i2connect

INTERACTIVE INNOVATION

Connecting advisors to boost interactive innovation in agriculture and forestry

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Task 1.1

Provide conceptual ground, create mutual understanding

Deliverable 1.1

Innovation advisors for interactive innovation process: Conceptual grounds and common understandings

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PP	Restricted to other programme participants (including the Commission Services)	
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Table of abbreviations

AAS	Agricultural Advisory Service
AFKIS	Agricultural and Forestry Knowledge and Innovation System
AIS	Agricultural Innovation System
AKIS	Agricultural Knowledge and Innovation System
ANT	Actor Network Theory
AS	Advisory Service
CIDT	Centre for International Development and Training
CoP	Communities of Practice
EIP agri	European Innovation Partnership for Agricultural Productivity and Sustainability
EU	European Union
EUFRAS	European Forum for Agricultural and Rural Advisory Services
FIBL	Forschungsinstitut für biologischen Landbau
FBO	Farmer Based Organization
GA	Grand Agreement
GFRAS	Global Forum for Rural Advisory Services
IALB	Internationalen Akademie für land- und hauswirtschaftliche Beraterinnen und Berater.
IP	Innovation Platform
ISS	Innovation Support Service
LINSA	Learning and Innovation Networks for sustainable agriculture
MEAS	Modernizing Extension and Advisory Services
NGO	Non-Governmental Organization
OECD	Organisation for Economic Co-operation and Development
PTD	Participatory Technology Development
R&D	Research and Development
SCAR AKIS	Standard Committee on Agricultural Research, Agricultural Knowledge and Innovation Systems
SEASN	South Eastern Europe Advisory Service Network
SME	Small and Medium Enterprise
TAP	Tropical Agricultural Platform
UHOH	University of Hohenheim

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1. Introduction

In this section, we briefly revisit the objectives of the i2connect project as a whole, then explain the purpose of this document, the Deliverable 1.1, and finally outline its structure.

1.1. Objective of the i2 connect project

In Europe, good examples showing advisors active as innovation brokers and facilitators in interactive innovation projects are still limited in number. By education and training, farm and forestry advisors most often adhere to the "linear knowledge transfer model" (SCAR AKIS 2017). Many are not aware of the concept of interactive innovation, are not fully able to support innovation processes, and are not recognised for the new roles they could play in more interactive and effective agricultural and forestry knowledge and innovation systems (AFKIS). Both, in theory and practice, there are still gaps of understanding and a lot to learn about what is behind the specific roles of advisors in the different stages of the innovation process and the necessary competencies going along with it. Moreover, implications for advisory organizations, for their managers and further AFKIS decision makers to create an enabling environment for innovative advisors and innovation processes are unclear. This hampers the effectiveness of e.g. the EIP-AGRI initiative and other interactive innovation initiatives in the EU (Fotheringham et al. 2016).

i2connect was set up to address this need and assist an interactive innovation support culture within the AFKIS and thereby contribute to the further and wider implementation of the EIP-AGRI and other interactive innovation endeavours in agriculture and forestry sectors. The project's overall objective is thus to "Empower advisors as well as their organisations to engage and support farmers and foresters in interactive innovation processes". To reach this overarching goal, three specific objectives were formulated:

1. To strengthen the skills, competencies and attitudes of advisors to support interactive innovation, by: identifying and sharing best practices, developing tools and methods, training, and organising peer to peer learning & networking.
2. To enhance and profile the role of advisors in interactive innovation processes, at different scales: by a better understanding of the AFKIS at country level, by identifying providers of advisory services across Europe, by creating an enabling environment within advisory services, by better connecting and embedding advisory services within the AFKIS and by appropriate public policies.
3. To create a social support network and a networking culture among advisors facilitating innovative innovation processes. In particular, emphasis will be given to ensure that advisors in Central and Eastern European countries make use of the opportunities being created in the project.

To achieve these objectives, three conceptual dimensions were devised for successful intervention – the interactive innovation dimension, the professional community of practice dimension and the enabling environment dimension (Fig. 1). It is the expectation that these dimensions will guide all partners to better understand, analyse and reflect upon the experiences made in the course of the

project. They are also supposed to guide the analysis of field review cases and support the collection and documentation of insights in a systematic way.

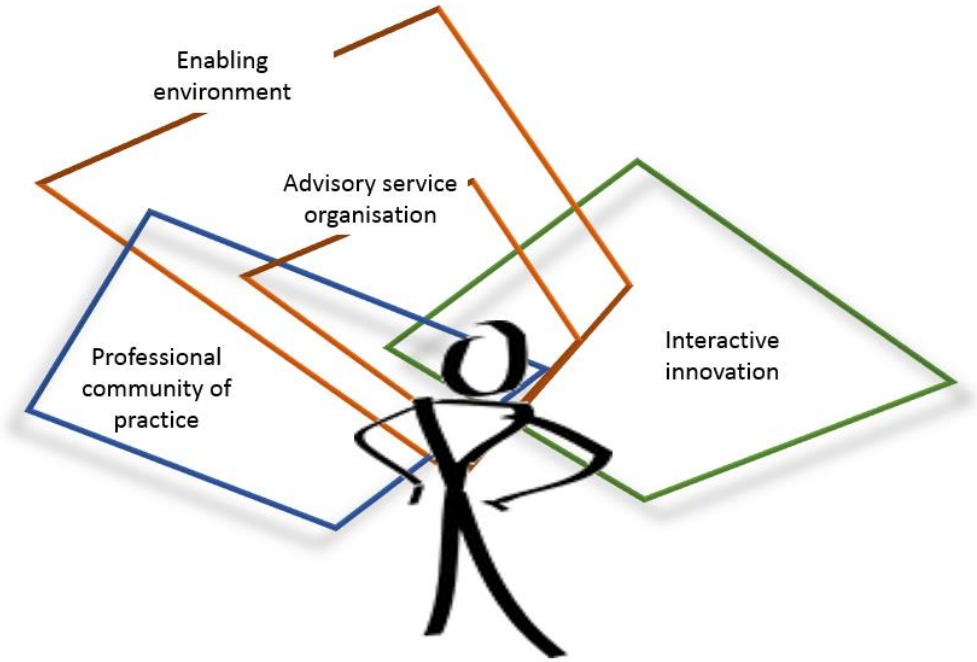


Figure 1 Conceptual dimensions for supporting and enabling innovation advisors

1.2. Purpose and development procedure of the deliverable 1.1

The purpose of the deliverable 1.1 is to provide the state of discussions about frameworks, key concepts and technical terms from agricultural and forestry extension and advisory services, innovation and knowledge systems research, human resource and organisational development, so as to create and support a joint understanding for the up-coming learning processes among the i2connect partners (and potentially beyond). To ensure that all project partners' understanding were included the document was elaborated in an iterative way:

- The structure was developed based on the specific objectives of the project;
- A number of key terms and concepts were taken from the excellence part of the i2connect GA;
- On these bases, the UHOH team developed first texts for the subsections to which partners in task 1.1 and other partners from the Consortium were invited to contribute, with complements from peer-reviewed publications, and seminal books providing concepts and theories;
- The UHOH team made sure that ideas and concerns were integrated, divergences of understandings appropriately taken into account, and guiding ideas highlighted etc.;
- The document was finalised through a number of exchanges among partners.

1.3. Structure of the document and how it will be used

The document is structured in six sections. Following a request from the kick-off meeting, we start, right after the introduction, with a description of what is meant by the 'advisor' and the related services. Here, we first rely on traditional understandings that go back to the classical agricultural and forestry advisory literature, and complement them by selected recent concepts that became popular through targeted innovation policies at national and EU levels (section 2). Section 3 introduces complementary as well as extended concepts and theories that stem from 'innovation studies'. Here, we see that there are mutual interdependencies of concepts developed in extension research and in innovation studies, whereby:

- on the one side, the traditional understanding of advisory services' tasks and functions has always implied the component of introducing and enhancing innovation (adoption) processes,
- on the other hand, recent policy measures towards fostering of innovations in agriculture and forestry have considerably enlarged our view on the spectrum of advisory roles, functions and tasks.

A closer look at how innovation occurs over time clearly reveals a complex social phenomenon, which cannot easily be captured by a single model (section 3.2). To depict the complexity of an innovation process, section 4 frames and describes an innovation as an 'interactive system' composed of a set of different actors that communicate and interact with each other over a period of time. First, the idea of a 'multi-actor' approach is explained, which is closely linked to the latest EU policy measures (4.1). Secondly, the 'innovation network' concept is presented as a scientifically very prolific one that is widely used in both economic and social sciences (4.2). In a similar way, the concept of 'innovation platforms' has a high utility as it has interfaces with both technology and social sciences (4.3). Then, the importance of the professional communities is addressed, which is of direct relevance in the i2connect context (4.4). Finally, the well-known AKIS/AIS concept is briefly presented as the overarching and embedding framework for the agricultural and forestry knowledge and innovation system (AFKIS) within the frame of the i2connect project. While sections 2 – 4 mainly serve as background for the explanation and operationalization of the specific objectives 2 and 3, section 5 is dedicated to concepts related to advisors' skills and competences (objective 1). Finally, section 6 concludes by presenting knowledge gaps identified during the elaboration of this conceptual paper that should be pursued in the course of the project.

2. Concepts related to advisors and advisory services

KEY TERMS AND CONCEPTS

Advisors are (i) those individuals who either as independent entrepreneurs or having an advisory position in different types of advisory organisations are formally responsible for multiple and changing roles and tasks in stimulating and facilitating innovation and (ii) those actors who provide similar services out of a non-formal advisor position but consider themselves as advisor.

Advisor's roles and tasks include all tasks and activities, which are conducted with the intention of helping clients to solve problems through enabling them to gain greater insights into problems' causes resulting in new motivation and orientation to act. In the context of the recently implemented policies to enhance innovations in agriculture and forestry sectors, news roles and tasks of advisors such as facilitation of exchange, learning, vision building among diverse communities, mediation of conflict situations, network and knowledge brokerage, matching of demand and supply of innovation support services have emerged.

Advisory services include (i) the actors involved in the advisory activity and the relationships they maintain with each other and with other external actors; and (ii) the activities that are used by advisory service actors to create knowledge and know-how in individual and/or collective learning processes.

Advisory service providers are the organizational bodies engaged with advisory service. They can also be labelled as bridging or intermediary organization. Organizationally, advisory service provides in Europe can be categorised into five types – public managing and administration authorities; public research and education institutes; private bodies (e.g. independent individual entrepreneurs and corporate advisory bodies); third sector-farmer based organizations (e.g. farmer groups, chamber of agriculture) and third sector-NGO (e.g. civil society organizations).

Classical advisory service focuses on providing support to clients or beneficiaries for problem-solving through sharing information, counselling, advising and co-creation of knowledge. Communicative services are offered with the aim to enabling clients to gain greater insights into problems' causes resulting in new motivation and orientation to act, and thus capacitate clients to solve the problem.

Innovation Support Service (ISS) is an immaterial and intangible service that involves one or several providers and one or several beneficiaries in activities in which they interact to address a more or less explicit demand emerging from a problematic situation that requires substantial change, and formulated by the beneficiaries to co-produce services aimed at solving the problem.

2.1. Advisor: What is meant by the 'advisor'?

In the traditional sense, the word advisor refers to staff in a public or private organization with an agricultural or forestry advisory profession and job description. In this case, those in the advisory profession have the mandate to provide information and advice to farming and forestry families and other actors along the value chain to improve production (SCAR AKIS 2017). In the past, terms such as 'extensionist', 'extension worker' or 'extension agent', were frequently used in a similar way; more concretely, they refer to those whose job is to disseminate agricultural technologies, advise and train farmers to use a specific practice or technology to solve a problem, a production constraint or a farm management challenge (Swanson & Rajalahti 2010). Thus, the term 'extension' also alludes to the times when advisory services mostly or exlusively stemmed from public bodies.

In the context of pluralism of advisory service systems, an increased diversity of actors providing these services can be observed, and in the literature one comes across individuals, technologies ('actants') and organizations, who do not necessarily have the task to 'advise' or the job 'advisor' as a label in the formal structure. Nevertheless, any task or function which corresponds to what Hoffmann, Gerster-Bentaya, Christinck, and Lemma (2009, p.25) describe as "helping clients to solve problems through enabling them to gain greater insights into problems' causes resulting in new motivation and orientation to act" could be considered as substantiating the *being an advisor*. This broad definition clearly expands the traditional view of advisors in the classical agriculture and forestry advisory literature considerably and challenges current understandings.

In addition to this broader understanding of actors, we also observe additional roles and tasks in the context of recently implemented policies and societal initiatives to enhance innovations in the sector. The new roles of advisors stem from an interactive, dynamic understanding of problem solving and involves activities that use communication to stimulate and facilitate change (Leeuwis 2004). These tasks include facilitation of exchange, learning, vision building among diverse communities, mediation of conflict situations, network and knowledge brokerage, matching of demand and supply of innovation support services (Koutsouris 2018; Leeuwis & Aarts 2011). Table 1 illustrates the roles and respective tasks and activities of advisors.

