FAIRshare

DIGITAL TOOLS FOR FARM ADVISORS

D4.1: Framework for DAT pilots and User Cases (UC)

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Farm Advisory digital Innovation tools Realised and Shared

Table of Contents

List of Figures

List of Tables

General Introduction

The overarching aim of FAIRshare is to ensure that farm advisors and their organisations effectively use digital tools and services for supporting a more productive and sustainable agriculture. In particular, Work Package 4 (WP4), corresponding to specific objective (1.1.4), aims to identify the change management and innovation process issues arising from novel or new digital tools and services in different farm advisory contexts through up to 30 User Cases (UCs).

Previous WPs are dedicated to the development of a Permanent Networking Facility (PNF) with pan-European online search and inventory of DATs and digital support services (WP1), the collection of 'Good practice' DATS (WP2) and the in-depth exploration of the ways digital agriculture is advocated and animated in the interface between the advisory and farming communities (WP3).

Following, WPs 4, 5 and 6 will generate and resource a participatory 'Living Laboratory', empowering advisor peers from across the EU to interact with the online inventory and, in a series of workshops, to exchange, co-adapt, co-design and apply digital tools. The FAIRshare 'Living Laboratory' will enable advisors to address challenges to embedding digital tools in different advisory and farming contexts across the EU. Special focus will be on co-designing powerful communication and engagement approaches for advisors to advocate and inspire their peers and farmer clients, driving a social movement for the wider and better use of digital tools.

Within such a framework, the User Cases will trial the adoption of some of the digital tools identified earlier in the course of the project (WP3). The learnings from the sharing and adoption of these tools will be valuable in identifying the contextual differences and the issues experienced by farmers and advisors. These leanings, in turn, will be used in each of the 30 User Cases to develop a roadmap leading towards greater use of digitisation by advisors and farmers (WP5).

This deliverable focuses on developing a conceptual and operational framework based on the 'Living Laboratory' approach and change management theories to

support behavioural change in diverse regional and organisational user cases. The main goal of this task is to determine and define relevant concepts. Since FAIRshare is working with numerous multi-actor groups with very different backgrounds, we need to align concepts to talk the same language throughout the project. Furthermore, this task will set the scene for a clear structured methodological approach to facilitate the practical work in WP5 (Road maps) and WP 6 (Implementation).

The Deliverable comprises two chapters: Living Laboratories and Change Management.

The first chapter aims, through extensive literature review[2], at providing an understanding of what Living Laboratories and their basic features are as well as guidelines concerning basic procedures for setting-up and running LLs along with an array of methods and tools plus some examples to facilitate LLs development in User Cases.

The second chapter deals with change management. In the course of digitization or digital transformation, a major challenge in all industries, a review as well as modification of an organization's structure, services, activities, processes or its relationship with other stakeholders may be incurred. In this respect, change management theories can be useful in supporting change in diverse organizational User Cases (involving, among others, extension/advisory organizations/groups). Therefore, based on a review of relevant literature the main models on change management are presented along with an attempt of synthesis.

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[2] Given the purpose of the current document (i.e. addressing multi-actor groups with very different backgrounds and the need to align concepts to talk the same language throughout the project) the literature review does not follow strictly an academic literature review pattern.

CHAPTER 1: LIVING LABORATORIES

1.1   Introduction

> *"The challenge is to support a multi-actor process that enables farm advisors, farmers and other AKIS actors to co-adapt existing advisory tools for expanded use and full exploitation. New innovated digital technologies must also be co-created, which can 'piggy back' on existing tools, assisting their embedding into existing farmer and advisory routines and practices. A further challenge is located at the interface between farmers and advisors, and relates to the building the advisory capacities needed for managing data flows across regional, national and transnational AKISs. This entails the building of trust around issues such as big data and artificial intelligence. Addressing such a challenge requires participatory approaches to co-designing communication and public engagement campaigns. This is to animate end users' interactions with a co-designed, intuitively navigable inventory of 'good tools' and 'good practices' that is representative of EU and international (evolving) state-of-the-art."* (FAIRshare GA, Part B, p. 4)

This reflects the shift from the diffusion of innovations theory, also known as the (linear, top-down) transfer of technology/knowledge model (ToT/ToK), which has been based on the understanding that innovations originate from scientists, are transferred by extension agents, and are adopted/ applied by farmers, to systemic models such as AKIS/AIS (Agricultural Knowledge and Innovation Systems/ Agricultural Innovation Systems). That is, the move from a praxeology (i.e., theory informing practice, and practices feeding new theory) of transfer of technology/ knowledge to one of facilitating knowledge, i.e. the facilitation of learning processes entailing stakeholders' participation in experiential learning and knowledge exchange. Then, social learning, i.e. "the collective action and reflection that occurs among different individuals and groups as they work to improve the management of human and environmental interrelationships" (Keen et al, 2005, p. 4), lies at the heart of such multi-stakeholder processes. Current systemic approaches build on networks as social processes encouraging the sharing of knowledge and, notably, as preconditions for innovation. They therefore focus on processes relevant to innovation networks as formed by heterogeneous actors with particular attention being given to (social) co-ordination. Particularly, in order to avoid or overcome gaps (cognitive,

information, managerial or system) resulting in network and institutional failures growing attention is given nowadays to various types of process intermediaries and facilitators/brokers[3].

It follows that innovations can be designed for, with or by users (Ståhlbröst and Holst, 2012). When the innovation is designed "for users" the control is in the hands of designers who attempt to understand users' needs (through surveys, interviews, focus groups, observation and the like) - a process involving some iteration when needed. In such a case users are passive. When the innovation design is "with users", products/ services are co-designed with both designers and users being active. Designers may have a more active and controlling role since they run the process, steering the design and development activities. Nevertheless, users have an active role throughout the development process and, particularly, in matters of form and content and, to some degree, of solutions with a strong and equal voice (esp. in the early and late phases of the process); users steer context and evaluation activities.

Finally, in the case innovation is designed "by users", users become the innovators, i.e. generate the idea, inspire others, create prototypes, produce content and develop the solutions, with designers mainly being facilitators. In such a case users have the capacity to think out of the box based on their contextual knowledge.

According to Vicini et al. (2012), the direct involvement of end-users in activities of co-design is a fruitful process capable of producing innovative solutions that respond realistically to user needs and problems and lead to the attainment of users' goals.

Ståhlbröst (2008)[4] has offered 10 I's for user involvement in IT[5] design processes, mobilizing and involving people in the development of new ICT solutions[6], as follows:
Identify: Clarify users´ individual characteristics to understand them in depth.

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[3] Based on Koutsouris (2018)
[4] see also Holst et al. (2009)
[5] IT = Information Technology https://en.wikipedia.org/wiki/Information_technology
[6] ICT = Information and Communication Technology
https://en.wikipedia.org/wiki/Information_and_communications_technology

Inform about their users' role, your expectations, and their freedom to choose.

Interact: Enable interaction within the development team, and with partners outside the development team, such as users and authorities.

Iterate: increase the development of the team's understanding of the users' situations; build users' knowledge about possible solutions and diverse perspectives; value the design decisions throughout.

Involve real users with real experiences based on their everyday practices in the early stages of the development process.

Influence: users can influence the development if they are involved early on in the process; the possible influence of every stimulus applied in user involvement processes needs to be considered and discussed in the development team.

Inspire: To inspire developers, users should also be inspired to envisage a desired future state and to describe this state.

Illuminate: Create an open climate in which the users feel comfortable about revealing their thoughts. Encouraging users to open up and illuminate vital aspects about their current life situations makes it possible to design the implementation of the system according to their situation.

Integrate: representations of users' needs should be integrated in the design to increase the chance that the final systems will provide added value; when the design (in all its varied maturity levels) is introduced, it should be integrated in the users' real-world context based on the knowledge gained in the interaction process.

Implement: results should be implemented and tested in the users' perceived real-world environment; therefore it is imperative to create as authentic a situation as possible for the users to make it possible to get their spontaneous input.

1.1.1 Design Thinking

Such a line of thinking corresponds to 'Design-Driven innovation'. According to Almirall and Wareham (2010) design thinking

"*attempts to cross the gap between a great idea and a great product by tapping into the users' needs, feelings and sensations by having a more exact understanding of what users explicitly feel or do when they use a particular product or service ... At a primary level, design thinking places user experience*

and cognition at the forefront of study… An understanding of the user as a partner who is an "expert of his/her experience" and where the designer and the researcher supports him by providing tools for ideation and expression … is at the core of the Living Labs approach … which also shares tools and methods from design thinking."[7]

According to the 'The Basics of User Experience Design'[8] design thinking is "an iterative process in which we seek to understand the user, challenge assumptions, and redefine problems in an attempt to identify alternative strategies and solutions that might not be instantly apparent with our initial level of understanding." Then, user experience design "is about designing the ideal experience of using a service or product." The latter term is used mainly in relation to websites and (software) applications; in such cases the answers to the questions:

- Does the site or application give the user value?
- Does the user find the site or application simple to use and navigate?
- Does the user actually enjoy using the site or the application?

should be YES to all as such projects depend on a single factor: how the users feel about it (site, application, etc.). The main methodology used to guarantee the user experience in most projects is 'user-centered design', i.e. designing with the users' needs and expected behaviors in mind.

The five phases of design thinking are as follows[9]:

- Empathize – with your users
- Define – your users' needs, their problem, and your insights
- Ideate – by challenging assumptions and creating ideas for innovative solutions
- Prototype – to start creating solutions
- Test – solutions (see Figure 1)

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[7] The authors claim that the opposite trajectory, i.e. the renegotiation of the social meaning or vision of a product (the change of the emotional and symbolic content of products by redefining the meanings and languages associated with them), is also possible.

[8] https://www.interaction-design.org/ebook

[9] See: https://dschool.stanford.edu/; https://www.interaction-design.org/ebook

These phases can often occur in parallel and repeat iteratively in an attempt to generate a holistic and emphatic understanding of the problems that people face. Therefore, design teams continuously use their results to review, question, and improve their initial assumptions, understandings and results thus identify alternative strategies and solutions that might not be instantly apparent.
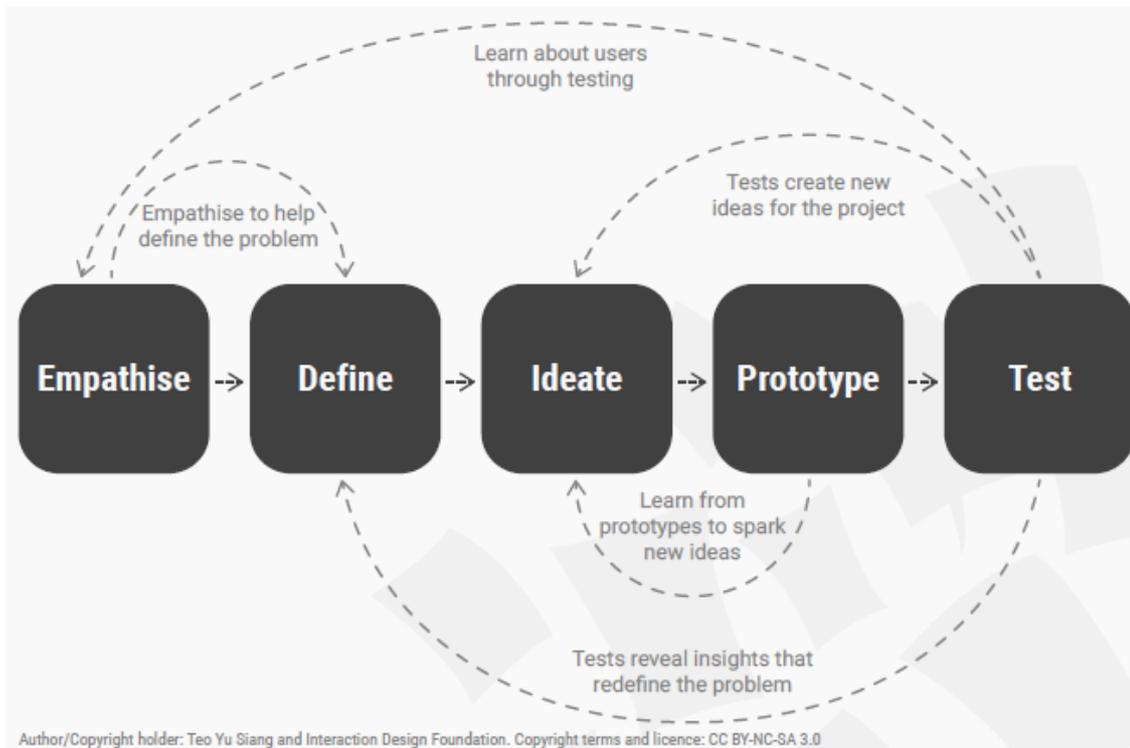
Figure 1: Design Thinking is an Iterative and Non-linear Process

There are 7 factors that influence user experience: (the product has to be) useful, usable, findable, credible, desirable, accessible and valuable[10] (Figure 2). In particular,

Useful: the product has to have a purpose to be on market, meaning that it has to be useful to people.

Usable: enabling users to achieve their end objective with a product effectively and efficiently.

Findable: the product must be easy to find, and in the instance of digital and information products, the content within them must be easy to find, too.

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[10] https://www.interaction-design.org/ebook

Credible: ability of the user to trust in the product that it will last for a reasonable amount of time and that the information provided with it is accurate and fit-for-purpose.

Desirable: desirability is conveyed in design through branding, image, identity, aesthetics, etc.

Accessible: providing an experience which can be accessed by users with a full range of abilities—this includes those who are disabled in some respect.

Valuable: the product must deliver value.

