, New York University Press.

Holliman, R., Whitelegg, E., Scanlon, E., Smidt, S., Thomas, J. (eds.) (2009). *Investigating Science Communication in the Information Age: Implications for public engagement and popular media*. Oxford University Press.

Irwin, A., Michael, M. (2003). *Science, Social Theory and Public Knowledge*. Open University Press.

Knorr-Cetina, K. (1985 [1981]). *The Manufacture of Knowledge*. Pergamon.

Kuhn, T.S. (1962). *The Structure of Scientific Revolutions*, Chicago, The University of Chicago Press.

Latour, B. (1987). *Science in Action: How to Follow Scientists and Engineers through Society*, Cambridge, Mass., Harvard University Press.

MacKenzie, D.A. and J. Wajcman (eds.) (1999). *The Social Shaping of Technology*, 2nd edn., Buckingham [etc.], Open University Press.

Merton, R.K. (1973). *The Sociology of Science: Theoretical and Empirical Investigations*, London, The University of Chicago Press.

Popper, K.R. (2002). *Conjectures and Refutations: the Growth of Scientific Knowledge*, London, New York, Routledge Classics.

Sismondo, S. (2004). *An Introduction to Science and Technology Studies*, Oxford, Blackwell Publishing.

Weigold, M.F. (2001). Communicating science: a review of the literature. In: *Science Communication* 23(2): 164-193.

Woolgar, S. (ed.) (1988). *Knowledge and Reflexivity: New Frontiers in the Sociology of Knowledge*. SAGE Publications.