Table 1 Tasks and activities of advisors in agriculture advisory services

Advisors' role	Description of the tasks and activities
Extensionist	- Delivers specific recommendations from research, especially for the staple food crops, to all types of farmers following a top-down model - Delivers information and institutional and legal framework conditions that matter for farm, field and forestry work
Advisor	Based on demand: - Advises farmers to use a specific practice, technology or work organisation to solve an identified problem, production, management constraint

	- Helps others to solve problems by enabling them to gain greater insights into their causes resulting in new motivations and direction - Helps farmers in decision-making and in the implementation of changes on their farms (e.g. a significant investment or diversification of farm activities)
Communication specialist/communication worker/change agent	- Facilitates communication and knowledge sharing, and awareness creation among partners
Facilitator	- Aims at the development of shared meaning, language and objectives between dialogue partners in order to stimulate change and develop innovative solutions - Generates innovations (policy or technological) - Supports problem-solving
Innovation Broker	- Introduces disconnected people, organizations, and networks or facilitates new ideas, objectives and projects between already connected ones (Network formation) - Bridges the gap between AFKIS actors (Network formation) - Innovation process management - Facilitates demand articulation
Organiser/trainer	- Supports organization development and capacity building by fostering knowledge, skills and abilities - Empowers farmers to investigate new options to increase the viability of their farm businesses
Mediator	- Conflict management
Consultant	- Advisory communication to enhance problem solving ability

Based on Koutsuris (2018), Leeuwis (2004), Klerkx and Leeuwis (2008), Hoffmann et al. (2009)

2.2. Advisory services

Scholars have defined and described extension or advisory services in a variety of ways and levels in the academic literature. For instance, Christoplos (2010) describes extension as a system "that should facilitate the access of farmers, their organisations and other market actors to knowledge, information and technologies; facilitate their interaction with partners in research, education, agri-business, and other relevant institutions; and assist them to develop their own technical, organisational and management skills and practices". Similarly, Birner et al. (2009, p.342) define an advisory system as "the entire set of organizations that support and facilitate people engaged in agricultural production to solve problems and to obtain information, skills, and technologies to improve their livelihoods and well-being".

On the other hand, Hoffmann et al. (2009, p.25) define advisory work as "the process whereby the extension worker tries to motivate his extension partner and, by offering encouragement and ideas, seeks to give him the capability to act to solve his acute problems. In this way, partners acquire greater insight into the network of problems affecting them and recognise the alternative solutions available. They gain from this both the incentive to embark on problem solving and the direction to take. Through

advisory work, otherwise untapped human resources are set free and utilised." Similarly, Leeuwis (2004, p.27) describes extension as "a series of embedded communicative interventions that are meant, among others, to develop and/or induce innovations which supposedly help to resolve (usually multi-actor) problematic situations". Parallel to the diversity in the academic literature, there is also a variety of definitions of extension/ advisory services in institutional documents. Table 2 provides an overview of selected definitions from institutional documents.

Table 2 Definitions of extension/advisory services in institutional documents

Organization	Description of extension or advisory service	Guiding principle
GFRAS	Rural advisory services, also called extension, are all the different activities that provide the information and services needed and demanded by rural actors to strengthen their capacities, empower them, and promote innovations. These activities enable rural people to obtain skills and information to address rural challenges.	Information dissemination; Capacity development
MEAS	Extension and advisory service (EAS) providers have a key role to play as a critical link between farming populations and sources of new information and tools, so that practices can be appropriately adapted.	Linkage creation
OECD	The aim of extension is to help rural families to improve their living conditions. The task of the extension worker is to transfer scientific knowledge and technical advice to rural families in order to enable them to run their farms more efficiently, and thereby improve living conditions.	Transfer of knowledge
EU	The farm advisory services shall cover economic, environmental and social dimensions and deliver up to date technological and scientific information developed by research and innovation. They shall be integrated within the interrelated services of farm advisors, researchers, farmer organisations and other relevant stakeholders that form the Agricultural Knowledge and Innovation Systems (AKIS)[1].	Information dissemination; Cross-compliance and regulatory
World Bank	Extension and rural information services provide critical access to knowledge and information that rural people need to increase productivity and sustainability of production systems, and thus improve the quality of their livelihoods. A growing consensus exists that agricultural extension systems must be pluralistic networks of institutions providing varied information and innovation services. Such systems must be demand-driven with close linkages to clients, and develop sustainable sources of financing, increasingly market driven integrated services.	Information dissemination; Innovation services; Network building and demand and supply articulation

Source: based on Labarthe et al. (2013)

[1] CAP Strategic Plans Art 13.

The terms 'advisory services' and 'extension services' are used interchangeably in literature. **However, within i2connect, we will only use the term advisory services, as extension tends to focus mainly on approaches to knowledge dissemination that are often top-down.** In contrast, the term advisory services includes: (i) the actors involved in the advisory activity and the relationships they maintain with each other and with other external actors; and (ii) the activities that are used by advisory service actors to create knowledge and know-how in individual and/or collective learning processes (Faure, Desjeux & Gasselin 2012).

2.3. Examples and typology of advisory service providers

Advisory and innovation support services can be understood as either an organisational body or a corporate actor (service provider) or as an activity (Knierim, Ndah & Gerster-Bentaya 2018). As an organisational body, the service provider can be labeled as an advisory organisation, bridging organisation, or intermediary organisation (Howells, 2006). Some authors differentiate and categorise advisory services as public and private (Kidd, Lamers, Ficarelli & Hoffmann 2000), where private includes profit and non-profit organisations. Others, to capture the organisational diversity better, extend the differentiation and include third sector organisations such as farmer-based organisations and NGOs (Birner et al. 2009). The fivefold provider-based typology compiled by Birner et al. (2009) gives a systematic overview of the advisory service landscape in Europe (Knierim et al. 2017). Table 3 illustrates the overview of the five typologies together with the elaborated features and goal orientation as refined by Knierim et al. (2017).

Table 3 Typology of Agriculture Advisory Services

Types of AAS	Example of organizations	Internal coordination features	Goal and Orientation
Public authorities	Ministries and subordinate national and regional organisations	- Frequently in the form of large bureaucracies. - Hierarchically integrated -Top-down decision-making processes	General public interests, public goods provision
Public research and education	Universities and education bodies Research institutes	- They have specific goals, target specific groups and provide specific services due to their public good orientation, societal influences and long-term continuity.	Generation of scientific knowledge, public interests
Private sector	Consultancy firms, Freelancers, Private agricultural advisory companies that are independent	- Various forms of independently acting bodies, oscillating between team cooperation and individual free lancers - Includes any organisational form of a registered company or any individual entrepreneur that provides advice as an entrepreneurial activity that is not coupled with selling agricultural commodities.	Profit generation, competitiveness, recognisable profile

Third Sector-Farmer based organisations	Farmer based groups, coope-ratives Chambers of agriculture, pro-fesssional sector associations	- Users/farmers' interest, professional representation, can be of a holistic nature (i.e., with broad range of activities) or of a specific nature (focus on limited specialised activities)	Users'/farmers' interests, Professional representation
Third sector non-government organisations	Includes other civil society orga-nisations, especially non-profit ones such as foundations, charitable trusts etc	- General or particular societal interests coping with specific challenges, often operating under short term funding conditions	Particular societal interests

Source: based on Birner et al. (2009) and Knierim et al. (2017, 2018)

Advisory service organisations have existed in Europe since the late 19th century and have broadly been prevalent since the Second World War (Hoffmann et al. 2009). They were developed by public administrations in many countries as a means to support agricultural and forestry production and to enhance technological progress. In some cases, they were established on the initiative or in partnership with farmer-based bodies or other professional associations. Thus, in some countries, agricultural chambers are the prominent service providers, while in others, the ministry of agriculture and its subordinated bodies are dominant. Knierim et al. (2017) have identified and illustrated the diversity of advisory services in EU member states and the dominant advisory provider(s) per EU country as of the year 2013 (Table 4). Also, funding of providers and remuneration of advisory service, therefore, creates another basis of distinction (Ndah, Knierim, Koutsouris & Faure 2018).

Table 4 Type of dominant AAS provider in EU member states (as of 2013)

Type of dominant advisory service provider	EU Countries
Public organization	Bulgaria Cyprus Greece Hungary Ireland Latvia Poland Romania Slovakia Croatia
Private organisation	Estonia The Netherlands
Farmer-based organisation (FBO)	Austria Belgium Denmark Finland France Lithuania Portugal Slovenia Spain Sweden
Public / Private organisation	Czech Republic United Kingdom
Public / Private/ FBO	Germany Italy Malta
Public / FBO	Luxembourg

Source: Knierim et al. (2017)

2.4. Characterization of advisory service activity

The activities in advisory services can be distinguished into two: classical advisory service and innovation support service.

2.4.1. Classical advisory services

The classical advisory service focuses on providing support to problem solving (counselling /advising) through providing information to bridge the knowledge gap and to motivate and capacitate clients to solve the problem. The support could be a single event or a process over time. It could be targeted to individuals, to groups or to a larger public (Hoffmann et al. 2009).

The overarching goal in the classical understanding is bringing knowledge from research to practice and improving the livelihoods of farming communities through technology transfer and capacity development (Nagel 1997). Research and public extension services are viewed as main and active actors while the clients (farmers) are the passive actors who receive solutions from the advisors. However, this view of classical advisory services failed to address complex problems and led to the fine-tuning of advisory services to take into account diversity of technologies and variety of actors (Leeuwis 2004).

In the problem solving perspective, the service of an advisor starts in providing support in the diagnosis of a situation, and in the definition of problems after the determination of objectives by the clients. As a technical expert, the advisor plays an important role in discussing the various alternatives in order to support the farmer's decision making. Their specialist knowledge and expertise are called for when assessing how much the alternatives are likely to contribute to achieve the objectives, and when estimating the probable financial input and associated risks as well as possible undesirable consequences. During the implementation of the chosen alternative by the client, advisors may support with further information if need arises. During evaluation, they may support the assessment of results and the search for causes for particular results (Hoffmann et al. 2009). Thus, according to the client's actual needs and interests, advisors may fulfill several of all functions.

With the rise of new providers of agriculture advisory services, and the stronger focus of supporting innovation processes, new services and new methods to deliver the services have emerged.

2.4.2. Innovation support services

In the context of a world-wide policy towards fostering agricultural development through innovations, the understanding of advisory services also now encompasses a broader range of activities and roles such as, facilitation, networking and intermediation which are collectively called Innovation Support Services (ISS). Faure et al. (2019, p. 147) describe ISS as "an immaterial and intangible service that involves one or several providers and one or several beneficiaries in activities in which they interact to address a more or less explicit demand emerging from a problematic situation and formulated by the beneficiaries and to co-produce the services aimed at solving the problem". ISS providers could be public, private, and third sector actors who take the task either as a core business or as part of a broader package of services. Literature differentiates and aggregates types of ISS functions based on their emphasis (Heemskerk, Klerkx, & Sitimal 2011; Kilelu, Klerkx, & Leeuwis 2013; Mathé et al. 2016; Knierim, Ndah, & Gerster-Bentaya 2018; Faure et al. 2019). In this paper, we propose to use the

typologies of ISS functions compiled by Knierim et al. (2018) and Faure et al. (2019) as presented in Table 5 to identify and characterise the ISS activities and roles of advisors.

Table 5 ISS activities and their descriptions

ISS activities	Brief description/ of activities	Examples	Conceptual basis
Creating awareness and facilitating exchange of knowledge	Activities contributing to knowledge awareness, dissemination of scientific knowledge or technical information	Use of posters, official documents, databases, brochures, banners, fairs, field visits, policy briefs, guidelines, technical reports, thesis report etc.	Leeuwis (2004:31); Kilelu et al. (2011)
Advisory, consultancy and backstopping	Activities aiming at solving problems on actors' demands and at the co-construction of solutions	A case of visiting and advising, guidance on the job, support to problem-solving	Leeuwis (2004); Edquist (2011); Heemskerk et al (2011)
Demand articulation	Services targeted to help actors to express clear needs to research, service providers, other actors	Price organised to award specific product, support to establishing project exposé	Oakley (1991) ; Kilelu et al. (2013); Kilelu et al (2014)
Networking, facilitation and brokerage	Services to organise networks; improve relationships between actors, to align services, all activities aimed at strengthening collaborative and collective action.	Round table discussions, establishing contacts, Maintaining platforms and social media devices, acting as a mediator to solve a conflict/solve problem	Oakley (1991); Albert (2000); Auvine et al. (2002); Roth (2003); Heemskerk et al. (2011); Koutsouris (2012); Kilelu et al. (2013)
Capacity building	The services comprise the provision of classical training and of experiential learning processes.	Training on leadership, on management and planning, on how to manage a cooperative, how to work collectively, technical training etc.	Oakley, (1991); Albert (2000); Leeuwis (2004); Edquist (2011); Heemskerk et al. (2011); Kilelu et al. (2013); Allebone-Webb et al. (2016)
Enhancing access to resources	Services enhancing the acquisition of needed resources for the innovation process.	Inputs (fertilisers, seeds, facilities, equipment), funds, access to market and acquisition of certification status	Albert (2000); Hekkert et al. (2007); Hekkert et al. (2007), revisited in Klerkx et al. (2009); Labarthe et al. (2013)
Institutional support for niche innovation,	Institutional support (incubators, experimental infrastructures, etc.), support for the design and	A survey to check if laws are followed, support actors to comply with the procedures, deliver certification, provide	Gadrey (1994); Edquist (2011); Heemskerk et al. (2011); Kilelu et al.

and scaling mechanisms	enforcement of norms, rules, funding mechanisms, taxes, and subsidies, etc.	new authorization to implement activities forbidden before	(2013); Faure et al. (2014)

Source: Knierim et al. (2018) and Faure et al. (2019) and based on Mathe et al. (2016) and Faure et al. (2017)

2.4.3. From ISS roles to business models

Regardless of the ownership and management structure of organisations delivering innovation support services to farmers as individuals or groups of advisors, there is a transactional relationship between the service provider(s) and client(s). This dimension may be strictly a business service offered and paid for in a consultancy fashion or longer-term relationship based on past experience or a mandated role of support offered/assigned as part of a levy or central funded program or arise from mutual benefit. This sub-section explores the 'business models' related to interactive innovation support, i.e. the institutional settings and the financial constellations that go along with the provision of advisory and innovation support services.