Figure 2: The 7 Factors that Influence User Experience

Additionally, the characteristics that further affect the usability of a product are: effectiveness, efficiency, engagement, error tolerance and ease of learning.[11]

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[11] https://www.interaction-design.org/ebook

1.2 Living Laboratories/Labs

1.2.1 What are Living Laboratories/ Living Labs?

According to Colobrans (2019), Living Laboratories or Living Labs (LLs) are related to the concept of Open Innovation (see, for example, Chesbrough 2003, 2006), that is, on the benefit of opening up innovation processes to the users. This way new products and services take into account users' real needs and the risks of being rejected by the market are reduced. In the same vein, Leminen et al. (2012) conceive of a Living Lab as an open-innovation network in which stakeholders team up to generate new products, services, and technologies.

The actual birth of the concept of LLs is ascribed to MIT's Prof. William Mitchell[12], who utilized the possibilities offered then by contemporary computing, sensing and information technology, to move innovation research from *in vitro* to *in vivo* settings (Dutilleul et al., 2010). More specifically, Mitchell used the term LL to describe the process for conducting user research in the context of smart homes or homes of the future (Bergvall-Kåreborn et al., 2009; Dutilleul et al., 2010). In such a lab the routine activities and interactions of everyday home life can be observed, recorded and experimentally manipulated with volunteer research participants individually living in the lab, treating it as a temporary home (Rogel, 2013[13]).

According to Zavratnik et al. (2019) despite the fact that the concept first emerged in North America, it soon started to thrive in Europe through many dispersed initiatives all over the continent[14]. Moreover, one of the most crucial moments of the European, but also wider, global community of LLs, happened in

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[12] MIT = *Massachusetts Institute of Technology (USA)*
[13] See also: https://www.scribd.com/document/423662117/Short-History-of-Living-Labs-Research-and-Policy-Contex
[14] See also: Knickel and Knickel (2018)

2006 when the European Network of Living Labs (ENoLL)[15] was formed (EC, 2009) one month after the Helsinki Manifesto (2006) [16].

The concept has evolved over the years and now one of the key elements of a LL experiment or test is that users are studied or involved in their everyday habitats instead of recreating a natural context in a laboratory setting.

Furthermore, at the time of emergence, LLs were primarily connected with technological development and ICT aiming to enhance the use of ICT "in the lay society" (Bergvall-Kåreborn et al., 2009). Nevertheless, the focus of Living Labs has, since then, changed. Nowadays, LLs can be found in a wide variety of fields in the social sphere as well as in economy, technology, urban planning and rural development focusing, again, on enhancing stakeholders'/ users' participation in innovation processes (Ballon et al., 2015). A LL approach applied in those different areas is believed to encourage innovation, creativity, improvisation and collaboration and support community, social change and digitization in their endeavor to address challenges on the crossroads of social dimensions, economic aspects and environmental issues, i.e. sustainability and social innovation (Zavratnik et al., 2019). However, this in turn, leads to a broad variety of definitions owing to the abundance of descriptive papers addressing examples and practices but, at the same time, the lack of detailed analysis and critical evaluation (Dell'Era and Landoni, 2014; Schuurman et al., 2015; Steen and van Bueren, 2017; Zavratnik et al., 2019).

Consequently, to date there exists no agreed upon definition of the concept; LLs have been broadly conceived and thus understood and defined as many different things which, in turn, indicates their importance along with the need to further elaborate the concept in different environments. For example, according to Dell'Era and Landoni (2014) LLs have been defined as follows (Table 1).

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[15] See: "Introducing ENoLL and its Living Lab community", https://issuu.com/enoll/docs/enoll-print (video)
[16] For the history of LLs see, inter alia, Dutilleul et al. (2010) and Zavratnik et al. (2019)

Table 1: Definitions of Living Laboratories[17]

#	Definition	Source
1	"Both a methodology for User Driven Innovation (UDI) and the organisations that primarily use it"	ENoLL www.openlivinglabs.eu
2	"A user-driven open innovation ecosystem based on a business – citizens–government partnership which enables users to take an active part in the research, development and innovation process"	European Commission Information Society and Media
3	"An organised set of methods and stakeholder, which focus on user involvement, user-centric research methodology for sensing, prototyping and validating solutions in evolving real life contexts"	Vinnova http://www.vinnova.se
4	"Consciously constructed social environments in which the uncontrollable dynamics of everyday life are accepted as part of the innovation environment which enables designers and users to co-produce new products and services"	Frissen and van Lieshout (2004)
5	"A user-centric research methodology for sensing, prototyping, validating and refining complex solutions in multiple and evolving real life contexts"	Eriksson et al. (2005)
6	"Experimentation environment in which technology is given shape in real-life contexts and in which (end) users are considered co-producers"	Ballon et al. (2005)
7	"Functional regions where stakeholders have formed a Public-Private-Partnership (PPP) of firms, public agencies, universities, institutes and people all collaborating for creation, prototyping, validating and testing of new services, products and systems in real-life contexts. Such contexts are cities, villages, rural areas and industrial plants"	CoreLabs project (2007)
8	"Systemic innovation approach in which all stakeholders in a product, service or application participate directly in the development process"	Feurstein et al. (2008)
9	"Home-like environment by ambient intelligence and ubiquitous computing technologies such as wireless and sensor technologies to sense, prototype and validate complex ICT solutions"	Ståhlbröst and Bergvall-Kåreborn (2008)
10	"A user-centric innovation milieu built on every-day practice and research, with an approach that facilitates user influence in open and distributed innovation processes engaging all relevant partners in real-life contexts, aiming to create sustainable values"	Bergvall-Kåreborn et al. (2009)
11	"Open innovation environment in real-life settings in which user-driven innovation is the co-creation process for new services, products and societal infrastructures"	Living Lab Handbook (2010)
12	"Testing in a live environment with real end-users and in cooperation with players from the entire value chain will help companies evaluate their services and allow adjustments and corrections to be made well in advance of launch"	Kallai (2010)
13	"An R&D concept which aims to create innovations in a multi-contextual, real-world setting"	Konsti-Laasko et al. (2012)

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[17] See also Steen and van Bueren (2017)
https://timreview.ca/sites/default/files/SteenVanBueren_TIMReview_July2017_AppendicesAB.pdf

ENoLL's definition[18] is as follows:

Living labs are a **new research area and phenomenon** in which human ideas and needs, from a multi-actor and participatory perspective (usually including a public-private partnerships), are established as a starting point in innovation and transition towards new productive, governance, consuming and living models. Living labs have the purpose of creating, validating and testing new products, services, business ideas, markets and technologies in the real world.

According to Ståhlbröst and Holst (2012), LLs have been defined as a methodology, an organization, a system, an arena, an environment, and/or a systemic innovation approach.

Based on their literature review on LLs, Westerlund and Leminen (2014)[19] found that a LL has been defined/ understood as: *a regional system; an innovation system; an ecosystem; a network; a combined approach; an environment with embedded technologies and users; a context or a methodology; an enhancement or implementation of public and user involvement* (such as for rural innovations, regional innovations, smart cities, enabler-driven or user driven innovations, public–private partnerships (PPPs), and a public–private–people partnership (4Ps or quadruple helix); *a development project for products, services, and systems; a business activity and operational mode; an innovation management tool.* These authors define LLs as:

"*physical regions or virtual realities, or interaction spaces, in which stakeholders form public-private-people partnerships (4Ps) of companies, public agencies, universities, users, and other stakeholders, all collaborating for creation, prototyping, validating, and testing of new technologies, services, products, and systems in real-life contexts*" (Westerlund and Leminen, 2011).

In a somewhat similar vein, in their own review, Zavratnik et al. (2019) cite perceptions of a LL as: a place of creativity where collaboration between different people happens, a (multi stakeholder) organization, an innovation

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[18] https://enoll.org/about-us/what-are-living-labs/
[19] See also: Laminen (2015).

milieu, (research) methodology, an approach for involving users, a public private partnerships concept, an open innovation ecosystem based on open innovation, an experimentation platform, and a user-centered approach. The authors further cite Westerlund et al. (2018), who based on the qualitative analysis of LL examples and practices, suggest the following definition of a LL:

"*a sociotechnical platform with shared resources, a collaboration framework, and real-life context, which organizes its stakeholders into an innovation ecosystem that relies on representative governance, open standards, and diverse activities and methods to gather, create, communicate, and deliver new knowledge, validated solutions, professional development and social impact*".

Voytenko et al. (2016) define LL as "*an arena (i.e. geographically or institutionally bounded spaces), and as an approach for intentional collaborative experimentation of researchers, citizens, companies and local governments*" while another recent definition claims that, LLs are "*spaces for innovative and participative research, development and activity deployment … using multi-disciplinary methods and approaches and bringing people together in social contexts around a range of themes*" (Mastelic et al., 2018)

Nevertheless, despite such a multiplicity of definitions, Steen and van Bueren (2017, p.22) claim that "*Yet, gradually, in the current living lab literature, a stabilized conception of living labs with roughly similar characteristics has emerged.*" (see below)

Box 1. Design thinking, systems thinking and reflexive monitoring Living Labs in Agrilink

Design Thinking is a method for practical, creative resolution of complex and ill-defined problems (Bootcamp, 2010). The recommended stages in design thinking are *empathize, define, ideate, prototype*, *test and implement*. These stages are used in an organic, non-linear way to organize the support to the living lab teams. The stages are used as building blocks of an iterative process, going back and forth through them.

Systems thinking is an approach to thinking about and acting in the world that recognizes interconnections and contexts by creating systemic (holistic) representations of what 'we' perceive about situations. It is very suited to participatory, action-oriented research and is complementary to more systematic, reductionist methods embodied in the scientific approach. It complements design thinking in the way that it approaches the understanding of messy or complex situations for some purpose, usually to effect some changes. Systems thinking in practice deals with: understanding inter-relationships, engaging with multiple perspectives and reflecting on boundary judgements (Lane, 2017).

Reflexive monitoring involves active reflection on the part of researchers and practitioners, to critically look at their own practices, their views and their ways of doing things. Reflexive monitoring offers tools to stimulate reflexivity in co-creation processes whilst also collecting relevant data on the processes that can later be used to compare and contrast the Living Labs.[20]

Source: Potters et al., 2020

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[20] For Reflexive Monitoring see Van Mierlo et al. (2010),
https://library.wur.nl/WebQuery/wurpubs/fulltext/149471

1.2.2 LL's Characteristics and Types

For Ståhlbröst and Holst (2012), LL **is a concept to support the processes of user-driven ICT systems**. This is attained through experimentation situated in real-world contexts (vs. constructed laboratory settings); users changed roles from passive consumers to active prosumers of content; shortened time to market for innovators; and, a globalized market through internet and IT's entrance into peoples' every day activities. The authors also underline that each LL environment needs organization and methodologies suitable for its specific circumstances.

According to Aversano et al. (2016) a general defining element of LLs is the ability to study users in a natural setting. This means that either the technical infrastructure (laboratory setting) resembles the natural environment and thus allows to capture user behavior in the user's everyday environment or that the research methodologies enable capturing the real-life context.

For Colobrans (2019), LLs have

"*a singular characteristic: they are set up to document, generate and experiment with ideas, concepts and/or prototypes of new products and services. They do this in real situations with real people who use prototypes or new version of products and/or services before they are formally inserted into the market or society.*"

According to Voytenko et al. (2016) the five key-characteristics of LLs are: experimentation and learning; participation and user involvement; leadership and ownership; and evaluation and refinement.

For Zavratnik et al. (2019) the common points which contribute to understanding the LL concept are:
a) openness, in the sense of inviting different collaborators, addressing different themes, and including citizens and the public;
b) innovation, which is the one of the main ingredients, the aim and the principle of Living Labs;

c) co-creation, i.e. the involvement of users and, by and large, of (all) stakeholders at all stages of the development of products and services or, in general, of new solutions vis-à-vis socio-economic or technological challenges which, in turn, enhances the possibility of novel solutions to successfully address emerging (sustainability) challenges; and

d) real-life setting, i.e. either laboratory settings that resemble real life or work in specific local contexts, values and economies so as to develop products or services most valuable in certain social and cultural environments.

Thus, for example, in the case of *Rural LLs* the authors (Zavratnik et al. 2019[21]) underline the need to "*take into consideration the complexities of demographic challenges, consequences of emigration/immigration, ageing of the rural population, climate change and its implications for the livelihoods of the rural population, etc.*" Given also that creating favorable conditions for entrepreneurship and innovation is understood as being one of the main drivers for economic and social development in such areas, on the one hand, the need for multidisciplinary approaches (Pérez-Trejo et al., 2010) and, on the other hand, the mission to increase the innovation potential in rural areas addressing not only the economic welfare of the rural communities, but above all their social and environmental welfare, emerge. In this respect, according to the authors, LLs can "*help establish an ecosystem for research and actions on innovative practices that promote open and collaborative innovation processes by engaging all relevant stakeholders and people in different relevant contexts*"[22]

According to Dutilleul et al.'s literature review (2010) LLs are associated with five distinct meanings:

"(1) an *innovation system* consisting of organized and structured multi-disciplinary networks fostering interaction and collaboration, (2) in vivo *monitoring of a 'living' social setting* generally involving experimentation of a technology, (3) an approach for involving users in the *product development process*, or (4) *organizations* facilitating the network, maintaining and developing its technological infrastructure and offering

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P a g e | **21**

relevant services; finally, the term may also refer to (5) the eponymous European *movement*."

Therefore, the authors, along with Følstad (2008), note that, in practice, LLs "*adopt different parts of the multi-faceted concept and operate according to different interpretations of it*".

According to Colobrans (2019), in the literature, the term LL is predominantly used to refer to one or more of the following attributes:

- A **space for designing and validating** projects involving technological, social and/or cultural innovation; LL gathers information, generates and validates ideas, concepts and designs and innovates and thus is an instrument created to assist innovation processes from start to finish
- A type of **structure dedicated to Research, Development and Innovation (R&D&i)** – with reference to *in situ* laboratory.
- A **legal entity** designed to make it possible to work on a single level with stakeholders from the public and private sectors and citizens (PPPP - People-Public-Private-Partnership)
- A variety of **participatory methodology** based on active collaboration and cooperation between the various agents of a system**;** expressions such as Open Innovation*,* User-Centred Design, People-Centred Innovation and User Experience Research are used in LLs in order to attain technological inventions more usable, more desirable, more feasible, more viable, more attractive and, among other things, safer.
- A set of fundamentally qualitative **research techniques**.

Furthermore, Ståhlbröst and Holst (2012) maintain that there are different types of LLs such as (without excluding the possibility of other types to exist as well):

- **Research LLs** focusing on performing research on different aspects of the innovation process.

- **Corporate LLs** that focus on having a physical place where they invite stakeholders (e.g. citizens) to co-create innovations.

- **Organizational LLs** where the members of an organization co-creatively develop innovations.

- **Intermediary LLs** in which different partners are invited to collaboratively innovate in a neutral arena.

- **A time limited LL** as a support for the innovation process in a project. The Living Lab closes when the project ends.

On their part, Leminem et al. (2012) based on 103 semi-structured interviews with representatives of 26 living labs in four countries between 2007 and 2011, distinguished four types of living labs. Such a differentiation is based on which actor drives their activities: utilizer-driven, enabler-driven, provider-driven and user-driven.

Type 1: Utilizer-driven LLs

Utilizers are companies that launch and promote LLs to develop and test the firm's products and services; thus LLs are used as a strategic tool to collect data on users or user communities of their products or services.

Type 2: Enabler-driven LLs

Enablers include various public-sector actors, NGOs and financiers (towns, municipalities, or area-development organizations) who initiate LLs as typically public-sector projects that pursue societal improvements (reduction of local unemployment or solving diverse social and structural problems) with far reaching results, such as the development of rural areas. In this case the activation of collaboration among the key actors may be a key outcome by itself.

Type 3: Provider-driven LLs

Provider-driven LLs are launched as a result of actions by various developer organizations (educational institutes, universities, consultants), i.e. the open-innovation network organizes itself around providers (around either a project or longer-lived innovation platforms) aiming at the promotion of research and theory development and the finding of solutions to specific problems, focusing on improving users' everyday life in a way that allows for all participants in the network benefit. Nevertheless, providers may struggle to attract enablers and utilizers to participate in such a network; in general, provider- driven living labs are a challenge, as companies demand faster development cycles and rapid results. On the other hand, knowledge created within the network is cumulated and reused in future endeavors within the network.

Type 4: User-driven LLs

User-driven LLs are established by user communities and aim at solving users' everyday problems in a way that is consistent with their values and requirements. In this sense, value is (co-)created mainly for the user community with companies and society in general being also benefit indirectly. User-driven LLs are, on the one hand, informally organized, facilitated (usually by a provider with other actors supporting users with resources, knowledge, equipment, mentorship, or guidance) and long lived, because they are built around the user community. On the other hand, according to the authors, they are quite uncommon to date.

The authors recommend that

"*anyone designing, participating in, or intending to participate in a living lab will benefit from understanding the overall purpose of the living lab and which party drives the network; this understanding helps them to comprehend the characteristics of the living lab and adopt a feasible role within the network.*"

Furthermore, Leminen and Westerlund (2017), in order to identify how methods and tools support understanding of LL innovation activities analyzed an international data set of 150 interviews in 40 LLs in ten countries and built a framework that has two dimensions: i) innovation process ("predefined, linear" vs. "iterative, nonlinear") and the usage of tools ("standardized" vs. "customized"). They thus distinguish four "archetypes" of living labs as follows:

a) Linearizers: they "*represent living labs with a predefined linear innovation process and a standardized set of tools. Such living labs aim at improving the efficiency of innovation activities and reducing costs both in the innovation process and in the usage of tools*".

b) Iterators: these "*have a predefined set of tools but adapt themselves to the needs of customers through an adaptive and flexible innovation process*".

c) Mass customizers: they "*take the given predefined linear innovation process, but try to increase the flexibility by customizing the needed tools for innovation activities*".

d) Tailors: these "*rely on both iterative, nonlinear innovation processes and customized tools. Tailors include living labs who have prior experience and knowledge for innovation activities but wish to keep the innovation activities flexible*".

Based on this analysis the authors further offer "three preliminary propositions" as follows:

"1. *Standardized tools* decrease the complexity of innovation activities, and decreasing complexity leads to predefined incremental innovation outcomes in living labs.

2. A *predefined linear innovation process* decreases the complexity of innovation activities, and decreasing complexity leads to predefined incremental innovation outcomes.

3. Adopting an *iterative, non-linear innovation process* and *customized tools* for innovation activities increases the likelihood of an undefined and a novel innovation outcome." (italics added)

Finally, according to Almirall and Wareham (2010), their cross case analysis showed that LLs manifest initial demand for products/ services and orchestrate the actions of disparate actors for the creation of a product or service. LLs also observe, codify and diffuse tacit knowledge and facilitate both exploration and exploitation. Finally, LLs are agnostic to whether their innovations are incremental or radical[23], and work both within existing social meanings, as well as to renegotiate them.

Therefore, according to the LL types put forward by Ståhlbröst and Holst (2012) the FAIRshare User Cases fall into the type "**time limited LL**" while according to Leminem et al. (2012) into the "*provider-driven LLs*". Moreover, following Leminen and Westerlund (2017) User Cases should strive to adopt an *iterative, non-linear innovation process* and *customized tools* in order to increase the likelihood of a novel innovation outcome.

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[23] Radical-disruptive means creating something that breaks away from what already exists as, for example, products that are completely new to the company or new to the market. Incremental means improving something that already exists or the introduction of relatively minor changes to an existing product (i.e. product modifications, upgrades and line extensions) See: Vicini et al. (2012) and Ståhlbröst et al. (2013).

1.2.3 LL's Components, Principles, Building Blocks and Processes

1.2.3.1 Components of LLs

Bergvall-Kåreborn et al. (2009) have analyzed more than thirty projects that were carried out in two Swedish LLs - Botnia Living Lab (focusing on ICT products and services) and Halmstad Living Lab (concerned with open digital innovation processes and methods and tools for multi stakeholder involvement processes), and, on the basis of this analysis, have identified key components (ICT and infrastructure; management; partners and users; research; approach) and key principles (openness; influence; realism; value; sustainability) of Living Labs.

A short account of the components and key-principles of a Living Lab follows.

Key components

• **ICT & Infrastructure** outlines the role that ICT technology can play to facilitate new ways of cooperating and co-creating new innovations among stakeholders.

• **Management** represents the ownership, organization, and policy aspects. For example a Living Lab can be managed by consultants, companies or researchers.

• **Partners & Users** bring their own specific wealth of knowledge and expertise to the collective, helping to achieve boundary spanning knowledge transfer.

• **Research** symbolizes the collective learning and reflection that take place in the Living Lab; the provision of direct access to research that can benefit the outcome of a technological innovation is equally important.

• **Approach** represents the methods and techniques for LL practices which are

necessary for professional and successful operations.

At the center is innovation.

1.2.3.2 Key principles for LL design

Bergvall-Kåreborn et al. (2009) identify 5 key-principles in LLs: Openness, Influence, Realism, Value and Sustainability (see: Figure 3)[24].

1. **Openness**

Creating an innovation process that is as open as possible to the stakeholders (i.e. allowing for the collaboration between people of different backgrounds, with different perspectives that have different knowledge and experiences) is crucial since multiple perspectives bring power to the development process; gathering a multitude of perspectives may lead to faster and more successful development and new ideas. In this respect, the challenge is to create the appropriate environment/ climate in which stakeholders will be stimulated to share knowledge and experiences.

2. **Influence**

In LLs users are seen as active, competent partners and domain experts; their involvement and influence is thus essential and has to be facilitated. Moreover, innovations have to be based on the needs and desires of potential (heterogeneous) users. Here the challenge concerns the management of LLs so that participation, influence and responsibility among different partners are harmonized and serve the principle of user influence.

3. **Realism**

LL activities should be carried out in realistic, natural, real life settings (i.e. contexts, users, use situations, technologies, and partners). Here two approaches can be found: a) environments for testing and evaluating products or services are created in ways that are similar to the real world and b) products and services are tested and evaluated in users' real-world environments.

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[24] See also: Ståhlbröst and Holst (2012), Robles et al. (2015).

4. Value

LL processes support value creation for at least their partners (e.g. SMEs) in terms of business value (including aspects such as employee value, customer value, supplier value, managerial value and societal value) and presumptive customers or user in terms of user value. A LL may, on the one hand, create value based on all aspects of the value term and, on the other hand, provide insights about how users perceive value - which, in turn, can guide the innovation process to be able to deliver innovations that are perceived as valuable from multiple perspectives.

5. Sustainability

Sustainability refers to the viability of a LL as well as to its responsibility to the wider community. The former relates to continuous learning and development as well as to the partnership and its related networks which strengthens creativity and innovation, builds on trust, and this takes time to build up. The latter implies that LLs take responsibility of their environmental, social, and economic effects and, thus, help to meet the needs of both the present and the future.

Figure 3: Living Lab Key Principles
Source: Bergvall-Kåreborn et al. (2009)

These Key Principles are valuable since they provide the foundation for the design of LL operations. They also define what counts as a LL and how the value of LL operations can be assessed.

Likewise, according to Evans et al. (2017-2019)[25] LLs have five key-common 'elements' but multiple different implementations. These common elements are as follows (see Figure 4):

1.   **Multi-method approaches**: there is no single LL methodology, but all LLs combine and customize different user-centred, co-creation methodologies to best fit their purpose.

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[25] https://u4iot.eu/pdf/U4IoT_LivingLabMethodology_Handbook.pdf

2.   **Active user involvement**: this is rooted in the origins of LLs: the key to success in any activity is to involve the users already at the beginning of the process.

3.   **Multi-stakeholder participation**: even if the focus is on users, involving all relevant stakeholders is of crucial importance. These include all the quadruple helix actors: representatives of public and private sector, academia and people (see below).

4.   **Real-life setting**: activities take place in real-life settings to gain a thorough overview of the context.

5.   **Co-creation**: there is an increasing recognition that top-down experiments in which users being involved as factors rather than actors needs to change so that users become equal contributors and co-creators rather than subjects of studies.
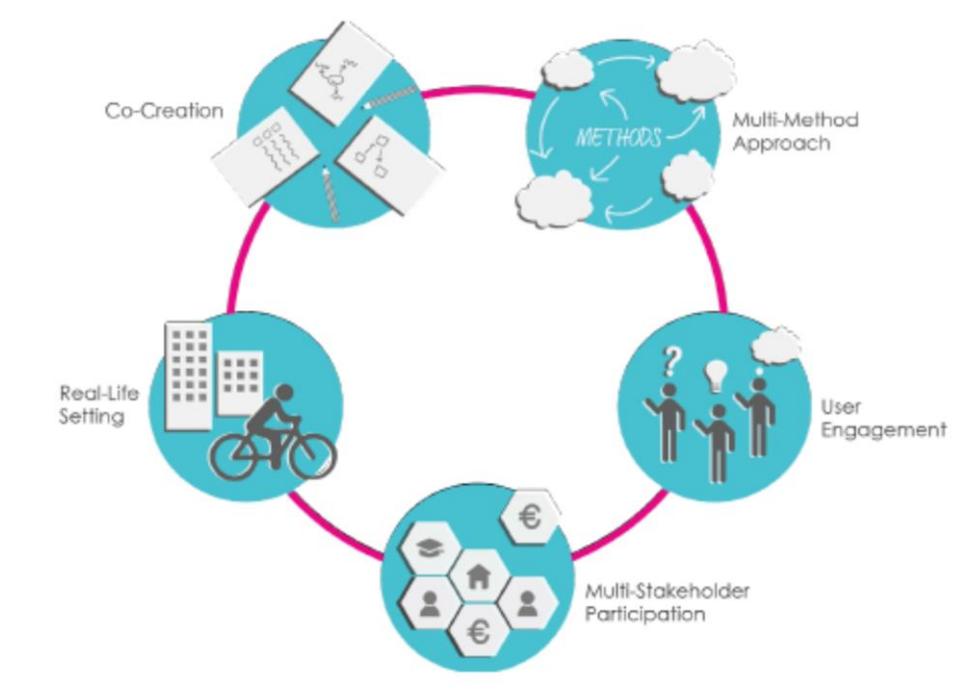
Figure 4: Common Elements of Living Labs
Source: Evans et al. (2017-2019)

In a LL, the aim is to harmonize the innovation process among four main stakeholders: companies, users, public organizations and researchers (Figure 5).