Rates of return on advisory services' investments in developing countries have generally ranged from 5 percent to more than 50 percent (Evenson 1997). A meta-study of 289 studies of economic returns to agricultural research and extension found median rates of return of 58 percent for extension investments, 49 percent for research investments, and 36 percent for investments in research and extension combined (Alston, Chan-Kang, Marra, Pardey, & Wyatt 2000). Some caution is necessary in interpreting these results as these kind of studies are confronted by daunting methodological problems and rates of return are highly variable for even the same program. Other studies such as (Hennessy & Heanue 2012) reported increased profits linked to higher rate of good practice adoption by farmers participating in advisor facilitated dairy discussion groups.

As institutional settings, we consider the multiple ways service provision is organised and financed. The literature usually distinguishes four models according to the governance and financing character of the institutions involved (cf. Fig.2).

As regards payment for advisory services/consultancies, many different ways are used to determine fair and proportionate cost. As with any service, the rate of fee is based on a calculated market value and represents a return to labour, capital and management as well as a profit margin in the private sector. It is often the case that private sector suppliers have other more profitable side businesses, which are complementary and generate relatively bigger margins. These complimentary businesses may typically supply accountancy/taxation, legal or estate agency services to farmers and these may cross fund the advisory service business model.

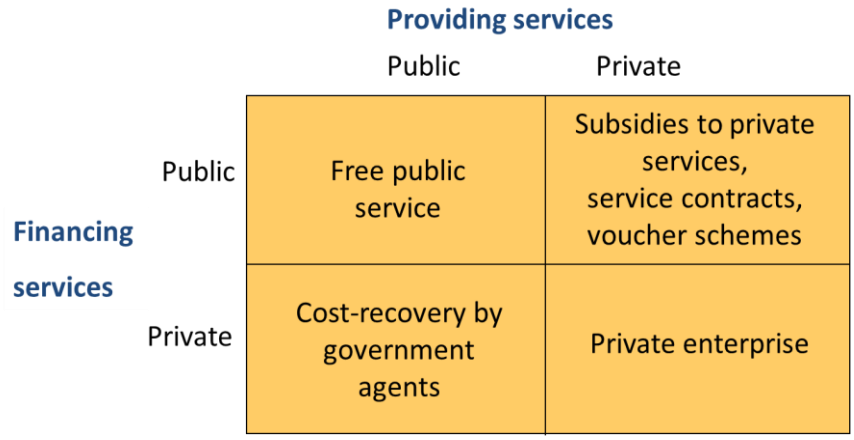


Figure 2 Provision and funding of service transactions (Kidd et al. 2000)

While public funds are used in the public and private sector organisations, their use is highly regulated and limited by the legislative background of the organisation, these limits are also subject to state aid rules[2], see article 21 and 22 of this EU legislation. Private external funding is also seen coming from up or downstream actors in the supply chain or from NGO's and varies on a specific case by case basis. In the Agrispin case studies, it was common to see many cases where the major input to the innovation intermediary was supported by an external body, whose business was or was not related to the group or parties involved. Other models exist where fees are linked to outcomes based on the principles of 'gainsharing' seen in remuneration of staff in certain industries, or 'no goal no fee' where the service fee is dependent on the outcome. There are some examples of this happening in the preparation of open funded project calls.

Within i2connect and the field reviews and cross visits, these models of funding will be part of the assessment of good practices and learning objectives. These will help to inform the project and will be a valuable input to WP3 in convincing advisors, their managers and others to see that i2connect can improve their service and value offering to their customers.

Business models for interactive innovation related services

Most advisory services, either public or private, provide administrative, technical and innovation support in a business relationship to farmers. This relationship is a commitment of time and money by both parties towards a mutually accepted service. The **interactional basis** of this relationship is that advisors provide services (technical, economic and social) which can help decision making on farms and as such, are valued by farm business, farmers and their families. For the **financial basis** of this transaction, a variety of business models is possible which are presented in the following:

[2] https://ec.europa.eu/agriculture/stateaid_en

The consultancy model – This is where farmers pay the full cost of the service and a margin to the owner or provider of the service. The model is chosen by organisations with no direct public funding but may have indirect public funding. The value proposition is that the value of the service delivered meets or exceeds the expectation of the farmer and that they pay the providers. Payments are usually on a usage basis (like a visit to the dentist or medical doctor), and the service model may be time (/hour) related or based on a menu of services and supports with defined charges (Fig.3, lower right quadrant).

The membership fee model - This is where the farmer pays all or some of the cost and margin to the service provider in advance in return for the potential to use the service when needed. The level of charge may be adjusted if the usage exceeds the contracted amount of service, thus offering a tiered fee structure based on scale of farm or usage pattern. This system is equivalent to a club membership, which entitles the farmer to a fixed supply of optional services and contact points. The onus is on the farmer to use the service offered and the advisor organisation to respond to the requests (Fig.3, upper right quadrant).

Partially funded service model - This is a model where the service provider receives funding from state grants directly or indirectly. Here, the justification for public funding is important and often limits the level of service to individual farmers who do not pay for them. The administration cost of collecting fees is often high and needs to be managed. Within this model, it is required to demonstrate value for money to both the farmer clients and the funding agency, often requiring co-designed programmes with key performance metrics, evaluation and impact assessment processes (Fig.3, lower left quadrant).

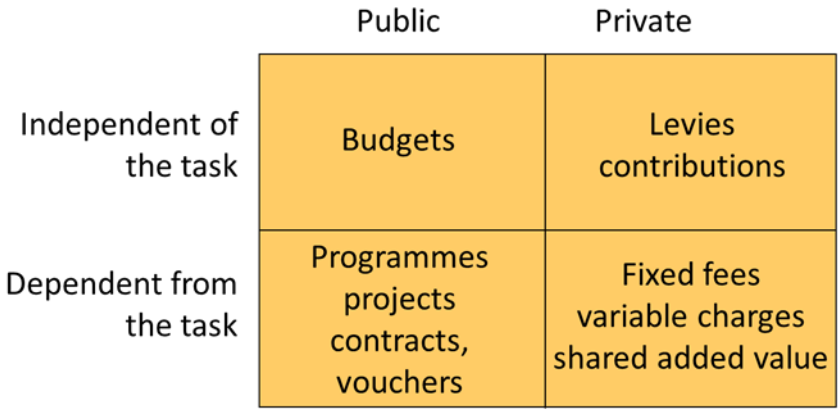


Figure 3 Financing schemes for service provision (Kidd et al. 2000)

The fully funded service model - In this model, funding for advisory services effort is provided in an annual budget from state grant, farm levies, local taxes. The value proposition for farmers is based on the time they invest in using the service and the value they receive for this input. The fact that the

service is free of charge it is not without effort for farmers as they commit time and cost in their participation (Fig. 3, upper left quadrant).

The fully funded service and participation model - This is where the funding budget for both the advisor and farmers are provided by a state, levy or project grant system. This model is the one currently supporting many EU EIP Operational Groups to boost interactive innovation. These projects are based around a clear public good and activity of networks of farmers and others.

3. Concepts related to Innovation

KEY TERMS AND CONCEPTS

Innovation is regarded both as a result and as a process. As a result, innovation means the implementation of new or significantly improved products (goods or services), or processes, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations. As a process, innovation is a dynamic and iterative process that emerges from a network of actors (e.g. technical, social institutional) where interactive learning takes place around a common concern or impulse of change. An innovation process is an iterative cycle or a line with several loops that repeat and adjust over time.

Typologies of Innovation provides us with different categorisations of innovations. Innovations can be categorised as a product, practice, service, and production process. Also, innovations can be categorised as technological, organizational or social.

Innovation adoption highlights the process by which an individual's behaviour is modified to accomplish the change that results from the uptake of an innovation **by one or several individuals**. The behaviour modification emerges from the interplay of diverse forces that create a set of circumstances through the dynamic interaction of a person and her/his environment. The decision to adopt an innovation involves several steps that include awareness or knowledge about the innovation, persuasion to test it, deciding to test, implementing the innovation, confirming to maintain the innovation by reinforcing the decision.

The innovation development process sheds light on the spread of innovation within a social system by emphasising the complex interactions and interdependencies between individuals and their social environment. Some models that are used to capture the process are:

a) **The diffusion of an innovation** model highlights the phases in which the dissemination of the Innovation to more members of a social system takes place through certain channels over time. Diffusion may start slow and accelerate at later stages. In the diffusion process, the innovators and the early adopters are crucial to the success of an innovation. The model distinguishes four phases: i) the innovator as a trouble maker phase, where the first person to practice Innovation is recognised, (ii) the critical phase, where some are persuaded by the ideas of the innovator and others reject it; also explained as the tipping point or the critical mass, iii) transition to self-sustaining process, where adoption by influential people brings new dynamism, and iv) final phase of the wave, where the adoption rate sinks gradually after reaching a peak; in this phase, the innovation is assumed not to be any longer equally appropriate and advantageous for all concerned.

Key terms and concepts continued

b) **The spiral of innovation model** differentiates the innovation process into seven non-linear phases or steps, which provides a clearer picture of the interactions and communication flows within the actors involved in the innovation process. The innovation starts with the **initial idea phase;** where actors get a new idea because of a felt problem or an opportunity. New initiatives could as well emerge from interactions. Next, during the **inspiration phase** others become inspired and form a warm informal network around the initiative. This includes people with shared interest or similar ambitions. In the **planning phase,** initiators formulate plan for action and negotiate space for experiments especially with people who control the conditions e.g. funds, mandates etc. During the **development phase,** experimentation is carried out, new practices developed and evidence collected to proof that these practices work. Then, in the **realization phase**, innovation goes into implementation at full scale. This requires negotiation with people affected by the change. During the **dissemination phase,** effective new practices are being picked up by others with similar interest and problems. Finally, in the **embedding phase,** new practice becomes widely accepted and existing structures and institutions incorporate this as normal. Here, what matter is new rules, laws, subsidies, taxes, to mainstream the innovation.

c) **The 3-phases in innovation process** aggregate innovation into three main steps. **The initiation phase** that involves activities relating to interest creation, research and discovery of issues, opportunities, and solutions, leading eventually to the intention to adopt an innovation. **The development phase** involves trials and pilots of the Innovation and evaluating it from practical, strategic, financial, and/or technological perspectives. **The dissemination phase** deals with the inclusion and absorption of the Innovation in the societal system. It includes acceptance, adoption and the use of the Innovation by the society.

3.1. Innovation: definition and typologies

The definition of innovation provided by the OECD (Mortensen & Bloch 2005) has become a general reference for innovation studies in different fields. It states that innovation means an implementation of new or significantly improved products (goods or services), or processes, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations. In the guidelines for the EIP-AGRI (COM 2014), the European Commission further elaborates on this concept: "Innovation is often described as a new idea that proves successful in practice. Innovation may be technological, but also non-technological, organisational or social. Innovation may be based on new but also on traditional practices in a new geographical or environmental context. The new idea can be a new product, practice, service, production process or a new way of organising things, etc. Such a new idea turns into an innovation only if it is widely adopted and proves its usefulness in practice." Innovations can be characterised in various ways: as a product or a process, incremental or radical, technical or organizational (Eurostat 2005) or as "Doing things better, doing better things, or changing track" (Wielinga et al. 2008).