These stakeholders can benefit from the LL approach in many different ways. For instance companies can get new and innovative ideas; users can get the innovation they want; researchers can get study cases; and, public organizations can get increased return on investment on innovation research.
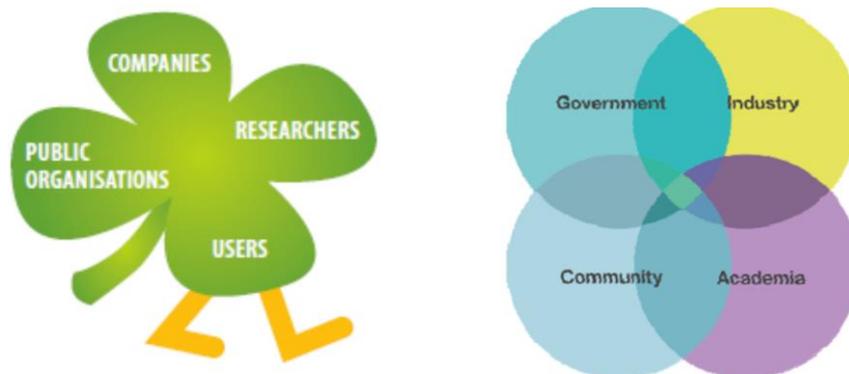
Figure 5: Main stakeholders - the quarto-helix
Source:
https://www.ltu.se/cms_fs/1.101555!/file/LivingLabsMethodologyBook_web.pdf
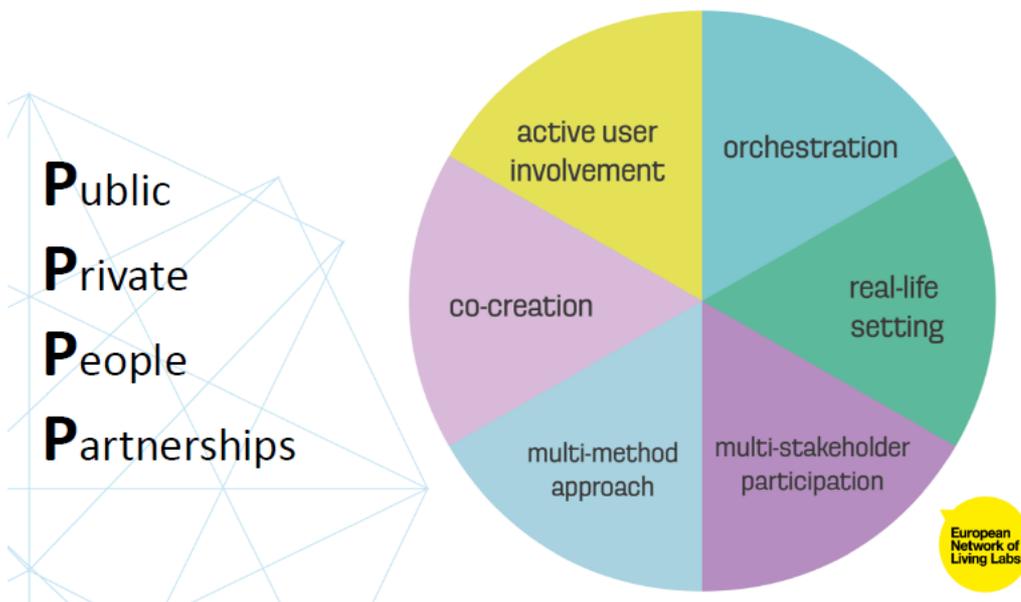
Figure 6: What LLs have in common
Source: ENOLL Open Living Lab Days 2019

Furthermore, Schuurman (2015) based on an extensive literature review proposed three distinct levels of analysis for LLs: "*the macro level, which*

concerns the Living Lab constellation, the meso level, which entails the innovation projects that are carried out within these constellations, and the micro level, which consist of the methodological steps that are carried out within these projects" (p. 199), that is, the so-called three layer model. Therefore,

- at the macro or **organizational level**, the LL is a set of actors and stakeholders organized to enable and foster innovation, typically in a certain domain or area, often also with a territorial link or focus. These organizations tend to be Public-Private-People partnerships;

- at the meso or **project level,** LL activities take place following a mostly organization-specific methodology in order to foster innovation;

- at the micro or **user activity level**, the various assets and capabilities of the LL organization manifest themselves as separate activities where users and/or stakeholders are involved.

According to Schuurman (2015, pp. 317-318)

On the macro level, Living Labs are a Public-Private-People partnership organized to exchange knowledge and conduct innovation projects. We regard these Living Lab innovation projects that are characterized by active user involvement, co-creation, multi-method and multi-stakeholder, as the meso level. These projects consist of different research steps that are aimed at generating user input and contribution to the innovation process, which we consider to be the micro level.

In this respect, the author claims that the main distinguishing Living Lab characteristics (re: methods and tools) are situated at the meso level (p. 202).

1.2.3.3 Main building blocks within Living Lab projects

According to Evans et al. (2017-2019) there are 3 main building blocks within LL projects : Exploration, Experimentation and Evaluation (Figure 7).

1. **Exploration**: getting to know the 'current state' and designing possible 'future states'.

The first phase within an innovation project, labeled 'exploration', consists of moving from idea towards concept or prototype of the solution. It is the 'problem-solution fit' stage implying the identification of the problem and the fitting of the solution as good as possible with the problem. **In this stage the main goal concerns the understanding of the 'current state'.** Exploration is used to understand current solutions and habits and the context within which they are used through methods and techniques like observation, participation and in-depth interviews. Having understood users and their context, the exploration of **users' latent needs and wants** follows, with sensitizing techniques (brainstorming, ideation and co-creation techniques) used to dig into the users' deeper levels of knowledge. This leads to the definition of opportunities for improvement of the 'current state'.

2. **Experimentation**: real-life testing of one or more proposed 'future states'.

This stage puts a concept to the test by developing and experimenting with a prototype. The testing takes place in a 'real-life' setting with the degree in which 'real-life' can be attained linked to the maturity of the design. Prototypes can take on many forms, from tangible to intangible products or services or experience design prototypes, the main goal being to facilitate testing of the possible 'future state'. The goal here is to understand user reactions and attitudes to the proposed solutions as well as to capture behavior through proxy technology assessments, User Experience testing, or actual field trials (the latter when a prototype is stable enough).

3. **Evaluation**: assessing the impact of the experiment with regards to the 'current state' in order to iterate the 'future state'.

The evaluation stage aims at illustrating potential impact and added-value created by the innovation through the comparison of the 'current state' and the 'after the intervention state'. In terms of Open Innovation processes, this stage is aimed at exploitation. This stage can include the monitoring of the actual

adoption and usage of the innovation in order to re-design or add new functionalities according to the needs of existing or new market groups.[26]

Figure 7: LL main building blocks[27]

Potters et al. (2020) [74] in their presentation of the AgriLink LLs argue for a reflexive monitoring approach, based upon criteria developed in soft systems thinking: Efficacy, Efficiency and Effectiveness, to monitor the Living Lab process. *Efficacy* refers to the question whether the LL does facilitate learning and development; e*fficiency* refers to whether the results or effects of the LL outweigh the efforts and resources as laid down; and, *effectiveness* refers to whether the LL is successful in creating a collective experimentation and learning process around the target-product/service.

1.2.3.4 Processes of developing a Living Lab

According to Colobrans' "Living Lab Guide" (2019)[28] the process of developing a LL is as follows.
STEP 1: *Establishing the group promoting the Living Lab.* A lead group which will operate as the promotor of the Living Lab has to be created. This group takes ownership of the problem to be investigated and includes representatives of the institutions involved – PPPP

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[26] Other versions of LL processes can be found, inter alia, at Vicini et al. (2012) and Aversano et al. (2016).
[27] https://u4iot.eu/pdf/U4IoT_LivingLabMethodology_Handbook.pdf
[28] https://mindb4act.eu/wp-content/uploads/2019/03/Living-Lab-Guide_web.pdf

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P a g e | **34**

STEP 2: *Establishing the group operating the Living Lab*. This group plans the investigation, analyses the results and reports on the outcomes of the experiences.

STEP 3. *Establishing a community of users*. This community is essential to validate the solutions model put forward.

STEP 4. *Activating the process of consultation*. Having planned the exploration (which methods and techniques will be used to carry out the research?), the operating group will have to execute the research (how, by whom, when and where is the information going to be gathered?) and subsequently process the results (how will the information generated, amassed, ordered and analyzed be turned into knowledge?).

For Ravetz et al. (2018)[29] when the Lab is set up, the participants can work on specific, practical interventions, with the typical steps including:

1. **Problem and opportunity phase**

• *1a. Scoping problems & opportunities:* exploring the key issues, negative or positive

• *1b. Data collection:* gathering data and evidence, both hard or 'soft'

• *1c. Visualization:* seeing the results in maps, graphs, or other arrays

• *1d. Analysis of problems:* assessing the priorities for action, targets, & resources needed.

2. **Co-design phase**

• *2a. Co-design of responses & options:* participative design of physical, economic or social interventions: with a cycle of design, from concept to detail.

• *2b. Evaluation of options:* generate alternatives, set criteria, and decide which to act on.

3. **Implementation phase**

• *3a. Implementation:* mobilize the interventions, physical, economic or social

•*3b. Monitoring and feedback:* measure the results & feedback to a next cycle. [30]

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[29] http://looperproject.eu/wp-content/uploads/2018/08/LOOPER_D4.1_Guidelines-for-Living-Labs_FINAL.pdf

[30] An approach comprising 8 steps of setting up and running is offered by Steen and van Bueren (2017), https://repository.tudelft.nl/islandora/object/uuid:2fcad7f5-522d-4552-9bc2-02a1d0a09db0?collection=research

1.2.4 End-user engagement toolkit

To guide the researchers and practitioners through the innovation processes, with a special focus on user-engagement, a specific toolkit was created by ENoLL in the context of the European IoT Large-Scale Pilots programme. The toolkit[31] comprises over 40 different methods and tools found across literature and online, put together in a format that follows the different phases along the innovation process. These three phases, exploration, experimentation and evaluation (presented in the introductory chapter), have been further divided into 3-5 iterations.

Similarly, in the case studies presented in The Living Lab Methodology Handbook[32] the methodologies used include:

Design Thinking[33]

Interviews

User persona[34]

Brainstorming / other workshop to create ideas for solutions[35]

Usability workshop / other workshop to try out, test, and improve, validate, the solution[36]

Feedback workshop /other workshop to gather feedback from users[37]

Prototyping[38]

Minimum Viable Product (MVP)[39]

Community Building[40]

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[31] https://u4iot.eu/end-user-engagement-toolkit.html

[32] https://u4iot.eu/pdf/U4IoT_LivingLabMethodology_Handbook.pdf

[33] https://www.interaction-design.org/literature/topics/design-thinking
https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process

[34] https://www.interaction-design.org/literature/article/personas-why-and-how-you-should-use-them

[35] https://www.interaction-design.org/literature/topics/brainstorming

[36] https://www.optimalworkshop.com/101/usability-testing#whenToDoUsabilityTesting

[37] https://www.betterevaluation.org/en/evaluation-options/feedback_workshop

[38] https://www.interaction-design.org/literature/article/design-thinking-get-started-with-prototyping

[39] https://www.techopedia.com/definition/27809/minimum-viable-product-mvp
https://clearbridgemobile.com/planning-a-minimum-viable-product-a-step-by-step-guide/

Scrum / Sprint Visual interviews / collage[41]

Observation / shadowing[42]

Photo Journal / User diary / Guided tour / Empathy prototyping[43]

Service design workshop / other workshop to develop the solution together[44]

Social media

Video support/media support by the final users

Focus groups[45]

Questionnaires.

According to Colobrans (2019), the fundamentally qualitative research techniques which can be used in LLs can be grouped into four large families as follows**:**

1. Those based on **in-person observation** (In-person observation is enriched in Living Labs by the active participation and interaction of the researchers with those being researched).

2. Those based on **different ways of asking questions** (whether casual or programmed questions, one-off or lengthy; whether structured, semi- structured or open, or questionnaires; whether directed at one, two or three people or a group).

3. Those based on **dramatization and role-plays.**

4. Those that involve **activities or workshops** in which textual, graphic, audio-visual or tangible materials are used to facilitate the emergence of experiences.

Materials and methods can also be found at the Center of distance-spanning technology (CDT) of Lulea University of Technology (Sweden) as for example

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[40] https://aese.psu.edu/research/centers/cecd/engagement-toolbox/engagement/what-is-community-engagement

[41] https://www.scrumguides.org/

[42] https://uxplanet.org/shadowing-and-observation-in-user-research-160b711a93cc
https://think.design/user-design-research/shadowing/

[43] https://www.designkit.org/methods

[44] https://www.interaction-design.org/literature/topics/service-design
https://servicedesigntools.org/

[45] https://www.sciencedirect.com/topics/psychology/focus-group

"People's Voices" (re: involving users in the development of interactive systems) and "The Living Lab Methodology Handbook"[46] as well as "Race to scale"[47].

The Co-Creative Workshop Methodology Handbook enables experts to empathize with the needs of end-users, whilst end-users are enabled to communicate on an expert level. Ideally this increases empathy within design and development teams, leading to more meaningful IoT-solutions[48].

From their side, DellEra and Landoni (2014) propose the following user-centered design tools: Questionnaires and Interviews; Focus Group; Human factors+ Ergonomics; Usability testing; Contextual inquiry; Applied Ethnography; Lead User Innovation.

Finally, the participatory tools outlined in FAIRshare MAA toolkit can also be used to facilitate engagement.

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[46] https://www.ltu.se/centres/cdt/Resultat/Metoder-och-handbocker?l=en
[47] https://www.ltu.se/cms_fs/1.101553!/file/FormIT_handbok.pdf
[48] See: https://u4iot.eu/pdf/U4IoT_CoCreativeWorkshopMethodology_Handbook.pdf

1.2.5 Examples

1.2.5.1. FormIT methodology in IoT context

According to their "Living Lab Methodology Handbook"[49], FormIT was developed by researchers at Luleå University of Technology (Botnia Living Lab) in close cooperation with the Center of distance-spanning technology (CDT) and various IT oriented companies. They have developed a methodology which "*can support both radical and incremental innovation development by involving different users and by putting weighted emphasis on the different phases*". Overall, it concerns "*a human-centred approach to develop digital innovations and innovation of new ICT-based services*".

FormIT embodies the aforementioned five Key Principles of LL operations since it very important to continuously consider how value can be created for the users, how the users can influence the process, how sustainability takes form in this project, how openness should take form and how the process should be designed to capture as realistic situation as possible.

The FormIT method is iterative and interaction with users is an all important prerequisite. The method[50] comprises three main cycles: 1) Concept design; 2) Prototype design, and 3) Innovation design. In each of these cycles, three phases are carried out: 1) Explore, 2) Design and c) Evaluate[51], which are repeated in iterative processes. Besides these three cycles, two additional cycles are included in the process. The first is planning, seen in the lower part of Figure 8, and the second is commercialization which is visible in the upper part of the Figure.