Alternatively, some authors regard innovation as the result of a dynamic and iterative process and therefore consider that innovation emerges from a network of actors (e.g. technical, social institutional) where interactive learning takes place around a common concern or impulse of change (Lundvall 1992; Edquist 1997; Knierim et al. 2015; Wielinga 2017). Along the same line of thinking, Smits (2002) and Leeuwis (2013) define innovation as "the result of the successful combination of hardware (technical devices), software (new modes of thinking), and orgware (new rules, standards)". Smits and Leeuwis use the term alignment to describe the process of building linkages and network that brings the different aspects and dimensions of an innovation in line with each other, which is crucial for the success.

An innovation process is an iterative cycle or a line with several loops that repeat and adjust over time. A cycle begins with a need to solve a problem or address a challenge and ends with its implementation and dissemination. Literature distinguishes different phases in innovation processes, which can be broadly categorised into: the initiation and generation of ideas, the adoption at individual level, the adoption and dissemination at societal level. Literature on adoption also takes the perspective of change in behaviour towards change that comes with the innovation. In the next sections, we briefly describe some concepts and models on innovation processes and adoption behaviour.

3.2. Innovation process

3.2.1. The initialization and generation of an innovation

A farmer, a scientist, an advisor, or other actors in the AKIS can be the initiator and driving force to a new idea, which could be a technical novelty, a policy initiative or a new social arrangement. However, in order to become a real innovation, such a new idea needs to be translated into skills and technologies and subsequently innovation (Leeuwis, p.141). Likewise, Hruschka (1994), Rogers (2003) and Wielinga, Koutsouris, Knierim, and Guichaoua (2017) highlight that innovation emerges from

interaction between stakeholders involved in the process of addressing problems and challenges along value chains.

Innovation is often triggered by a wish to solve a particular problem(s), which could have originated at individual or societal level (Leeuwis 2004). For example, it could come from a changed perception of an individual about reality or his/her aspiration to meet consumer concerns. At a societal level, it could be a problem related to natural constraints such as biodiversity loss or climate change. Besides problems, innovation can also be triggered by opportunities. For instance, the advancement of digital technologies may trigger AKIS actors to rethink practices of decision making on agricultural practices.

3.2.2. The adoption of an innovation (individual level)

Advisory services aim at individual and collective activities that can be conceived as voluntary change of behaviour. As explanatory bases to understand individual and group actions, we propose concepts from human psychology, agricultural sociology and extension.

Adoption of innovation is understood as the change, which results from the uptake of innovation by one or several individuals (Leeuwis 2004). In other words, adoption refers to modifying one's behaviour to accomplish the change (Hoffmann et al. 2009). According to Lewin (1943), human behaviour is the result of the interplay of diverse forces that create a set of circumstances through the dynamic interaction of a person and her/his environment. Lewin (1943) states that the interaction of situational forces with the perceived environment can be described as a field of forces, a system in tension or a psychological field.

Based on Lewin (1943), Hruschka (1994) explains change of behaviour (innovation adoption) as a result of the psychological field of inhibiting and driving forces. Inhibiting forces are those influential forces negative to target attainment and might include lack of subsidies, limited liquidity (for labour hiring, buying herbicides, legumes seeds for soil coverage, etc.), lack of machinery, and limited knowledge. On the other hand, driving forces or forces conducive to target might include financial assistance, technical advice, training, provision of inputs, linkage with market outlets, etc. According to Hruschka (1994), the forces tend always towards a state of dynamic equilibrium, while dis-equilibrium causes varying degrees of tension. Change – and thus behaviour modification – occurs when the magnitude of forces changes, forces are removed or added, - a concept that allows advisors to consider a change situation as determined by an interplay of various influencing factors.

More recently, a psychologically pronounced model became more prominent, which is the theory of planned behaviour (Ajzen 1991). With this model, three types of influencing factors are differentiated which are (positive or negative) 'attitude', the feeling of social pressure from others to perform or not perform a certain measure ('subjective norm') and the subjective beliefs about the ease or difficulty of successfully performing ('perceived behavioural control'). The combination of these socio-psychological constructs results in a positive or negative intention to perform the behaviour, which is taken as indicator for actual change or innovation adoption.

The innovation decision process

Rogers' (2003) five steps model of innovation adoption (Figure 4) is largely used to analyse adoption of agriculture innovation (Knierim et al. 2015). The five steps consist of the following processes:

(i) Becoming aware and getting knowledge of an innovation - This occurs when a potential adopter is exposed to the innovation's existence and gains some understanding of how it functions.

(ii) Becoming interested and convinced of its relevance - This occurs when a person forms a favourable or unfavourable attitude toward the innovation.

(iii) Making a decision to test it - This occurs when a person engages in activities that lead to a choice to adopt or reject the innovation.

(iv) Deciding for (or against) implementation - This occurs when an individual puts an innovation into use. Re-invention is especially likely to occur at the implementation stage.

(v) Confirming its maintenance - This occurs when an individual seeks reinforcement of an innovation decision that has already been made, but he or she may reverse this previous decision if exposed to conflicting messages about the innovation.

According to Hoffmann et al. (2009), the above five steps are not linear, and a backward and forward movement may be observed and sometimes a phase might be skipped.

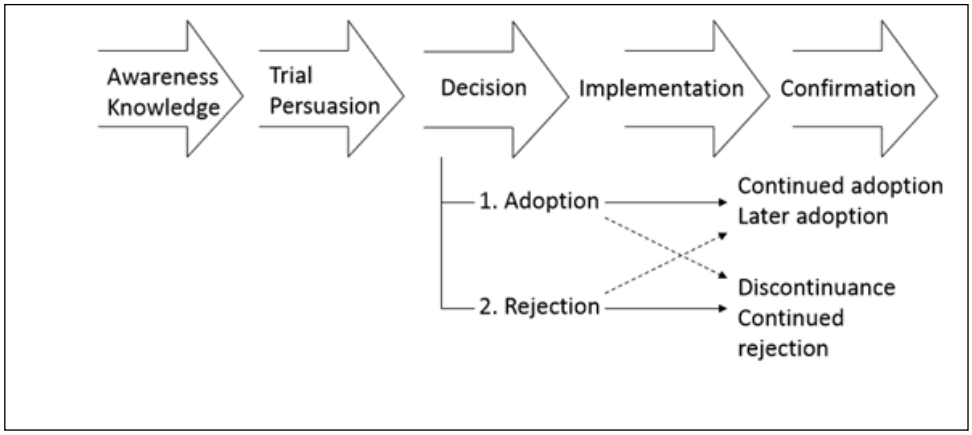


Figure 4 A model of five stages in the innovation decision process. Modified from Rogers (2003)

3.2.3. The comprehensive innovation development process (societal level)

In parallel to the innovation adoption process that occurs at individual level, an innovation's spread within a social system can be observed. Such early studies in agricultural production led to the development of the 'diffusion curve' and subsequently further models. A small selection is presented in the following section, which can be used to frame and structure innovation case studies in i2connect.

The diffusion curves

The diffusion of an innovation happens when the dissemination of the innovation to more members of society takes place through certain channels over time (Hoffmann 2009; Rogers 2003). In those cases when an innovation is established successfully and remains undisturbed in a social system, it begins with a slow rate of adoption, then it rises gradually and falls again towards the end taking the shape of the letter 'S' (Figure 5) (Rogers 2003). However, it could also be the case that at the beginning, adoption is slow and accelerates increasingly only in the final phase; this gives rise to a J-shaped curve (Hoffmann et al. 2009). Rogers (2003) has developed five categories of adopters according to their adoption behaviour (innovators, early adopters, early majority, late majority and laggards) from which here the first two are particularly highlighted because of their crucial role for an innovation's success:

(i) Innovators - Those risk-takers and pioneers who lead the way, frequently venturesome and educated persons.

(ii) Early adopter - Those who climb on board of the train early and help spread the word about the innovation to others. Frequently, they include social leaders and popular and educated persons.

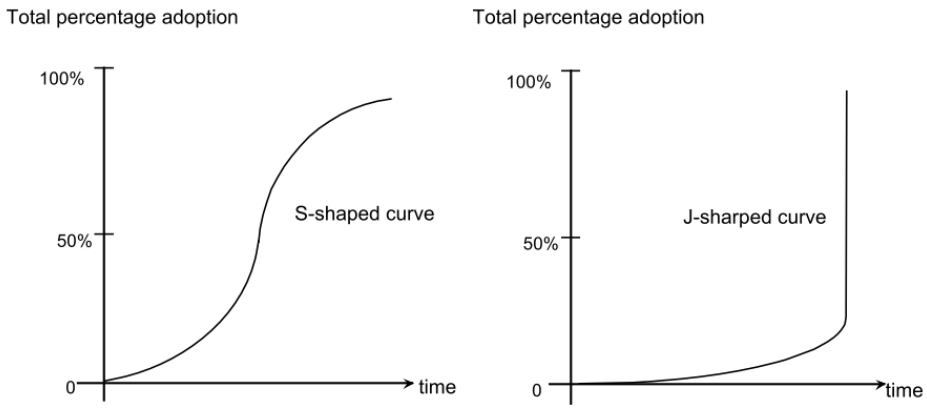


Figure 5 Diffusion curves. Source: Hoffmann et al. (2009)

In contrast to Rogers (2003), authors from the European extension studies such as Albrecht (1964), Röling et al. (1976) and Hoffmann et al. (2009) emphasise on the complex interactions and interdependencies between individuals and the social system during the whole process of diffusion. Criticizing the S-curve as too ideal and simplistic, Hoffmann (2009) proposes an alternative categorization of diffusion phases as follows:

(i) The innovator as a troublemaker: The first person to practice an innovation in a social system is called an innovator. The innovator at this early stage is the one who experiences a problem for which he would like to find a solution. For his peers, his activity is not only seen as strange, but an indication that their methods are old fashioned and outdated so that they might put up defence mechanism rejecting the innovation regard the innovator as a troublemaker.

(ii) The critical phase: Hoffmann et al. (2009) stresses that not everybody reacts negatively to the innovator. Some peers keep contact and refrain from mistrust and rejection. Some see themselves in a comparable situation with the innovator. Other terms often used to explain this phase are the critical mass and tipping point. A critical mass is the stage when more and more people start to believe that the new idea or practice is possible and existing structures should be abandoned or modified. Here people who were concerned of the risk in the initial stages start contributing to the change. Then the change process reaches a tipping point, a point of no return. Grodzins (1957) introduced the concept of tipping point, where the old structures and systems fall apart and new situations emerge.

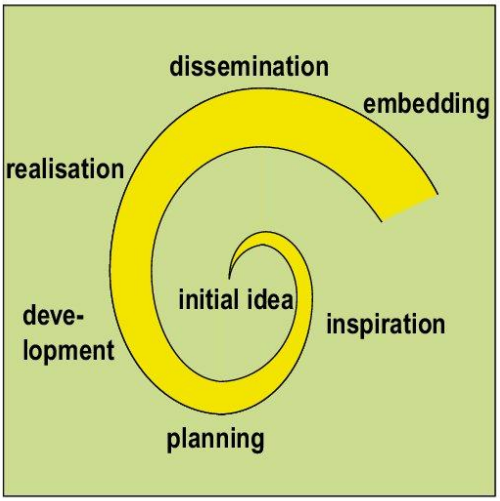
(iii) Transition to self-sustaining process: At this phase, what is currently new is going to be the future norm. While the first few adopters make the activity attractive, adoption by influential persons brings in a new dynamism into the process. A deviant behaviour on the part of the innovator, as initially regarded, is now felt to be a new approach. At this stage, farmers may no longer adequately check whether the innovation is beneficial or not hence, there is increased risk of misguided adoption of the innovation.

(iv) Final phase of the wave: What Rogers (2003) separates into the Late majority and the Laggards groups, Hoffmann et al. (2009) term the Final phase of the wave. They mention that if the innovation is assumed not to be equally appropriate and advantageous for all concerned, the adoption rate sinks slowly and gradually after reaching the peak. Just as the innovator from the onset was closest to the innovation and the first to adopt, there are now people for whom inhibiting forces are far stronger than the driving forces which would not necessarily qualify them as 'laggards' but rather as following different rationales.

A complementary approach to the diffusion curve could be the *interessement* model, which was introduced by Akrich et al. (1988) and conceives the innovation process as a *'tourbillonaire'* dynamic. The model seeks to explore the interactions and associations of the numerous actors along an innovation process. By doing so, the model enables us to follow multiple socio-technical negotiations among actors, their alliances and interests that drive an innovation (Akrich et al. 2002). The *interessement* model has inspired one of the contemporary approaches in social theory - the Actor Network Theory (ANT). The ANT focuses on tracing the interactions and relationships of actors and gives attention to the unpredictable ends and development processes of innovations (Latour 2005).

The spiral of innovation

The spiral of innovation model was developed in the context of the Dutch experiment "Networks in Animal Husbandry (2004 – 2007) (Wielinga et al. 2008; Wielinga & Geerling, 2009). In the more recent EU horizon 2020 project 'AgriSpin – Creating space for Innovation' it served to analyse interactive innovation cases during cross visits. The model differentiates the innovation process into seven non-linear phases or steps, which provides a clearer picture of the interactions and communication flows within the actors involved in the innovation process (Ndah et al. 2017). The interactions in each phase are described below.



1. **Initial idea phase;** where actors get a new idea because of a felt problem or an opportunity. New initiatives could as well emerge from interactions,
2. **Inspiration phase;** where others become inspired and form a warm informal network around the initiative. This includes people with shared interest or similar ambitions.
3. **Planning phase**; where initiators formulate plan for action and negotiate space for experiments especially with people who control the conditions e.g. funds, mandates etc., -
4. **Development phase**; where experimentation is carried out, new practices developed and evidence collected to proof that these practices work, -
5. **Realization phase**; here, innovation goes into implementation at full scale. This requires negotiation with people affected by the change,
6. **Dissemination phase**; where effective new practices are being picked up by others with similar interest and problems,
7. **Embedding phase**; where new practice becomes widely accepted and existing structures and institutions incorporate this as normal. Here, what matter is new rules, laws, subsidies, taxes, to mainstream the innovation.

Figure 6 The seven phases of the innovation process. Source: Wielinga et al. (2008)

The 3 phases in innovation process

Recent studies on technology innovation in agricultural systems have simplified again the innovation process concept and aggregated the phases into three main ones (Eastwood et al. 2017; Kernecker et al. 2019). Kernecker et al. (2019) define innovation as a social process that can be distinguished into three phases: The initiative, development and dissemination phase.

- The **Initiative** phase involves activities relating to interest creation, research and discovery of issues, opportunities, and solutions, leading eventually to the intention to adopt an innovation.
- The **development phase** involves trials and pilots of the innovation and evaluating it from practical, strategic, financial, and/or technological perspectives.
- The **dissemination phase** deals with the inclusion and absorption of the innovation in the societal system. It includes acceptance, adoption and the use of the innovation by the society.

4. Concepts related to interactive innovation system

KEY TERMS AND CONCEPTS

Interactive innovation emphasises cooperation among various actors, the sharing of knowledge and effective intermediation between actors along the value chains and at different territorial levels. Key for interactive innovation is that existing (sometimes tacit) knowledge is included whereby end-users and practitioners are not only involved as study objects but their entrepreneurial skills and practical knowledge are used for developing the solution or opportunity, thereby creating co-ownership.

Multi-actor approach involves all the relevant actors along the entire project; from the participation in the planning of work and experiments, their execution, up until the dissemination of results and possible demonstration phase. The relevant actors are those that share a complex problem, which requires new knowledge and practice and include actors from different societal sectors such as researchers, entrepreneurs, educators, government workers, NGO representatives as well as farmers/farmer groups, advisors, enterprises, etc.

The innovation network approach considers innovation to be the result of networks, which can be seen as social processes encouraging the sharing and utilization of knowledge. A network can be defined as a set of formal and informal social relationships between heterogeneous actors that shape collaborative action.

Learning and Innovation Networks for Sustainable Agriculture (LINSA): A network consisting of producers, consumers, experts, NGOs, SMEs, local administrations and components of the formal Agricultural Knowledge Systems that are mutually engaged with common goals for sustainable agriculture and rural development – cooperating, sharing resources and co-producing new knowledge by creating conditions for communication.

Learning organisation is a recognisable place where people intentionally expand their capacity to create the results they desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continuously learning to see the whole together.

Communities of Practice are groups of individuals that are informally bound together by shared values, expertise, interest, and a domain of practice. Here, learning is understood as a process of social construction and knowledge sharing in a cultural and historical context, rather than a process of knowledge transfer. Unlike a network of professional organisations, communities of practice are more flexible and accommodate dynamic membership that is influenced by the changing conditions.

KEY TERMS AND CONCEPTS

An **innovation platform** is a deliberate configuration of individual or organizational actors with different backgrounds and interests, with the purpose of facilitating and undertaking various activities around identified agricultural challenges and opportunities, at different levels in agricultural systems.

Agricultural Knowledge and Information System (AKIS) indicates a system that links people and institutions to promote mutual learning and generate, share, and utilise agriculture related technology, knowledge, and information. The system integrates farmers, agricultural educators, researchers, and advisors to harness knowledge and information from various sources for improved livelihoods. Farmers are at the heart of this knowledge constellation.

Agricultural Innovation System (AIS) indicates a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behaviour and performance. An even more abstract AIS concept differentiates between the four components (i) research and development, (ii) bridging institutions, (iii) business and enterprises and (iv) the enabling environment, which are all embedded in the larger political, institutional and social context.

Over the past 40 years, a wide range of approaches to agricultural innovation has emerged according to different perspectives on how innovation comes about and how the actors are involved in the process. In the classical "linear knowledge transfer" model that was in vogue during the 1960s and 1970s, formal knowledge (explicit knowledge) is developed through R&D activities, and advisory agents transfer the knowledge to farmers, who are expected to adopt it. It was a clear division of tasks between R&D and AS but critiques soon came up that the agricultural innovations were rather applicable for better-off farmers and less applicable for the diverse production situations of subsistence or small-scale farmers. The PTD (Participatory Technology Development) approach, which arose in the 1980s intended to include not only the needs of small-scale and subsistence farmers but also to engage farmers, researchers and advisory staff in a process of innovation creation (Reij & Waters-Bayer, 2014; van Veldhuizen et al. 1997). However, the approach remained quite marginal, was applied in countries of the Global South and was mainly supported by NGOs. In the decades that followed, the simplistic view of innovation as "an invention to be transferred to and adopted as such by the intended users" (Klerkx et al. 2015, p.458) was criticised on several grounds, including the fact that innovation processes are in fact rather dynamic and that many actors play an active role in the process (Roling & Wagemakers 2000; World Bank 2006). This is reflected in the idea that innovation is the outcome of an Agricultural Innovation System (AIS), which is the most recent in the family of systems approaches. According to this approach, innovation is not only about adopting new technologies but also about new social and organizational arrangements. It additionally provides the

framework for understanding innovation as emerging from networks of actors engaged in an interactive learning process (Koutsouris 2018).

Also in recent European research and innovation discourses that feed into the design of research programs for the agriculture and forestry sector, there is an increasing trend toward an interactive innovation approach, which emphasises cooperation among various actors, the sharing of knowledge and effective intermediation between the stakeholders along the value chains and at different territorial levels. In the guidelines for the EIP-Agri (European Commission 2017, p.9), the European Commission defines the interactive innovation approach as follows:

HORIZON 2020 - Work Program 2016 – 2017, on interactive innovation approach

"In this interactive innovation model, building blocks for innovation are expected to come from science, but also from practice and intermediaries, such as farmers, advisors, businesses, NGOs, etc. Key for interactive innovation is to include existing (sometimes tacit) knowledge into scientific work: end-users and practitioners are involved, not as a study-object, but in view of using their entrepreneurial skills and practical knowledge for developing the solution or opportunity and creating co-ownership. Innovation generated with an interactive approach tends to deliver solutions that are well adapted to circumstances and easier to implement since the participatory process is favourable to speeding up the acceptance and dissemination of the new ideas. In short, the focus of interactive innovation is: "an idea put into practice with success" because a new idea turns into a genuine innovation only if it is widely adopted and proves its usefulness in practice."

In the following sub-sections, we explore some of the major concepts related to the interactive innovation approach.

4.1. The multi-actor approach and innovation

Multi-actor approaches are not new and have over thirty years, been a key principle in EU policy making, a more recent example being initiatives such as EIP-AGRI and Horizon 2020. The underlying rationale is that practical solutions to the most challenging development problems cannot be solved by a single actor, even an institutional one (Macken-Walsh 2019). The defining characteristic therefore of a multi-actor approach is that it involves all the relevant actors along the entire project: from the participation in the planning of work and experiments, their execution, up until the dissemination of results and a possible demonstration phase. The relevant actors are those that share a complex problem, which requires new knowledge and practice and include actors from different societal sectors such as researchers, entrepreneurs, educators, government workers, NGO representatives as well as farmers/farmer groups, advisors, enterprises, etc. Each is involved through their personal interests and goals and/or institutional backgrounds, and brings to the table complementary types of knowledge, as well as a range of perspectives, values and interests (Beers & Sol 2009). Ultimately, innovations that are generated through such a multi-actor process, are expected to generate solutions that are well adapted and easier to apply by virtue of "cross-fertilization of ideas between actors, co-creation and generation of co-ownership" (European Commision 2017).

4.2. The innovation network/innovation system concept

The network approach to innovation, in a similar way, resulted from the increasing recognition that complex problems in the agricultural sector cannot be dealt by one actor alone. Instead, diverse societal actors with diverging interests and values need to come together to co-create new innovations (Hermans, Klerkx, & Roep 2015). The network approach was thus a response to the need for a new way of organizing and connecting multi-disciplinary and inter-sectoral groups so as to facilitate the processes of knowledge co-creation and social learning (Beers & Geerling-Eiff 2014). In this approach, there is "a shift from monoculture of scientific knowledge towards ecology of knowledge, which assumes the diversity of knowledge" (Moschitz et al. 2015, p.2). It also changes the traditional perspective of the learning process from considering the individual farmers as "passive absorbers of the purposefully disseminated knowledge" (Moschitz, Roep, Brunori, & Tisenkopfs 2015) to that of active social learning, the central proposition of which is that knowledge is acquired in interaction. Within this context, a network can be seen as social processes encouraging the sharing of knowledge and can be defined as a set of formal and informal social relationships between heterogeneous actors that shape collaborative action.

In agricultural research, the term LINSA (Learning and Innovation Networks for Sustainable Agriculture) was introduced which was defined as "a network consisting of producers, consumers, experts, NGOs, SMEs, local administrations and components of the formal AKS (Agricultural Knowledge Systems) that are mutually engaged with common goals for sustainable agriculture and rural development – cooperating, sharing resources and co-producing new knowledge by creating conditions for communication" (Dockès et al. 2013). The idea was proposed as a response to the inadequacy of formal AKIS institutions to bring about the transition from the long-dominant productivist regime towards a sustainability-oriented one. Through the three-year European funded research project *SOLINSA "Agricultural Knowledge Systems in Transition: Towards a more effective and efficient support of Learning and Innovation Networks for Sustainable"*[3], several key learnings were obtained. First of all, the project found that LINSA can manifest in different forms depending on the structure, actor relationships, knowledge and communication system traits, learning processes and relationship to AKIS. Three key features were also identified to be integral to the social learning process – the processes of co-evolution, joint reflection and facilitation.

4.3. Professional organisations and peer-to-peer networks

Networks of actors in innovation processes can be organised formally as professional organisations or associations at national level, regional level (e.g. SEASN), EU level (e.g. EUFRAS, FiBL Europe) and global level (e.g. GFRAS). Professional organizations in advisory services provide a platform where best practices in advisory methodologies are discussed and shared for mutual benefit among advisors and organisations from; public, private, FBO and other third sector actors that share common interests and values.

[3] Grant Agreement N° 266306

"Organisations are social structures with a definable membership and an internal allocation of roles, and they pursue the aim of passing on their achievements to the outside world. They are or at least they are intended to be rationally organised" (Mayntz 1963 in Hoffmann et al. 2009, p.85). Members in organisations derive procedures for making decisions in the name of the organisation, delegating individuals the authority to act for the organisation and setting boundary between the organisation and the rest of the world (Argyris & Schon 1978).

Networks of innovation actors can also be organised informally as peer-to peer networks such as communities of practice. The overall aim of both networks can be summarised as the facilitation of learning and knowledge sharing towards a common concern, or goal by interacting with actors in the AKIS. This process can be challenging in a fast-changing world where economic, societal, and technological transformations in agriculture are making the sector more data-driven, information-rich and knowledge-intensive (GFAR 2018). To cope with these changes, organisations "need to be adaptive and creative and anticipate diversity and continuous change" (Leeuwis 2004, p.306).

The following sub-sections briefly summarise two concepts; learning organisation and communities of practice that may guide us to understand the learning processes and structures of networks of actors engaged in interactive innovation processes.

4.3.1. Learning organisation

Learning is a process of co-evolution and transformation to cope with a changing environment. The ability to cope with change is understood as an "ability to learn" or, at a corporate level, to be a "learning organisation".

The learning process takes place through exchanging information, services, goods and assets with own colleagues or with outside partners and through feedback by monitoring results (Hoffmann et al. 2009). Learning organisations embrace multiple and heterogeneous informal networks of actors within the organization and encourage the flow of knowledge and innovation (Brown & Duguid, 1991). Similarly, Senge (1990) defined a learning organisation as "a place where people continually expand their capacity to create the results they desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continuously learning to see the whole together" (Senge 1990, p.3). According to Senge, there are five key elements required for organisations to become learning organizations. These are:

- Capacity to focus on what is important to the individual worker and stakeholder within the organisation
- Team learning based on collective thinking
- Mental models which allow a capacity for the expression of internal perceptions.
- Shared vision, which is the ability to build commitment within all individuals and in a group.
- Systems thinking which allows the organisation to find holistic solutions to problems.