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[49] https://u4iot.eu/pdf/U4IoT_LivingLabMethodology_Handbook.pdf
[50] https://www.ltu.se/cms_fs/1.101555!/file/LivingLabsMethodologyBook_web.pdf
[51] Or 1) Explore, 2) Co-create, 3) Implement and 4) Evaluate (see: https://u4iot.eu/pdf/U4IoT_LivingLabMethodology_Handbook.pdf)

Three iterative cycles

- Concept design cycle

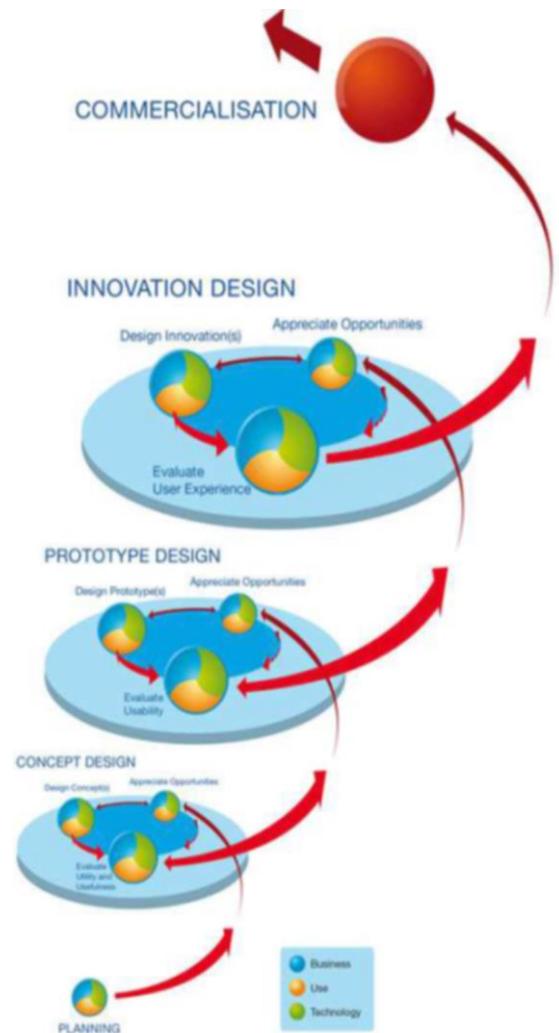- Prototype design cycle

- Innovation design cycle

In each cycle there are three phases:

- Appreciate Opportunities

- Design

- Evaluate

Three aspects within each phase:

- Use

- Business

- Technology

Figure 8: The FormIT process
Source:
https://www.ltu.se/cms_fs/1.101555!/file/LivingLabsMethodologyBook_web.pdf

A short analysis of the phases/cycles of the methodology follows.

PLANNING

This (initial) phase stands for planning the project as a whole and here it is important to gain as much information as possible about the underlying circumstances for the project:
• The project background.
• Aim and scope of the project.
• Different perspectives of the project.
• Relevant skills within the project team.
• The context in which the project exists.
• Constraints and boundaries that need to be defined and agreed upon.
A mix of competences stimulates knowledge sharing and an increased understanding of the stakeholders' visions. It is crucial to achieve a shared perspective on the purpose of the project.

CONCEPT DESIGN

Here, in the first place, the focus is on appreciating opportunities and generating the stakeholders' needs of the product/ service (needs that motivate the users to buy and use a particular innovation). In this respect, users should be supported to "tell stories about their lives". Focusing on telling stories (vs. answering specific questions about needs and requirements based on structured questionnaires) has been found to encourage users to talk about, and discuss, their situation and dreams independent of any technical solution or artefact. This, in turn, makes possible the exploration/identification of users' underlying rationale related to their needs of a possible final solution

This is followed by the translation of needs into concepts. The design of such concepts has to be detailed enough for the users to understand the basic objective of the innovation. The final phase is evaluation aiming at making sure that the involved stakeholders agree with the basic objectives of the developed concept. Therefore, this cycle ends up in a concept (or rough prototype) which represents needs.

Therefore, FormIT is fundamentally different from traditional problem-solving approaches. It strongly stresses the importance of the first phase which creates the foundation for the rest of the process; it is the phase in which "users can make the strongest contributions by actually setting the direction for the design".

Of course, **s**ince users' needs and requirements can change as they become more familiar with possible solutions, it is important to re-examine their needs continually and make sure they correlate to given requirements (see below).

PROTOTYPE DESIGN

Here a variety of data gathering methods, such as interviews and observations are used in order to find out "when using a service, what needs are then important for the users?" When data collection is saturated (i.e. does not generate any new insights), then focus shifts to the design phase. But this time the design of the solution broadens to include basic functions, work flows, and interfaces. The challenge is to identify needs that users consider relevant, and the different expressions they may take. Finally, evaluation takes place, including questions and analyses concerning a) how easy the service or product is to learn and b) how effective and enjoyable it is to use, from the user's perspective.

As [10] point out, often, this phase is iterated several times until the prototype is stable enough to be implemented on a broad scale in a real-world context (Ståhlbröst and Bergvall-Kåreborn, 2008; Ståhlbröst, 2008).

DESIGN OF FINAL SOLUTION

This phase starts with the analysis of the results of the usability evaluation in order to generate changes in the needs of and in the service or product. Small changes in needs (owing to their deeper understanding of the innovation) imply changes in the design of the innovation as well. Following, "*the challenge is to evaluate users' actual experience of the final version of the solution*". Crucial in this respect is the fact that solutions have to be tested in real world contexts which is highly demanding a procedure whose success requires a deep understanding of the users' every day situation as well as their needs relevant in that situation; the latter, in turn, will increase the probability that users actually use the innovation.

COMMERCIALISATION

Commercialisation can be viewed as a separate project in which the aim is to introduce the innovation to a potential buyer and assess its potential on the market.

This methodology have proved to:
• speed up the innovation process from idea to market launch
• to co-create and improve innovative ideas
• to investigate and create new business opportunities[52]

1.2.5.2 Agri-Food Living Lab: The Virtual Meeting Place for Open Innovation on Farm Information Management and ICT[53]

Wolfert et al. (2011) present the Agri-Food LL as an appropriate vehicle to support information management in the agri-food sector. This, in turn, requires flexible information systems based on a common digital infrastructure, i.e. facing, both technically and organizationally, a huge challenge. According to the authors, "*The Agri-Food Living Lab is a community of practitioners tightly connected with a web portal functioning as a virtual meeting place and providing a structure and components that support information systems development*".

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[52] In the Handbook see, among others, the FRACTALS project (www.fractals-fp7.com) whose aim was to support start-ups and SMEs across Europe and help them in better market penetration of their innovative ICT for agrifood solutions based on FIWARE technology (p. 44-48).
[53] https://library.wur.nl/WebQuery/wurpubs/fulltext/192940
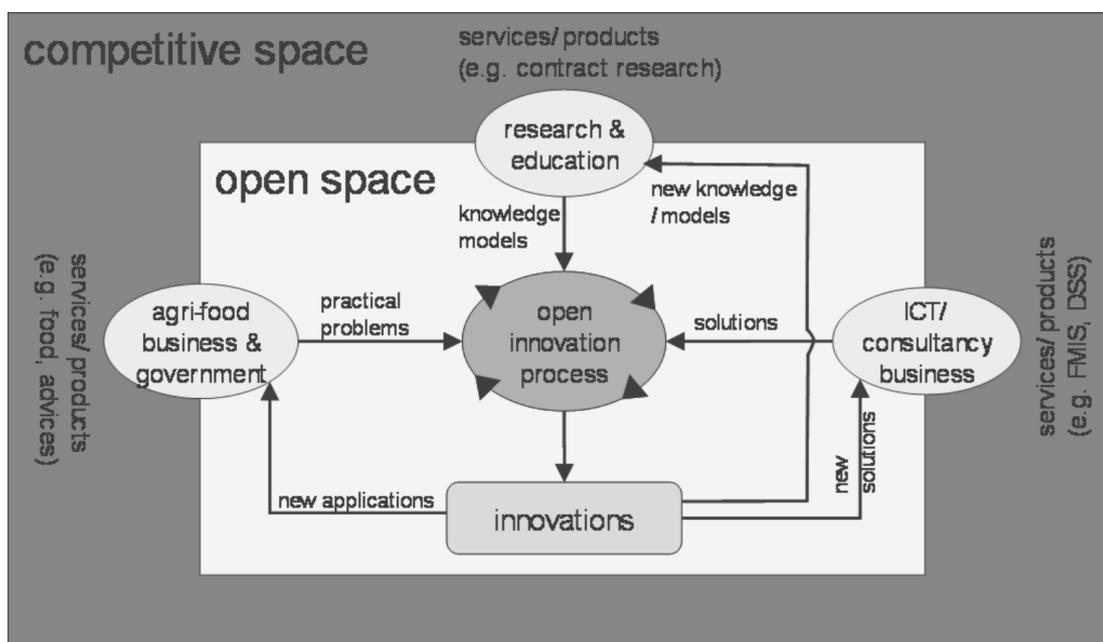
Figure 9: Schematic representation of the Agri-Food Living Lab
Source: https://library.wur.nl/WebQuery/wurpubs/fulltext/192940

In Figure 9, the general process of the Agri-Food LL is schematically represented. According to the authors, "*the open innovation process plays a central role.*" As they explain every stakeholder brings in their particular 'input(s)': "*agri-food business and government … bring in practical problems; research and education bring in knowledge and models that are related to these problems; ICT business and consultants bring in existing business solutions.*" The open innovation process which is followed generates new (partial) solutions and knowledge which is publicly available and can be constantly reused within such an open innovation process. It is important that the (partial) solutions and knowledge can be used by others for a different problem than intended. The parties are free to share solutions or to keep them for themselves to develop commercial products or services. As the authors argue: "*In that way, there is always an interaction between the competitive and open space and the players themselves decide in which space they develop. Because the open space is also a place for contacts with (potential) customers, it is expected that this is 'a-place-to-be' for vendors. Hence, it is expected that the open space is potentially a self-enhancing mechanism.*"

Based on this conceptual framework, a community of practice with a web platform as a central meeting place was realized in July 2010. The main **components** of this web portal are (Figure 10):

• use cases (they a central role in developing new applications, where possible, consisting of a combination of existing web services)

• discussion forum

• web services catalogue

• reference information models

Besides, other common features are included such as blogs, news, events, interesting links, etc.[54]
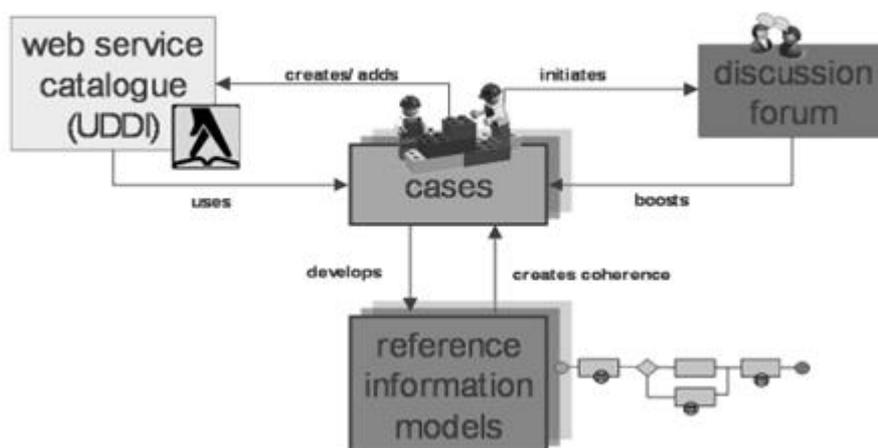
Figure 10: Components of the Agri-Food Living Lab portal and their relationship
Source: https://library.wur.nl/WebQuery/wurpubs/fulltext/192940

According to Wolfert et al. (2011)[55], at the time, the following use cases were embedded in the LL:

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[54] Another example concerns Mobile Living Labs in which mobile devices are used to evaluate concepts and prototypes in real-life settings. The workshop Mobile Living Labs 09: Methods and Tools for Evaluation in the Wild (see: http://mll09.novay.nl, https://dl.acm.org/doi/10.1145/1613858.1613981) provides a forum for researchers and practitioners to share experiences and issues with methods and tools for Mobile Living Labs.
[55] https://library.wur.nl/WebQuery/wurpubs/fulltext/192940

- precision fertilization - generating a variable-rate fertilizer advice

- spraying advice - generating a spaying advice based on a central database

- controlled traffic farming - auto-steering and autonomous vehicles

- sensor-based data processing - handling of data that is generated by various sensors

- sustainability reporting - collecting data to generate a sustainability report at product level

- land parcel identification and registration - coupling of information systems between farm and government

- benchmarking - tools, to be combined with data, with which farmers can benchmark themselves

- Geo-Field-Optimisation-Service - optimizing the arrangement of a field

- QMS online - combining satellite-sensed data with other data to benchmark fields

1.2.6 LLs Best Practice - The harmonization cube

A common methodology, called harmonization cube, to harmonize and exchange best practices of LLs was developed by Mulder et al. (2007). In the Helsinki manifesto (2006) it is stated that, "*This approach should ensure that common methodologies and tools are developed across Europe that support, stimulate and accelerate the innovation process It can be said that harmonization of LL methods and tools is key.*" (Mulder et al., 2008).