In i2connect, the concept of learning organisation may be useful to understand the features of professional organisations that facilitate the process of learning among the network of actors.

4.3.2. Communities of Practice

A good example of peer to peer networks is the Communities of practice (CoP). CoP are groups of individuals that are informally bound together by shared values, expertise, interest, and a domain of practice (Wenger, McDermott, and Snyder 2002). Individuals in CoP deepen their knowledge and expertise related to their shared concerns, problems, or passions by interacting on an ongoing basis and experimenting with new methodologies and new approaches that can potentially play a role in strengthening their practices (Wenger, McDermott, and Snyder 2002; Ingram 2014). According to Wenger (1998), the defining features of CoPs are:

- Emerge spontaneously from informal networking among individuals in groups,
- Individuals in the group are united in both action and in meaning creation, both for themselves, and for the larger collective,
- Constant changing of membership and changing circumstances without organizational constraint,
- Use face to face or virtual mechanisms to share information,
- Can emerge within an organisational setting.

The notion of CoP emphasises that learning is a process of social construction and knowledge sharing in a cultural and historical context, rather than a process of knowledge transfer (Morgan 2011; Farnsworth, Kleanthous, & Wenger-Trayner 2016). Unlike the network of professional organisations, communities of practice are more flexible and accommodate dynamic membership that is influenced by the changing conditions.

In i2connect, CoP could be a relevant model to understand and foster the learning processes among network of actors involved in selected innovation cases.

4.4. Innovation platforms

Similarly, innovation platforms (IPs) are based on the innovation systems approach and have recently gained ground as important interventions for creating spaces to orientate interaction in order to enable innovation (Klerkx, Aarts, & Leeuwis 2010). The concept of 'platforms' as places of negotiation and social learning concerning conflicting interests, goes back to Röling (1994). Since then, the terminology used is different in different contexts – "innovation networks", stakeholder networks", "innovation clusters" or "multi-stakeholder platforms", etc. and there seems not to be a clear agreement in literature on the specific characteristics of an innovation platform (Pali & Swans 2013; Nederlof, Wongtschowski, & van der Lee 2011). In this conceptual paper, we concur with the definition given by Kilelu, Klerkx, and Leeuwis (2013) who describe an IP as follows: a deliberate configuration of individual or organizational actors with different backgrounds and interests, with the purpose of facilitating and undertaking various activities around identified agricultural challenges and opportunities, at different levels in agricultural systems. By bringing different actors together, IPs provide not only the space for learning but also for negotiation, conflict and dealing with power dynamics.

The benefit of IPs is several folds. First, they provide a space for dialogue and understanding among the various actors that can lead to a common vision and mutual trust. Second, the different actors by virtue of their different backgrounds provide different alternatives to the bottlenecks hindering innovations and develop solutions beyond what individual actors can achieve alone. Third, participation in the decision making creates motivation and feelings of ownership which leads to a higher likelihood that the solutions are supported and actively promoted. IPs also contribute to the capacity development of actors by improving communication, learning and exposure to new ideas, so they are better equipped to adapt to unforeseen changes and new opportunities (Homann-Kee Tui et al. 2013).

However, the implementation of IPs alone does not automatically translate to system-wide changes and large-scale impact (Schut et al. 2018). Several authors note that an IP's performance and impact depend on a number of variables. For example, IPs by virtue of bringing together diverse actors with different interests, objectives and needs can lead to tensions and conflicts (Hinnou, Mongbo, Kamanda, & Sanyang 2018). This can severely hinder the realization of expected development outcomes, unless the interactions are facilitated or orchestrated by skilled and motivated intermediary actors (Kilelu et al. 2013; Tenywa et al. 2011). Another factor is flexibility; IPs, while being a systematic and structured attempt to facilitate change through joint action, must also be flexible in terms of adapting to changing contexts (Homann-Kee Tui et al. 2013). As actors go through the iterative cycle of designing the intervention, testing in practice, observing for changes, reflecting on the success and failures and back to a new cycle of (re)designing the intervention, they must be prepared to adapt their approach and expectation as well as to manage failures.

4.5. AFKIS/AIS

As mentioned earlier, the past decades have witnessed a burgeoning of a wide range of systems approaches to the complex processes of knowledge generation and exchange, learning and innovation practices. In the domain of agriculture, related policy, research, technology, and rural development, two main frameworks in particular have emerged:

- The Agricultural Knowledge and Information System (AKIS) or Agricultural Knowledge and Innovation Systems (AKIS),
- The Agricultural Innovation Systems (AIS).

The World Bank (2012) defines the two frameworks as follows:

- *Agricultural Knowledge and Information System (AKIS)* indicates a system that links people and institutions engaged in mutual learning and who together generate, share, and utilise agriculture related technology, knowledge, and information. The system integrates farmers, agricultural educators, researchers, and advisors to harness knowledge and information from various sources for improved livelihoods. Farmers are at the heart of this knowledge triangle.

- *Agricultural Innovation System (AIS)* indicates a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behaviour and performance.

The AKIS acronym has since evolved to describe Agricultural Knowledge and Innovation Systems to "encompass and influence the complexity of knowledge and innovation processes in the rural sphere" (EU SCAR 2012). According to EIP-AGRI, AKIS describes "the whole knowledge exchange system: the ways people and organizations interact within a country or a region. AKIS can include farming practice, businesses, authorities, research, etc. and can vary a lot, depending on the country or sector."
(Labarthe, Caggiano, Laurent, Faure, & Ceft 2013) highlight the similarities between the two perspectives as sharing:

- the constructivist paradigm
- the understanding of innovation as a product of a social phenomenon: i.e. innovation taking place in the complex interaction of diverse social actors rather than in isolated sub-systems
- the recognition of the diversity of knowledge sources as equally important inputs for innovations to happen.

However, the same authors also recognise some differences emerging in the academic debate between the two perspectives (Labarthe et al. 2013, p. 29). The first is that AIS integrates a much broader scope of actors whereas AKIS is "limited in its ability to conduct analysis beyond the nexus of the public sector and to consider the heterogeneity among agents, the institutional context that conditions their behaviours and the learning processes that determine their capacity to change". Another point is that the two perspectives by virtue of the different viewpoints from which they emerged, differ in their choices of interest and emphasis; whereas AIS derives from a researcher perspective, AKIS evolved from the extension perspective.

For the overall purpose of i2connect, a knowledge and innovation system concept is necessary to describe and differentiate the wider environment of the 'innovation advisor'. Therefore, we refrain from drawing a stark differentiation between AKIS and AIS for the practical use and rather see them as interlinked and cumulative whereby AKIS focuses on "the generation and diffusion of knowledge, and AIS on the generation, diffusion, and application of knowledge" (Roseboom 2011 in Labarthe et al. 2013, p.30). As the most comprehensive however abstract concept, i2connect partners may use the AIS perspective, which we visualise below based on the TAP (2016) framework.

AIS, as seen in Figure 7, can be distinguished into four components: research and education, business and enterprise, bridging institutions and the enabling environment. Within this framework, **we understand innovation as a process of co-creation involving a broad spectrum of actors who are engaged in an interactive process of knowledge acquisition and learning. The underlying assumption is that the pattern of interaction between individuals and groups, including common attitudes, routines, practices, rules or laws that regulate the interactions, largely generates the innovation capacity of an organization or sector.**

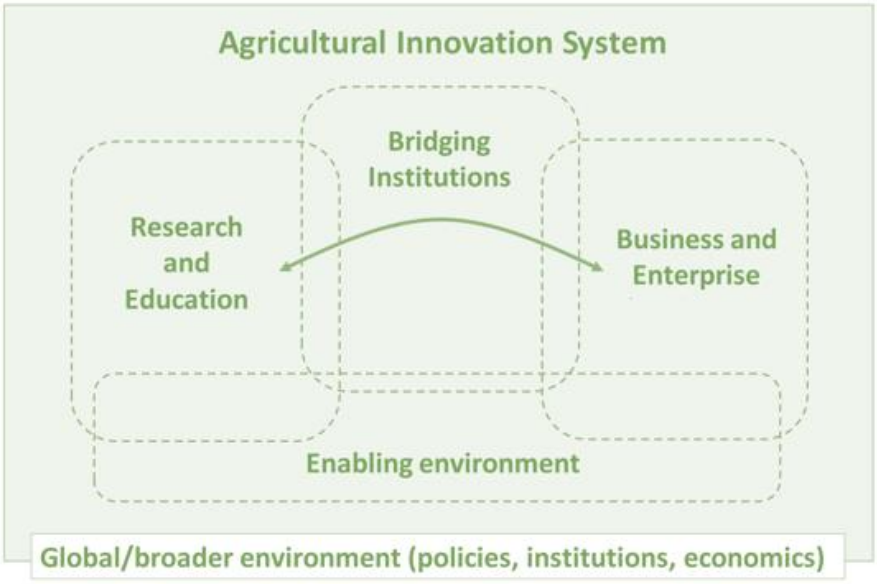


Figure 7 Conceptual Diagram of the Agricultural Innovation System
Adapted from TAP (2016)

5. Building the competences of innovation advisors

KEY TERMS AND CONCEPTS

Social learning is a simultaneous process of both individual learning and interactive learning in a process of social change, which affects the wider social-ecological systems. This means that for social learning to occur there is not only a change in understanding that is demonstrated in the individuals involved but also a change at a sufficiently broad scale through social interaction.

Single-loop learning is an incremental learning that does no more than correct deviations from the norm by making small changes and improvements without challenging assumptions, beliefs or decisions.

Double-loop or generative learning involves challenging assumptions, beliefs, norms and decisions in an organization rather than accepting them. Double-loop learning goes far deeper than the traditional learning loop provided by the single loop and is associated with change, which might involve a major modification in an organization.

Triple-loop or deutero learning involves learning about the double loop learning process. It focuses on questioning current and existing learning habits. Triple-loop learning is about reflecting on what people in organizations believe, how they think and their values and how they relate to what they do and how they do it.

Competence is the proven ability to apply learning outcomes adequately in a defined context, i.e. using knowledge, skills and personal, social and/or methodological abilities in work or study situations and in professional and personal development.

Capability refers to the deployment and application of competencies

Capacity refers to the ability of people, organizations and society as a whole to manage their affairs successfully. It is understood as a process of collective learning and continuous adaptation to externalities, and not something that can be designed and implemented with a well-designed set of products and services.

Experiential learning is said to occur when a personally responsible participant, cognitively, affectively, and behaviourally processes knowledge, skills and/or attitudes in a learning situation characterised by a high level of involvement. Thus, experiential learning involves more than just the cognitive aspect of learning.

Transformative learning occurs if an effective change in a frame of reference (consisting of associations, concepts, values, or feelings, which define a person's lifeworld and form the assumptions through which a person understands experiences) has taken place.

KEY TERMS AND CONCEPTS

Collaborative learning means that people work together in order to construct something that did not exist before the collaboration, and which would not exist without the collaboration process. Interaction and dialogue between the participating individuals are key.

Training aims to fill a specific knowledge and competence gap(s) identified in a certain context. This is in contrast to teaching which aims at knowledge transfer and assumes participants have no prior knowledge.

Facilitation is the process of enabling and empowering people in a group to carry out a task by encouraging them to share ideas, resources, and opinions and to think critically to identify needs and effects ways of satisfying those needs.

Coaching is a form of supporting individuals or teams to acquire competence in a very specific problem situation that is defined by trainees themselves.

As described in Section 2, the current roles of an innovation advisor are diverse, reflecting the changing perspectives on advisory work over the last few decades. What was once narrowly defined as the process of transmitting technological innovation has now evolved to encompass a "multi-faceted, multi-purpose, multi-scaled and multi-disciplinary field". Now, the expectation is that advisors are "on the ground, co-innovating and collaborating, influencing change first in themselves, their partner communities and the organizations in which they work" (Ampt, Cross, Ross, & Howie 2015). However, as Campbell and Mortlock (2000) put it, when it comes to advisory work, we have amnesia, whereby "we have failed to learn from past mistakes and continue to rationalise the profession using a top-down framework within a conventional adoption-diffusion paradigm" (Ampt et al. 2016, p.158).

To develop the competences of innovation advisors amidst the requirements of this changing dynamic, we think it worthwhile to briefly mention a few learning theories that might be useful in fostering such competencies and mindsets. For this purpose, in this section, first, we re-evaluate the concept of learning in the context of interactive innovation and highlight some theoretical frameworks that may be of value. Based on this new understanding, we then briefly review the classical literature on the competences of advisors and open the discussion for some of the additional competences that are required for advisors engaged in interactive innovation. Lastly, we explore some of the didactical concepts for facilitating such competences in advisors.

5.1. Theoretical approaches to learning towards interactive innovation

Traditionally, learning has often been used as a synonym for knowledge where learning is seen as the acquisition of knowledge through study (Ison, High, Blackmore, & Cerf 2000). Learning is said to have occurred when individuals or groups have a change in their knowledge and understanding of the "state

or functioning of social, economic, biophysical or technical systems" (van Mierlo, Leeuwis, Smits, & Woolthuis 2010). However, when we consider innovation to be a multi-actor process that is driven by different worldviews and visions, other forms of perception and perceptual change should be considered as well. This means that learning should not be understood in narrow cognitive terms only but also in relation to the diverse social drivers that influence what actors do and do not do, for example, their own and other actors' goals, capacities, opportunities, identities, etc. (ibid.)

There are many well-known theories of learning in diverse disciplines that emphasise different aspects depending on the context. It is certainly not the aim of this section to provide an overview of these theoretical perspectives. Instead, we focus on those which we think are more relevant in the context of the above understanding of learning, which may serve as the overarching framework for guiding our task of defining and developing the competences of innovation advisors.

5.1.1. Social learning

The concept of "social learning" has been taken up by several researchers and activists in several domains. In early works, like that of (Bandura & Walters 1977), social learning was conceptualised as individual learning that takes place in a social context and hence is influenced by social norms. Recently, a new school of thought has arisen which conceptualises social learning as a simultaneous process of both individual learning and interactive learning in a process of social change, which affects the wider social-ecological systems (Reed et al. 2010). This means that for social learning to occur there is not only a change in understanding that is demonstrated in the individuals involved but also a change at a sufficiently broad scale through social interaction.

Sol, Beers, & Wals (2013) posit social learning as a dynamic process in which trust, commitment and reframing are regarded as emergent properties that are essential in triggering transformational change. Trust is the expectation that others will act in a responsible way without the need for intervening. Trust is said to develop fast when participants invest in the project and in each other, are willing to share knowledge and information and dare to take risks for the project. In that regard, trust is often higher in groups with some shared history of positive mutual experiences. Commitment refers to the extent to which participants and their organizational backgrounds expend their resources towards the goals of the project. It can be passion, motivation but also physical resources like time and money. Reframing is the process whereby there is a shift or substitution of original frames as participants embark on a process of reflection on their knowledge and values. During a social learning process, actors' understandings of the challenge at hand evolve. In addition, the values and the extent to which they agree with their collaboration partners also changes. If successful, the actors engage in a collaborate act of re-framing their views which in the end gives rise to a new shared frame on the problem (Beers, Sol, & Wals 2010).

5.1.2. Organisational learning

The concept of organizational learning provides a framework to understand how learning takes place in an organization. According to Eilertsen and London (2005), an organisation learns via a three-stage

process that consists of knowledge acquisition, dissemination and shared implementation by the members of the organisation. These three steps interlink implicit knowledge from individuals' experiences that are reflected in their behaviour, beliefs or attitudes during the interaction process; and explicit knowledge from files and documents. The learning process takes place through exchanging information, services, goods and assets with own colleagues or with outside partners and through feedback by monitoring results (Hoffmann et al. 2009). Authors like Argyris and Schon (1978) and Eilertsen and London (2005) have identified types or levels of learning that an organization can experience, i.e. single-loop, double-loop, deutero or triple-loop learning (Figure 8). All the learning types may be observed simultaneously in an organization or only one or two of them.

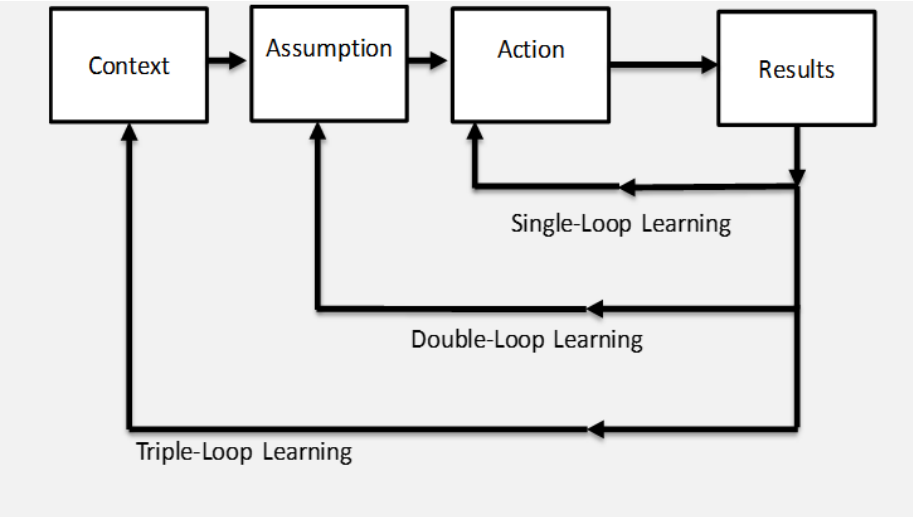


Figure 8: Three types of Learning. Source: Eilertsen and London (2005)

The single-loop learning type is an incremental learning that does no more than correct deviations from the norm by making small changes and improvements without challenging assumptions, beliefs or decisions. Organizations where single-loop learning is the norm, members define the 'governing variables': what they expect to achieve in terms of targets and standards, and then monitor and review achievements and take corrective action as necessary. For instance, an organization tries out new methods and tactics and attempts to get rapid feedback on their consequences in order to be able to make continuous adjustments and adaptations. This type of learning is about following the rules and procedures while trying to correct a problem (Argyris & Schon 1978).

The double-loop or generative learning type involves challenging assumptions, beliefs, norms and decisions in an organization rather than accepting them. On this basis, learning happens through the examination of the root causes of problems so that a new learning loop is established. Double-loop learning goes far deeper than the traditional learning loop provided by single-loop and is associated with change, which might involve a major modification in an organization. For example, changing the framework that governs the action, changing the system or procedure of work (Argyris & Schon, 1978).

The deutero (triple-loop learning) type involves learning about the double loop learning process. Or, in other words, it focuses on questioning current and existing learning habits. Triple-loop learning is about reflecting on what people in organizations believe, how they think, and their values and how they relate to what they do and how they do it. Triple-loop learning is for example when an organization changes an overall strategy (Visser 2007).

For supporting innovation process successfully, advisory organizations require enabling organizational conditions that support learning and transformation. That means the organizations need to be learning organizations to be able to support innovation process. Leaders and managers in advisory organizations can facilitate learning in their respective organizations by providing support to the advisors that include coaching and providing feedback, organizing on job training and other exchange opportunities, encouraging collaboration and team learning, create shared vision among members of the organization, providing more space for critical thinking and encouraging new ideas by rewarding efforts (Senge 1990; Leeuwis 2004; Hoffmann et al. 2009).

5.2. Defining competence in innovation advisors

As described in Section 2, the roles of an advisor are diverse, reflecting the changing perspectives on extension over the last few decades. What was once narrowly defined as the process of transmitting technological innovation has now evolved to encompass a "multi-faceted, multi-purpose, multi-scaled and multi-disciplinary field" (Ampt et al. 2015). This requires new roles to be defined and consequently new competences to be developed in advisors.

Several definitions exist in literature of the term "competence". For example, Silvera (1999) defines it as "skills, knowledge and behaviours that describe successful performance". Similar definitions include "capability to put existing and new knowledge into innovation and action" (Pant 2012) and the one put forward in the learning kit of GFRAS as "Sufficiency of knowledge and skills that enable a person to act in a wide variety of situations" (Davis 2015). The European Centre for the Development of Vocational Training gives a broader definition that includes social expertise defined as the "proven ability to apply learning outcomes adequately in a defined context, i.e. using knowledge, skills and personal, social and/or methodological abilities in work or study situations and in professional and personal development". Thus, competence is not limited to cognitive elements (involving the use of theory, concepts or tacit knowledge); it also encompasses functional aspects (involving technical skills) as well as interpersonal attributes (e.g. social or organizational skills) and ethical values (CEDEFOP 2011). Within the CEDEFOP framework, "knowledge" and "skills" are defined as follows:

1. Knowledge means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of this framework, knowledge is described as theoretical and/or factual.
2. Skills mean the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of this framework, skills are described as cognitive (involving the use of

logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).

In Figure 9, five main components are considered as being essential for the qualification of an advisor (Hoffmann et al. 2009).

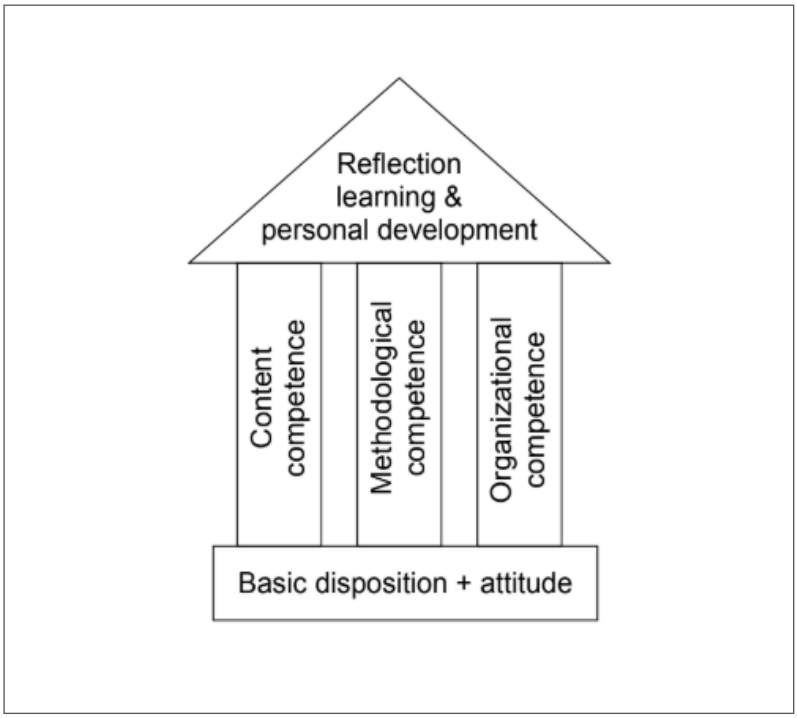


Figure 9: Qualification of an advisor. Source: Hoffmann et al. (2009)

1. **Basic disposition + attitude:** This forms the foundation and refers to the need for an understanding of "extension" and advisory work, which in the Hohenheim philosophy of advisory work is support in problem solving. The advisor must not only understand this but also accept the role and responsibilities in the advisory process. In terms of attitudes, congruency, empathy and appreciation are the three basic attitudes that lay the groundwork for any relationship between an advisor and the client.
2. **Content competence**: The advisor must be credible and knowledgeable in the subject matter and the ability to link it to the context of the farming and family system as well as the whole context of the client's livelihood.
3. **Methodological competence:** Communication skills (including individual advisory talks, group facilitation and training, handling large group events, etc.), and diagnostic and analytical skills that include the ability to interpret the verbal and nonverbal behaviour of people in order to gain an empathetic understanding and guide a fruitful dialogue. Knowledge about selecting

and applying concepts that support the entire problem-solving process from diagnosis to evaluation including the socio-psychological aspects.

4. **Managerial and organizational competence:** the ability of advisors to avoid getting into role conflicts where the advisor is free from his/her own or external interests and has no hierarchical relationship to the client. Also important is to be competent in organizational set-up that will establish a positive framework within which the advisor can facilitate the work and give the necessary guidance and backstopping.
5. **Reflection, learning & personal development:** a good advisor should constantly reflect on his /her work, pro-actively seek feedback, and when necessary, consult others when he/she has difficulties. The advisor should also engage in life-long learning to update technological and methodological knowledge and skills.

In addition to competence, it is common to find related terms such as "capability" and "capacity" which often are used synonymously. For i2connect, we propose a nuanced understanding of these terminologies and differentiate them as follows:

- According to the Centre for International Development and Training (CIDT), **capability** is of a higher order than competence and refers to the "deployment and application of competencies" (CIDIT, 2016). An individual can have the right competences – skills, knowledge, attitudes - but in order to be capable, other enabling factors must be present that support the individual to apply his/her competencies. Here, institutional frameworks and supporting environments are considered key for making the transition from being **competent** to being **capable.**
- **Capacity**, on the other hand refers to "the ability of people, organizations and society as a whole to manage their affairs successfully" (TAP 2016, p.4). Understood as a process of collective learning and continuous adaptation to externalities, it is not something that can be designed and implemented with a well-designed set of products and services.

Traditionally, capacity has often been viewed as a hierarchy of individual, organisation, inter-organizational and system-wide levels. This means competencies at the individual level would sequentially lead to enhanced capacity at other levels. However, this static view fails to take into consideration the interconnectedness of the various dimensions (TAP 2016). In the context of AIS, we concur with the TAP common framework that emphasises the relationship between the dimensions of capacity, capability and competences and stresses the importance of partnerships and networks in creating that interconnectedness.

In order to strengthen system-wide capacity for innovation, four key capacities are said to be required: the capacity to (i) navigate complexity, (ii) collaborate, (iii) to reflect and learn (iv) to engage in strategic and political processes (TAP 2016).