According to Hronszky and Kovacs (2013) the harmonization cube:

"*defines the main interoperability elements from organizational, technical and contextual points of view, by the stages of LL maturity. It details the main elements of the evaluation methodology divided by the maturity stages of the LLs - and the direction for further development- the stages of setup, sustainability and scalability put on the vertical axe, in this order.*"
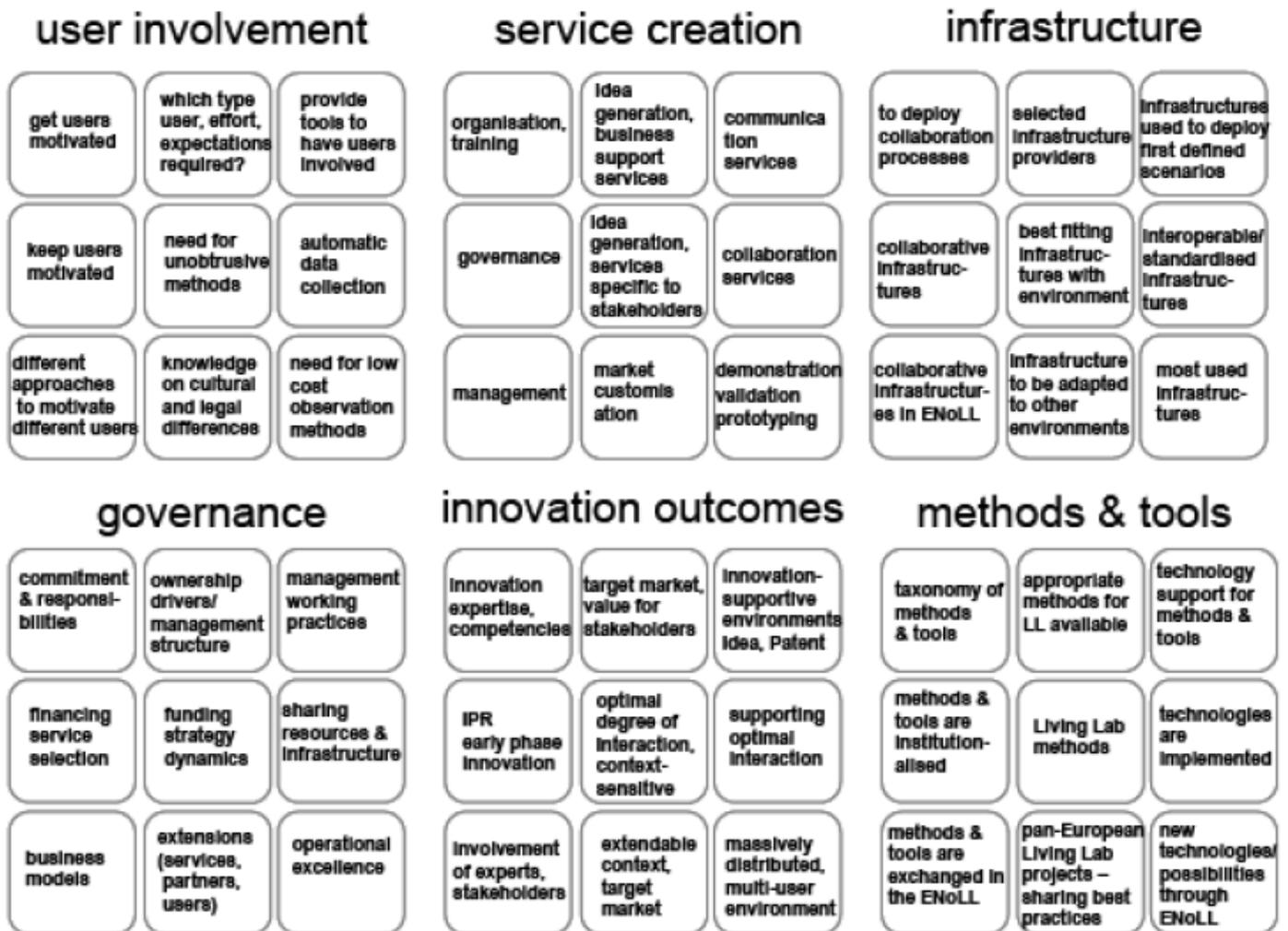
Figure 11: The elements of the harmonization cube

According to the authors,

"*The harmonization cube details the main elements that need to be considered in order to realize a more effective way of operation, interactive value creation, and interactive co-development for new products/services in the user's real life milieu. The harmonization cube methodology focuses on the main elements that should be analyzed when evaluating LLs. The maturity of each element is measurable on a scale. The main elements of the interoperability cube assess the LL processes in detail, focusing on the main elements.*"

1.2.7 Living Labs Comparison

Veeckman et al. (2013)[56] developed the "Living Lab Triangle" framework in order to guide, the thus far missing, empirical research into the practical implementation and the related outcomes of living labs. The proposed framework (Figure 12) has 3 pillars and consists of 11 key characteristics. The identified characteristics are divided on a) a generic level (i.e. the LL environment) and b) project level (i.e. the LL approach).
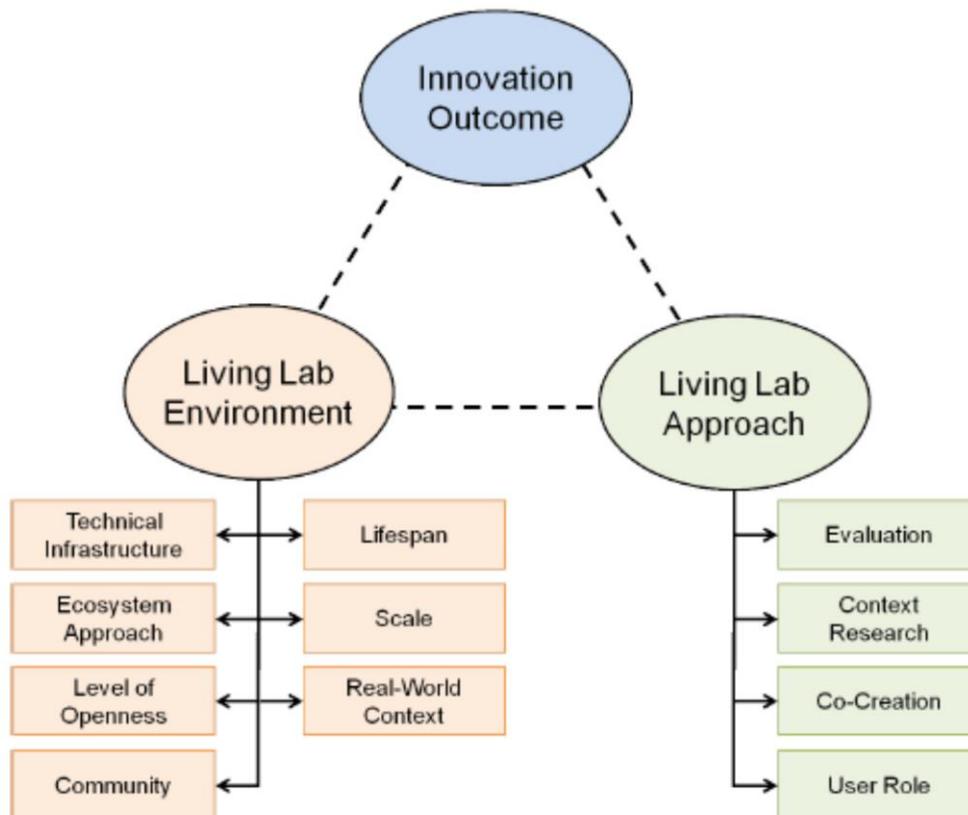
Figure 12: The Living Lab Triangle: The triangulation between environment, approach, and outcome in living labs
Source: Veeckman et al. (2013)

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[56] https://timreview.ca/article/748

The authors underline that, on the one hand, in order to evaluate the success of a LL, the innovation outcome must be considered and, on the other hand, literature is silent about which components affect the outcome in living labs. They thus support Leminen et al. (2012) who found that it depends on: i) strategic intention; ii) passion; iii) knowledge and skills; iv) other resources; and v) partners in the living lab network (see Table 2).

Table 2: Components that affect outcomes of LLs

Component	Definition
Strategic intention	Different parties (e.g., companies, public organizations, research organizations, or user communities) having either individual or shared motives for collaboration
Passion	The passion for participation and collaboration within the user community or the partners in the ecosystem
Knowledge and skills	The knowledge and skills of participants in the living lab network (having or not having a certain expertise)
Other resources	The amount and timing of (available) resources
Partners in the living lab network	The number of different type of participants in the network

Moreover, the authors operationalized the previously discussed building blocks on a four-point scale while also adding four new building blocks: i) the ecosystem approach, ii) level of openness, iii) community aspect, and iv) user role as well as a new pillar: innovation outcome (see Table 3).

Table 3: Operationalization of the framework with options for each building block

Living Lab Environment

Technical Infrastructure

1. No technical infrastructure

2. Infrastructure without monitoring and technical testing

3. Infrastructure with basic monitoring and technical testing

4. Infrastructure with extensive monitoring and in-depth technical testing

Ecosystem Approach

1. No value creation and sharing for all involved stakeholders in the living lab ecosystem (e.g., stakeholders are chosen randomly)

2. Value creation and sharing to some of the stakeholders in the living lab ecosystem (e.g., missing links in the value chain, no equal contribution of all stakeholders)

3. Value creation and sharing for most of the stakeholders in the living lab ecosystem

4. Value creation and sharing for all involved stakeholders in the living lab ecosystem (e.g., long-term engagement and identification with the project)

Level of Openness – Intellectual Property Rights

1. Exclusive regarding results and information generated in the living lab

2. Little of the results and information generated in the living lab are shared (e.g., only brief updates or summaries)

3. Most of the results and information generated in the living lab are shared (e.g., presentations), but some results need to kept confidential

4. Inclusive regarding results; everybody has access to the results and generated knowledge

Level of Openness – Partnerships

1. Completely exclusive partnership (e.g., exclusively controlled by a single actor)

2. Semi-exclusive partnership (e.g., only open to members of a consortium)

3. Inclusive partnership: everyone is welcome to use the platform but access is limited in time and space

4. Inclusive partnership: everyone is welcome to use the platform with no time or space limitations

Community

1. No community

2. Mostly a passive community

3. Neither passive nor active community (equal shares)

4. Mostly an active community

Real-World Context

1. A laboratory setting

2. Real-world context with severe limitations on time or space (e.g., geographical limitation, required skills or devices)

3. Real-world context with some time or space limitations

4. Real-world context without any limitations

Lifespan

1. Short-term project (<6 months)

2. Medium-term project (6 months–1 year)

3. Long-term project (1–2 years)

4. Very long-term project, with the possibility to live on permanently (>2 years)

Scale

1. Not involving any users (N=0)

2. Small scale (<100 users)

3. Medium scale (100–500 users)

4. Large scale (>500 users)

Living Lab Approach

Evaluation

1. No evaluation by users

2. Limited evaluation by users (e.g., post survey)

3. Evaluation by users through an interactive process (e.g., focus groups)

4. Multiple possibilities for feedback and evaluation by users (e.g., before, during, and after an activity)

Context Research

1. The usage context is not considered at all

2. The usage context is moderately considered (e.g., a short survey)

3. The usage context is substantially considered using advanced techniques (e.g., surveys, diaries)

4. The usage context is considered using more advanced techniques (e.g., ethnography tools, observations) and is viewed as a critical element that influences usage behaviour

Co-Creation

1. No interaction with users

2. User feedback is captured, but users have no decision-making power in the innovation process

3. User feedback is captured (iterative), which may lead to some modifications/alterations of the innovation

4. User feedback is captured (iteratively); user can make changes to the innovation themselves; the user is part of the innovation process

User Role

1. Informant

2. Tester

3. Contributor (creating with the user)

4. Co-creator (creating by the user)

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CHAPTER 2: CHANGE MANAGEMENT

2.1 Basic definitions

Change is identified as shift of an organization "as a whole, from one being to another" (AlManei, et al., 2018). In general, such change relates to responses to some significant threat or opportunity arising outside of the organization and/or to processes of managerial perception, choice and actions (Alkaya and Hepaktan, 2003).

The implementation of a change is viewed, as a new organization design, i.e. as the moving of an organization toward a desired future state.
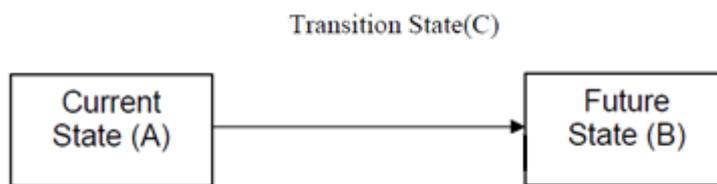
Figure 13: Organizational change as transition
Source: Alkaya and Hepaktan (2003)

As shown in Figure 13 at any time, an organization exists in a **current state** (A) which is a particular configuration of the strategy, task, individuals, etc. A change involves movement toward a desired **future state** (B), as described in various design documents (strategic design, impact analysis, operational design, and so on). Then, the period between the current state (A) and the future state (B) is the **transition state** (C). (Alkaya and Hepaktan, 2003)

According to AlManei et al. (2018) change can be distinguished by:

- **Scale:** Defines 'who' or 'what' will be changed
- **Scope:** Defines the number of people affected
- **Time:** Celerity **/** Speed of change
- **Intended outcome**

Furthermore, the same authors list the main types of change as follows:

- ✓ Radical and incremental (based on scale)
- ✓ A single business process or transformation of the whole organization (based on scale)
- ✓ First-order vs. second-order change (based on scale)
- ✓ Developmental vs. Transitional vs. Transformational (based on scale)
- ✓ Transformational vs. small change (based on the intended outcome)
- ✓ Rapid vs. incremental (based on Time)
- ✓ Individual vs. Group vs. Whole organization (based on Scope)

According to Levy (1986)[58] the characteristics of **first** and **second-order** change can be summarized as shown in Table 4 .

Table 4: The characteristics of first-order and second-order change in organizations

First-Order Change	Second-Order Change
Change in one or a few dimensions, components, or aspects.	Multidimensional, multicomponent change and aspects.
Change in one or a few levels (individual and group level).	Multilevel change (individuals, groups, and the whole organization).
Change in one or two behavioral aspects (attitudes, values).	Changes in all the behavioral aspects (attitudes, norms, values, perceptions, beliefs, world view, and behaviors).
Quantitative change.	Qualitative change.
Change in content.	Change in context.
Continuity, improvements, and development in the same direction.	Discontinuity, taking a new direction.
Incremental changes.	Revolutionary jumps.
Reversible changes.	Irreversible change.
Logical and rational change.	Seemingly irrational change based on different logic.
Change that does not alter the world view, the paradigm.	Change that results in a new world view, new paradigm.
Change within the old state of being (thinking and acting).	Change that results in a new state being (thinking and acting)

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[58] See https://learn1.open.ac.uk/mod/oublog/viewpost.php?post=178202

Change can also be distinguished as developmental, transitional and transformational[59].

Developmental: it enhances or corrects existing aspects of an organization, often focusing on the improvement of a skill or process, like improving existing billing and reporting methods; updating payroll procedures; refocusing marketing strategies and advertising processes (planned or emergent; first order or incremental change). Such changes are those made to improve current business procedures. As long as the staff is kept well informed of changes and get appropriate training they should not experience much stress from this kind of change. Developmental change may be the first step to make further changes to a business that will help to meet the demands of the market.

Transitional change, seeks to achieve a desired (future) state that is different from the existing one like experiencing corporate restructures, mergers or acquisitions; creating new products or services; implementing new technology (episodic, planned, second order or radical change). This kind of change is more challenging to implement and can increase employees' discomfort and much of the organizational change literature is based on this type.

Transformational change is radical or second order change often designating a fundamental and radical reorientation in the way the organization operates (Alkaya and Hepaktan, 2003). Examples of organization-wide change might include a change in mission, restructuring operations (e.g., restructuring to self-managed teams, layoffs, etc.), new technologies, mergers, major collaborations, new programs such as Total Quality Management, re-engineering, etc. Such change thus requires a shift in assumptions and can result in an organization that differs significantly in terms of structure, processes, culture and strategy.

With regard to scale[60] and time[61], AlManei et al. (2018) distinguish between:

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[59] See https://www.business.qld.gov.au/running-business/employing/staff-development/managing-change/types and https://www.jisc.ac.uk/full-guide/change-management

[60] Scale: single business process vs. transformation of the whole organization; Departmental - Divisional level vs. the whole organization; first order-incremental vs. Second order-transformational change.

[61] Time: rapid or incremental change

- **Evolution change** (large scale change carried out over a long period of time);
- **Revolution change** (again large scale change that however is carried out in a very short period of time, usually as a result of externally imposed changes);
- **Adaptation change** (a small scale change that is brought about gradually); and
- **Reconstruction change** (a small scale change rapidly carried out).

Finally, the authors distinguish between **individual**, **group** and **whole organization** change (re: scope) maintaining that, usually, a wide range of stakeholders (leadership, employees, customers, suppliers etc.) needs to be considered.

Das (2019) based on an extensive literature review understands organizational change as a process that involves a review as well as modification of an organization's structure, operational methodologies, strategies, technologies, and culture with a view to enhancing performance and productivity, resonance, and effect an overall positive transformation. Additionally, according to Mairura and Atambo (2019) management can be understood as a set of objectives (including planning and decision making, organizing, leading, controlling) with the aim to employ organization's resources (human, financial, physical and information) to achieve organizational goals in an efficient and effective manner. In this respect, AlManei et al. (2018), based on Goff (1994), define change management as the

> *"area of study that aims to facilitate the transition of individuals, teams or the whole organization by managing them. The purpose is thus to lead and guide the process from the current state to the intended future state by managing and controlling the different difficulties (especially the ones originating from the human side) in order to overcome resistance."*

For Mogogole and Jokonya (2018) change management is the procedure, techniques, methods and tools to control and manage people to attain the necessary business outcome after change; it thus aims at empowering employees to accept and embrace changes in their current business environment.

Finally, as far as digital transformation (DT) is concerned, Ismail et al. (2017), based on literature review[62], define it as:

> "*The process through which companies converge multiple new digital technologies, enhanced with ubiquitous connectivity, with the intention of reaching superior performance and sustained competitive advantage, by transforming multiple business dimensions, including the **business model**, the **customer experience** (comprising digitally enabled products and services) and **operations** (comprising processes and decision-making), and simultaneously impacting **people** (including skills talent and culture) and **networks** (including the entire value system)*".

The same authors also argue that DT is considered to be one of the major challenges in all industries and that only the most adaptable enterprises, responsive to technological trends, will be able to survive and remain on the competitive landscape; however, companies face multiple obstacles in initiating, let alone benefiting from, DT since only a minority have succeeded in developing the right, relevant managerial and technological skills. According to the literature failed attempts may be due to a lack of clarity about the different available options and elements that managers need to consider in their transformation approach; leadership challenges (lack of urgency, vision, direction) or institutional challenges (attitudes of older workers; legacy technology; innovation fatigue; politics) which, in turn, lead to certain degree of resistance to change and cultural barriers.

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[62] For example: "The integration of digital technologies and business processes in a digital economy" (Liu et al. 2011); "The use of technology to radically improve the performance or reach of enterprises" (Westerman et al. 2014).
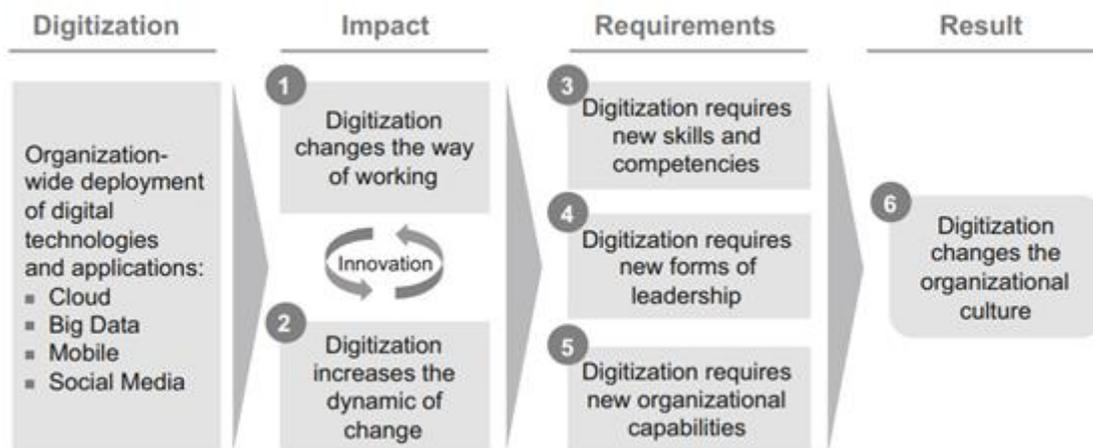
Figure 14: Organizational implications of digitization
Source: Kohnke (2017)

Following Kohnke (2017), the main organizational implications of digitization are presented in Fig. 14. According to the author (p. 73):

> "*The widespread deployment and adoption of digital technologies will have two major organizational impacts: Digitization not only changes ways of working; it also accelerates the speed of change organizations are facing. Both implications lead to three major requirements that have to be tackled by organizations in order for these to be successful with their digital transformation endeavors. Digitization requires new skills and competences; it calls for new forms of leadership, and it forces companies to build new organizational capabilities. To the degree that organizations fulfill these requirements and move quickly towards digitization, they will also evolve their culture.*"

2.2 Change Management Models

The elements of an organization that may be transformed during a change initiative/ change management include (Abraham, 2019): structure, work processes, people, technology and tools, procedures, culture and shred values, tasks, strategy and strategic plans, leadership style, and policies (see also Alkaya and Hepaktan, 2003; Mogogole and Jokonya, 2018). According to Alkaya and Hepaktan (2003) any organization undergoing major change should examine and assess the alignment of such 'elements' to its vision, its customers and each other. This will enable senior management to identify the leverage points that will create sustainable breakthrough change taking into account **change interdependencies**, i.e. that changing any of these 'elements', the other basic 'components' may be affected, a fact that may cause a change effort to fail.

An overview about the parameters that could be influenced by a change effort is given by McKinsey's 7 S model which, as the name suggests, espouses the use of 7 S's within the context of undertaking a change model. These 7 Ss are actually seven distinct steps that take place when organizations are undertaking a change model. According to Abraham (2019) this **"**_model is often used as an analytical tool for measuring and monitoring the changes taking place internally within the organization_**"**.
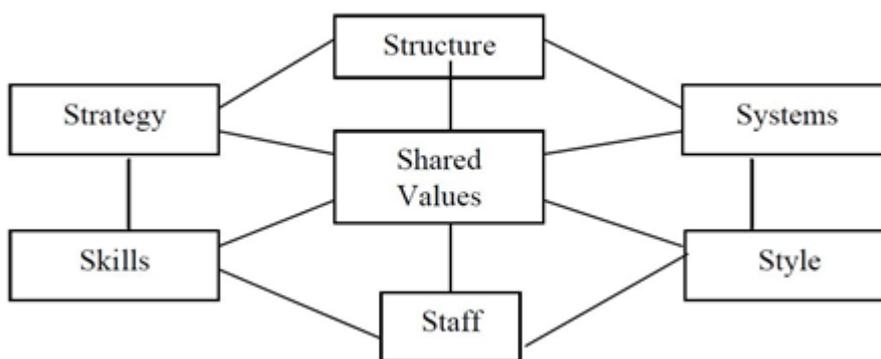
Figure 15: The McKinsey 7-S framework
Source: Alkaya and Hepaktan (2003)

Change management models focus on the implementation of change, that is, guide the activities change agents should perform in order to bring about change successfully in organizational systems (Worley and Mohrman, 2014). There are many change management philosophies and processes that can be used to implement sustainable change in an organization. Some of the most popular models have been offered by Kurt Lewin, John P. Kotter and Prosci's ADKAR model

2.2.1 Organizational Change management models

2.2.1.1 Lewin's Change Management Model

Kurt Lewin was one of the first to conceptualize and document a specific change management model which he presented in 1951. This model, despite being seven decades old, has stood the test of time and numerous applications exist with regard to different business settings (Britton, 2017; Abraham, 2019; Galli, 2019).

According to Lewin the change process of any organization could be conceived of as the transition from the current balanced status to the desired status (the new balanced status). Moreover, Lewin, in order to explain and guide how to initiate, manage, and stabilize the process of the organizational changes, proposed an organizational three-stage change manage model, also referred to as "the force field change management model", that contained 'unfreeze', 'change', and 'refreeze' stages (Galli, 2019; Alkaya and Hepaktan, 2003).

According to Lewin there are often many varied forces at play during the change process. For him, a particular set of behaviors or outcomes is the result of two opposing forces: those striving to maintain the status quo (e.g. solidified organizational conventions and customs, the agreement with the trade union, the organizational culture and conceptions, etc.) and those pushing for change (e.g. the pressure of the changes, the pressure of the competition, the transfer/adoption of the new technology, etc.). When both sets of forces were about equal, current behaviors or outcomes are maintained in a state of 'quasi-stationary equilibrium'. To change that state, the organization should increase

the forces pushing for change, decrease the forces maintaining the current state, or apply some combination of both (Worley and Mohrman, 2014; Britton, 2017; Galli, 2019).

It follows that Lewin conceived of change as modification of the forces keeping a system stable. His change management model focuses in particular on lowering "resistance to change", i.e. he suggested that decreasing the forces maintaining the status quo produced less tension and therefore was a more effective change strategy than increasing the forces for change. Thus, Lewin's fundamental idea is that combined attitudes need to be broken down before change can occur and then the new shared mentality needs to be cemented in the updated model (Worley and Mohrman, 2014); Britton, 2017; Galli, 2019). His model also takes into account the important fact that during the change process things may revert back to what they were, unless permanence of the new level is included in the objective (Alkaya and Hepaktan, 2003).

As aforementioned, Lewin's implementation theory is composed of three phases (Fig. 16):

- ✓ **Unfreeze**

- ✓ **Change / Moving**

- ✓ **Re-freeze**
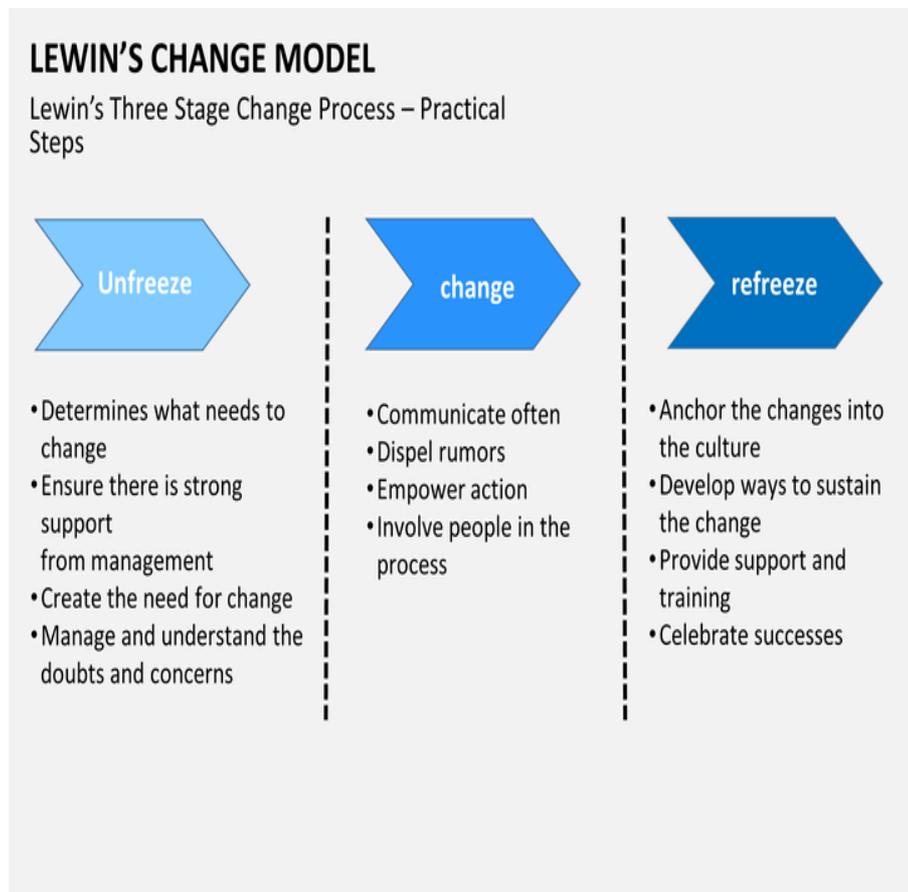
Figure 16: Lewin's change model
Source: Senior and Swailes (2010)

The Unfreezing phase. The first phase of change, involves the organization and/or management, preparing for the change, which has already been understood as necessary. During the unfreezing phase, some crucial processes should be done. In the first place, as the organization is going to move out of its comfort zone, it needs to make, at the earliest possible time, adequate preparations both financially and psychologically for the change process. This way the organization will, among others, be adequately prepared vis-à-vis resistance from its own employees as well as stakeholders influenced by and/or involved in the change process (Britton, 2017; AlManei et al., 2018; Abraham, 2019; Galli, 2019). In this respect, the 'current' state of affairs should be transparently outlined and the need for change established; it is crucial to paint a clear picture (a vision framed in a positive way) explaining why the move is

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P a g e | **69**

crucial to the survivability of the organization and how it will be attained (plan). The inclusion of all stakeholders in the process (re: ownership) is equally important; furthermore, the identification of those who will support and who will resist the change is important in order to put the right people in the right positions to facilitate the change process (Britton, 2017; AlManei et al., 2018; Abraham, 2019).