Figure 10 Competencies, Capabilities, and Capacity. Source: CIDT (2016)

5.3. Facilitating competence development

General concepts related to the requirements and competences of an innovation advisor have been presented in the previous section. This part presents the underlying concepts, principles and techniques which help in the design and support in acquiring the competences (i) having in mind the specific features of an interactive innovation process, and (ii) putting focus on the two main types of learners: the innovative advisor and the manager of the service organisation. Previous training experiences have demonstrated the appropriateness of the experiential and transformative learning approaches in trainings as described below (Gerster-Bentaya & Hoffmann 2011; Gerster-Bentaya, 2018, 2019; Gerster-Bentaya et al. 2017, 2019; Herrera et al. 2019), specifically in combination with interactive methods.

5.3.1. Learning approaches

5.3.1.1. Experiential learning

In order to qualify innovation advisors, an approach is needed that also enables the advisors as trainees a) to experience interactive innovation creation methods, b) to reflect upon their effects and impacts and c) to provide a safe space for practicing to get enough self-confidence before applying the methods in collaborative learning and daily work situation. Thus, practicing a participant-oriented learning attitude, using interactive training methods, and applying an experiential learning approach are logical consequences. Only if advisors experience themselves how it feels using interactive methods and how other actors in the innovation process are able to contribute and develop own ideas and come to solutions, they can apply such methods practically. This insight is a critical step in the process of

transforming prevailing attitudes and values of agents and of evolving one-directional training behaviour into a more interactive one.

The theoretical model of experiential learning is grounded in the humanistic and constructivist perspective, proposing that we are naturally capable to learn, and that experience plays a critical role in knowledge construction and acquisition. In other words, "learning occurs when someone creates knowledge through experiential transformations" (Kolb 1984). Figure 11 demonstrates the experiential learning cycle by Kolb.

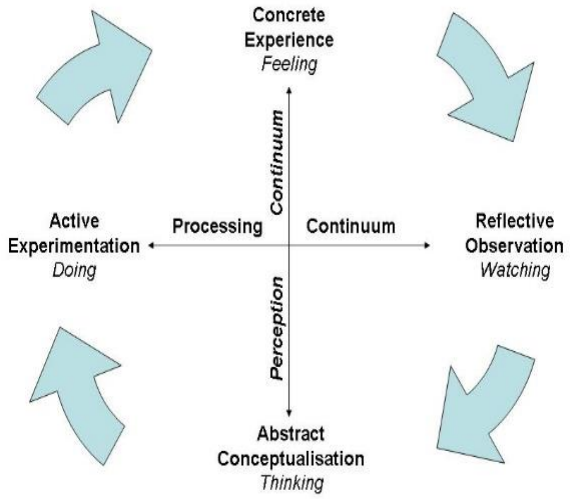


Figure 11: The experiential cycle of learning by Kolb (1984)

In conventional learning, concepts, theories are introduced first, with the intention to provide an overall frame and guidance to the learner. With this knowledge, the learner should be able to act. The experiential learning approach often also called "learning by doing" uses situations from the real world of participants. This implies that all learning is re-learning (Kolb 1984, p.28).

In training, in order to be able to have a common basis for joint reflections, experiences need to be created and reflected upon. This requires different abilities of learners and goes in a cyclic process: (a) the ability to get immersed into the concrete experience, (b) the ability of reflective observation, (c) the ability of abstract conceptualisation and (d) active experimentation abilities. "That is, they must be able to reflect on and observe their experiences from many perspectives. They must be able to create concepts that integrate their observations into logically sound theories, and they must be able to use these theories to make decisions and solve problems." (p.29).

Experiential learning thus involves more than just the cognitive learning generally stressed by management education. Hoover and Whitehead (1976, p.25) argue that "Experiential learning exists when a personally responsible participant cognitively, affectively, and behaviourally processes knowledge, skills, and/or attitudes in a learning situation characterised by a high level of active involvement". Hoover (2008) sees the approach as a methodology of education whereby structure and individual or group experiences are constructed to "develop learning and perceptual capacities, to develop and reinforce cognitions, to impact on emotions and attitudes, and, importantly, to function in developing capacities to behave consistently with the insights of these processes and experiences"

(Hoover 2008, p.82). This constitutes a challenge for the trainer/teacher who has to include the learner-related personal aspects in teaching and training.

5.3.1.2. Transformative learning

Transformative learning according to Mezirow (1997) occurs if an effective change in a frame of reference has taken place. This frame of reference consists of associations, concepts, values, or feelings, which define a person's lifeworld and form the assumptions through which a person understands experiences. They are the product of a highly selective perception process and acquired during socialisation in a given environment. Unusual and unpleasant ideas are rather rejected as irrelevant, weird or even wrong, as they do not fit to the 'line of action'. The frames can only be transformed by critically reflecting upon these assumptions through communicative learning.
Experience plays a critical role in knowledge construction and acquisition, and Kolb (1984) states that learning occurs when someone creates knowledge though experiential transformations while critically reflecting on it – ideas which Mezirow (2000) takes up in his elaborations more deeply.

5.3.1.3. Collaborative learning

Collaborative learning means that people work together in order to construct something that did not exist before the collaboration, and which would not exist without the collaboration process (Peters & Armstrong, 1998b). It can be considered similar to social learning since interaction and dialogue between the participating individuals is key. It is considered as a promising technique for learning to solve complex problems (Hesse, Care, Buder, Sassenberg, & Griffin 2015). Thus, it is promoted specifically in the context of innovation processes as innovation involves a wide variety of actors (TAP 2016). The efficacy of collaborative learning depends on the quality of the interaction of the involved actors, the relationship among them (Peters & Armstrong, 1998).

5.3.2. Modes and forms of learning

During the design of learning events, it is important to find out from the beginning, the mode that best fits the learners' needs. The first question would be what is teachable/trainable and what can be learned in innovation processes that need complex skills of actors operating under high uncertainty. Depending on whether learning is externally directed or self-directed and how it takes, Leurs and Roberts (2018) distinguish four modes of learning (see Fig. 12).

Informal learning in practice promotes the development of embodied knowledge, complex skills, situational awareness and reflexivity. It includes the day to day practical learning e.g. in the frame on an apprenticeship. ***Self-study about practice*** is expected to support generating conceptual understanding, developing basic skills and building confidence. It can take place through webinars, reading, self-directed exercises.
Mentoring and coaching support learners in reflecting upon their experiences made in practice in an exchange with more experienced experts (mentor, coach). In a directed way, it reveals implicit knowledge and practices. Training and simulations are directed ways of acquiring explicit knowledge

using exercises, simulations with the aim to generate conceptual understanding, to develop skills, and build confidence.

Implicit knowledge and skills are **learnable** best in practice while explicit knowledge in form of concepts, simulation and exercises directed by and expert or instructor can be **teachable**.

Figure 12 The four modes of learning. Source: Leurs and Roberts (2018)

Training, facilitation and coaching are formats of learning that are often used to encourage the process of acquiring competences for supporting interactive innovation processes.

Training is key for acquiring competence and improve a person's performance (Hoffmann et al., 2009). Unlike teaching that aims at knowledge transfer and assumes participants have no prior knowledge, training aims to fill a knowledge and competence gap(s) identified in a certain context. Training may cover various topics including technical, methodological or managerial and can take place in various settings such as on-the-job, online, workshops, and organization development trajectories (Leeuwis, 2004). In i2connect, we consider a non-directive, participant and problem-solving oriented training approach. This means "we should never give any clear cut directives, but assist learners to acquire knowledge and skills through their own effort" (Hoffmann et al. 2009, p.205).

The second form is **facilitation**, whose core purpose is to enable and empower people in a group to carry out a task by encouraging them to share ideas, resources, opinions and to think critically to identify needs and effective ways of satisfying those needs (Prendiville 2004). Beyond the conventional tasks of making communication easier, facilitation fosters synergy between people and enhances the competency of people for collective decision making (TAP 2016). In contrast to training, there is less focus on pre-defined learning objectives and more on collective action to solve a problem or achieve an objective, which is usually defined on the event.

Coaching is yet another form of supporting individuals or teams to acquire competence. "The coach is a mentor who provides guidance, a teacher who supports skills development, a judge who evaluates progress and a motivator who provides encouragement and keeps the mentee's spirits up" (Drucker

1998). The coach can support the trainee to improve his/her competence through observation, assessment and the provision of guidance (Byington 2010)

The above forms of learning have distinct features but are often used interchangeably. For the purpose of the i2connect project, it might be interesting to look at the differences in contrast to teaching as described by Gerster-Bentaya and Hoffmann (2011) and summarised in Table 6.

Table 6 Formats of learning often used

Criteria	Teaching	Training	Facilitation	Coaching
Number of participants involved	Up to several hundred	Maximum 25	Ideal: Maximum 25, special setting with large groups (up to 300)	Two persons: trainee and coach
Objective(s)	- To transfer information and knowledge - To reinforce moral values	Capacity building through predefined objectives and design which - providing knowledge - Reflecting on attitudes and behaviour - Training skills	Set by participants themselves (or representatives); decision making	To assist a person in a very specific problem situation defined by the trainee himself/herself
Typical life situation	Childhood, youth and young adult hood during school and university classes	Young persons, adults	At any time in personal life	According to special needs, normally to perform better in a certain job
Motivations for participation	- Obligation - Avoiding punishment	To get a better qualification; voluntary	To perform (job) better	
Motivations for learning and application	- Abstract, in the future, without obligation to practice. - Teacher driven	Upskill, might use. Content driven, useable at some future date	Learner driven focus on the need, driven by the group of co-learners	Coach driven, two-way process, practice focused. Own needs and ambition
Evaluation of outcome	External: Teachers, by giving grades and certificates	Participants and trainers	participants	
Relationship	-Dependency - compulsory	-Voluntary -trainer-trainee	-Voluntary - collaborative	-Voluntary - Coach-trainee

	- teacher-student			
Assumptions about participants	-Pupils have no prior knowledge - teachers have the information and knowledge	Knowledge, experience and skills are available to some extent. An information and skills gap exist that has to be overcome during training	Knowledge and capacities are available at participants' level	Trainee has knowledge and experience
Relation to content	Only the teacher or other external bodies determine the content of teaching	Based on gap identified, training content is determined either together with participants or trainers only/training institutions	Facilitated group itself determines what is important and what is not important	Specific, based on negotiation and agreement
Result	Degree, grade	Certificate, knowledge and skills	-Fewer time-consuming discussions, exchange process, more creative and more realistic solutions. - High level of identification with the solutions	Better skills, knowledge and behaviour acquired in line with the agreed objectives

Adapted from Gerster-Bentaya and Hoffmann (2011)

6. Conclusions

The purpose of this document is to create a common understanding and provide conceptual bases for the upcoming learning processes among the i2connect project partners in the project's frame (and potentially beyond). Hereby, we aim at presenting key terms and concepts that are relevant when working on i2connect's specific objectives. We addressed

- Competencies, capacities and capabilities of advisors to support interactive innovation (section 5),
- Roles and activities of advisors in interactive innovation processes at different scales and contexts, and (sections 2)
- System approaches to the complex dynamics of innovation processes (sections 3 and 4).

Thus, the document presents a summary of the state of relevant knowledge(s) with regard to meaningful and effective advisory and innovation support services for actors in agriculture and forestry sectors, as perceived by the authors. Consequently, it also shows knowledge gaps, which can have two origins: either they are the authors' own knowledge gaps or they are gaps to the community's knowledge, i.e. so far unexplored questions. In this section, we mention some of the knowledge gaps that we came across during the deliverable's elaboration.

- **Understanding the impact of different organizational types on advisors' agency:** Although, advisory organizations are characterised into five categories in literature, in practice there is a more plural service provision. However, insights are limited on how the pluralism impacts performance in practice. Moreover, understanding of how advisory organizations adapt to the changing environment is scarce, for instance, how public advisory organization transform to accommodate new policies. Similarly, there is little knowledge on how new service providers are coming up, how their advisors are trained, financed to respond to the new challenges of agriculture
- **Evolution of roles:** Regarding the concept of the new roles of advisors, little is known about how advisory organizations support advisors to be an 'innovative advisor' or to combine different tasks and roles. One challenging question is how a back office that effectively facilitates ISS should look like. Another gap is how advisors adapt and integrate new roles as e.g. the innovation support service into their former profile. How do advisors deal with different networks of actors they serve and interact? Does diversity of advisors (age, gender, experience, digital literacy) play a role on the ISS provision?
- **Digitalisation:** What does digitalisation of agriculture imply in innovation support services? What are the merits of digital technologies in facilitating interactively and collaboration between innovation actors? Insights on how innovation actors and actants (e.g. technologies) interact as well as their changing alliance and interest during an innovation process are limited. Knowledge on the socio-technical interactions would enrich our understanding of how innovations become successful or not. Who are the actors involved in such innovation process, what is their relationship, and are their interests?

Many more questions are likely to arise from joint exploration and reflection on interactive innovation cases. The concepts and common understanding outlined in this report shall be continuously checked, complemented and where necessary, adjusted in the course of the project so that by its end, an updated and more comprehensive version will be produced.

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Summary

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