In this stage, force field analysis, i.e. weighing the driving and resisting forces, can help assess the possibility of success of the upcoming change as for example if the factors supporting the change outweigh the factors against (AlManei et al., 2018; Galli, 2019). Additionally, Alkaya and Hepaktan (2003) suggest that team building and re-education are required.

Change or moving stage. This is the second successive stage within the Lewin's change model where most of the change actually occurs. Usually it is the longest hardest phase, as a lot of opposition to the change is expected and needs to be overcome (AlManei et al., 2018; Abraham, 2019). This stage involves the implementation of the planned change; specific change movements take place, following the change proposal so that the organization can transit from the current state to the future (target) state (AlManei et al., 2018; Galli, 2019). Good leadership is essential as employees will be guided through the change with the support of the change champions identified during the first phase; frequent communication and cooperation between the management and the staff is required (Britton, 2017; Abraham, 2019; Galli, 2019). Britton (2017) suggests that, during this stage, organizations, in trying to provide solutions to problems that emerge, should take an experimental approach while Galli (2019) suggests that the role model (i.e. new behaviors, values, and attitudes through the development of new skills and competencies) shall be established to guide the new working attitudes and working behaviors and/ or bring about changes in organizational structures and processes (Worley and Mohrman, 2014; Alkaya and Hepaktan , 2003).

The Re-freeze stage. In this stage, the change has been embraced and accepted. All the stakeholders have implemented the various plans of change and the organization, often after considerable time, is now stabilized in a new state of equilibrium (Worley and Mohrman, 2014; Abraham, 2019). Thus, according to

Britton (2017), new processes and practices are standardized and become the normal operating condition and new philosophies take the place of past ideologies. In this respect, Abraham (2019) argues that the staff should be supported in order to be able to perform at their maximum capability while at the same time becoming comfortable with the newly acquired changes. Moreover, the organization must be careful so as to ensure that the new ways are safe from regression thus employing strengthening methods, such as regulations and policies, organizational rewards, and the like that reinforce the new organizational state (Worley and Mohrman, 2014; AlManei et al., 2018; Galli, 2019). However, AlManei et al. (2018) also raise the question of the time needed to standardize before the next change initiative unfreezes the current state.

Lewin's model has certain **advantages and disadvantages.** Proponents stress its simplicity, its focus on driving and restraining forces and the fact that it is people-centered (Galli, 2019); the model is found to be the most satisfactory model in terms of initiating a change management initiative (Abraham, 2019). On the other hand, Lewin's change management model proposed has been blamed as being too simplistic and mechanistic, especially when organizational change is a continuous and complicated process or change is radical (Galli, 2019); additionally, as (Kritsonis, 2005) argues, Lewin did not consider individual feelings and experiences and the effects they can have.

Expanded Lewin's model. With respect to the way the change process needs to be managed, several researchers expanded Lewin's three-step model. In this vein, Alkaya and Hepactan (2003) expanded the model to show that the following sequential set of activities needs to take place:

1) Recognizing the need for change
2) Defining the problems
3) Identifying where the company is relative to the problem
4) Searching for alternatives
5) Defining goals (identifying where the company wants to be after the change)
6) Preparing for change
7) **Unfreezing** (loosening the organization so that it can change)
8) **Moving** (consciously managing the process of change)

9) Arriving (realizing when the goals have been met)
10) **Refreezing** (stabilizing and reinforcing the change)

2.2.1.2 Kotter's model of organizational change

John Kotter, a professor of the Harvard Business School, developed his own eight-stage model in 1996 in order to help the average business manager to handle the issue arising from transformational change. Kotter's is one of the most well-known, widely recognized and arguably the most adopted change management model (Pollack and Pollack, 2015; AlManei et al. (2018); Abraham, 2019; Galli, 2019).

Kotter developed his model based on the identification of eight common mistakes a wide range of organizations make when attempting to implement change; then, he created eight steps to counteract each of those mistakes. According to Mairura and Atambo (2019) Kotter's theory is based on a solid foundation of communication, empowerment and focus. For Pollack and Pollack (2015) it places a strong emphasis in leadership or is top-lead; as Galli (2019) states in this respect, throughout the eight steps of the model leaders hold the top position and bear the heavy responsibility to lead the organizational change; that is why Kotter's change model is considered much more effective - organizational change starts with the senior management. This also implies that the model focuses on the human dimension as well as to human processes of change (AlManei et al., 2018). The same authors also maintain that the model is more closely aligned with larger scale changes which have the potential to affect a large number of people while according to Pollack and Pollack (2015) it is typical of private sector change models. On the other hand, the model is said to be suitable for bounded change, i.e. where the scope is more limited and with clear boundaries, compared to transformational change (AlManei et al., 2018) and for centrally planned change Pollack and Pollack (2015).

Kotter's model consists of eight steps (accelerators) which can be used to implement the process of change successfully. The eight steps (accelerators) for leading change are:

✓ Establishing a sense of urgency

- ✓ Creating a guiding coalition
- ✓ Developing a vision and strategy
- ✓ Communicating the change vision
- ✓ Empowering broad-based action
- ✓ Generating short-term wins
- ✓ Consolidating gains and producing more change
- ✓ Anchoring new approaches in the culture (By, 2005**)**
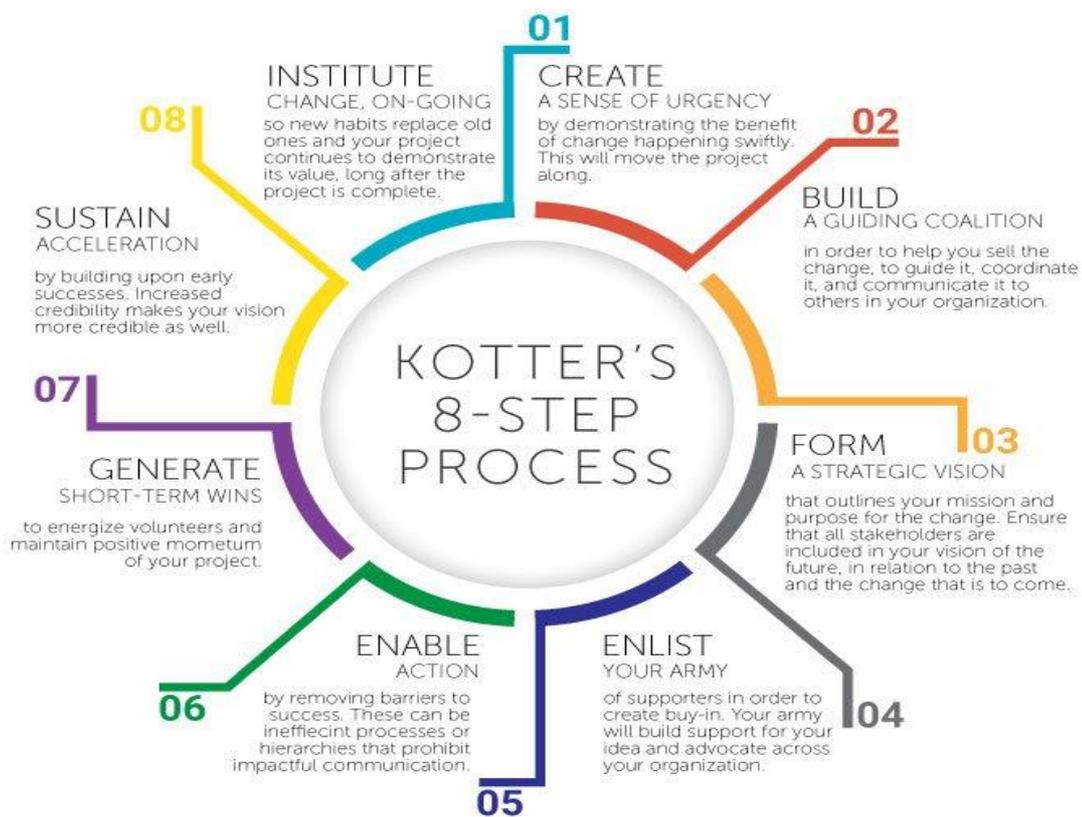
Figure 17: Kotter's change model
Source: https://www.groupex-solutions.com/blog/Change-Management-Issues-and-Tips-on-Avoiding-Them

1. Establishing a sense of urgency.

The first stage in Kotter's process concerns the creation of the necessary climate for change by building awareness on the need for the organization to change. For Kotter (2008) the failure to create a sense of urgency is the single biggest

error made when trying to change organizations; thus this stage can be considered as the most critical of the whole process (AlManei et al., 2018; Pollack and Pollack, 2015). It is the step that prepares the organization for change so that all of the players are supportive, participate in the change process and help to overcome barriers (Smith et al., 2014). Therefore, the management should convince and motivate its people by inspiring them to adapt to change (Hee and Shanmugam, 2019) while establishing 'a sense of urgency' to get everyone/the majority, decision-makers and stakeholders, on the same page and in support of the change (Britton, 2017; Pollack and Pollack, 2015). On the one hand, change process need an increased level of employee engagement (Hee and Shanmugam, 2019) while, on the other hand, as Kotter (2008) maintains, complacency, rather than a desire for change, has been identified as more likely to be the norm in established organizations. Therefore, according to Das (2019) a common pitfall at this stage is to underestimate the difficulty in driving people from their comfort zones; considerable effort may be required to motivate personnel to invest their time and effort and to put up with the inconveniences of change (Ansari and Bell, 2009). As Kotter (2012) argues, a small dedicated group who believe in the change will not suffice if others within the organization are complacent as the change will not be sustainable and will eventually fail; with complacency high, transformations usually go nowhere (Pollack and Pollack, 2015).

How, then to establish a sense of urgency? According to scholars (Das, 2019; Pollack and Pollack, 2015; Britton, 2017; Galli, 2019) first the focus will have to be on exploring the risks associated with continuing with 'business as usual' and why change is needed; that is, a description of the current state of affairs and why that state is not beneficial as well as a description of the future state and why it is positive (current crisis, the potential hazards and the great opportunities) must be performed. This has to be followed by further analysis of specific data in order to be clear with regard to where improvements are needed and what processes may be affected (Britton, 2017). Then, all of this information should be shared with stakeholders and employees throughout the organization to increase the support for the change (Britton, 2017); no matter how easy to sell the need for change is it is quite important to raise it. And it is the responsibility of the management to engage in honest discussions/dialogue with their staff and stakeholders in trying to find potential solutions (Abraham, 2019).

Specific action may also be required to convince at least 75% of organization's managers that the status quo is more dangerous than the unknown (Das, 2019). Finally, it has to be mentioned that some authors support the idea of the fabrication of an environment of extreme tension in order for all the personnel to realize that they are under significant threat in terms of their survivability leading them to creating extra effort in order for the solutions realized to succeed (Small et al., 2016).

2. Creating a guiding coalition.

The change must be driven by strong leadership. Thus a group of influential and committed people with relevant skills and experience has to be formed to effectively lead the change effort and inspire organization members. Each of the leaders will have to be assigned with such roles and responsibilities so as to facilitate the positive change effort (AlManei et al., 2018; Abraham, 2019; Pollack and Pollack, 2015; Das, 2019; Galli, 2019). The right composition of such a team will ensure the right level of trust, shared objectives and the facilitation of communication (Mairura and Atambo, 2019).

The existence of a powerful change management alliance is very important because a single individual cannot do everything alone: create an appropriate vision and communicate it to the entire organization; lead and manage the efforts of large groups of employees; solve emerging problems and overcome complications; identify and communicate sort-term wins and sustain the new state of affairs, etc. (Britton, 2017).

The qualifications of the coalition's members have been explored by researchers. According to available literature, the members of the guiding coalition should comprise of individuals: with the right amount of commitment toward the change effort (Chappell et al., 2016); with the right amount of expertise in the area of change (transformation skills) (Das, 2019; Hee and Shanmugam, 2019); who are subject matter experts and come from a variety of different disciplines, work areas, cultural backgrounds, etc. (Britton, 2017); capable of making far-reaching organizational decisions (positional power) and are strong organizational leaders (Britton, 2017); imbued with team spirit as well as having prior experience in teamwork at the top (Britton, 2017; Das, 2019); with credibility, integrity and are trusted throughout the organization (Smith et al., 2014). Two additional points should be mentioned here: first, the fact that the

engagement of the workforce is critical and thus the need to be considered from the very first stages (AlManei, et al., 2018); second, that the change team members should be encouraged to work outside the normal hierarchy (Das, 2019).

3. Developing a vision and strategy.

This stage concerns the creation of a comprehensive plan consisting of a vision and strategies to accelerate the change (Hee and Shanmugam, 2019). Therefore the actions required at this stage are to create, first, a vision to direct the change effort and, second, strategies for realizing that vision (Das, 2019; Galli, 2019).
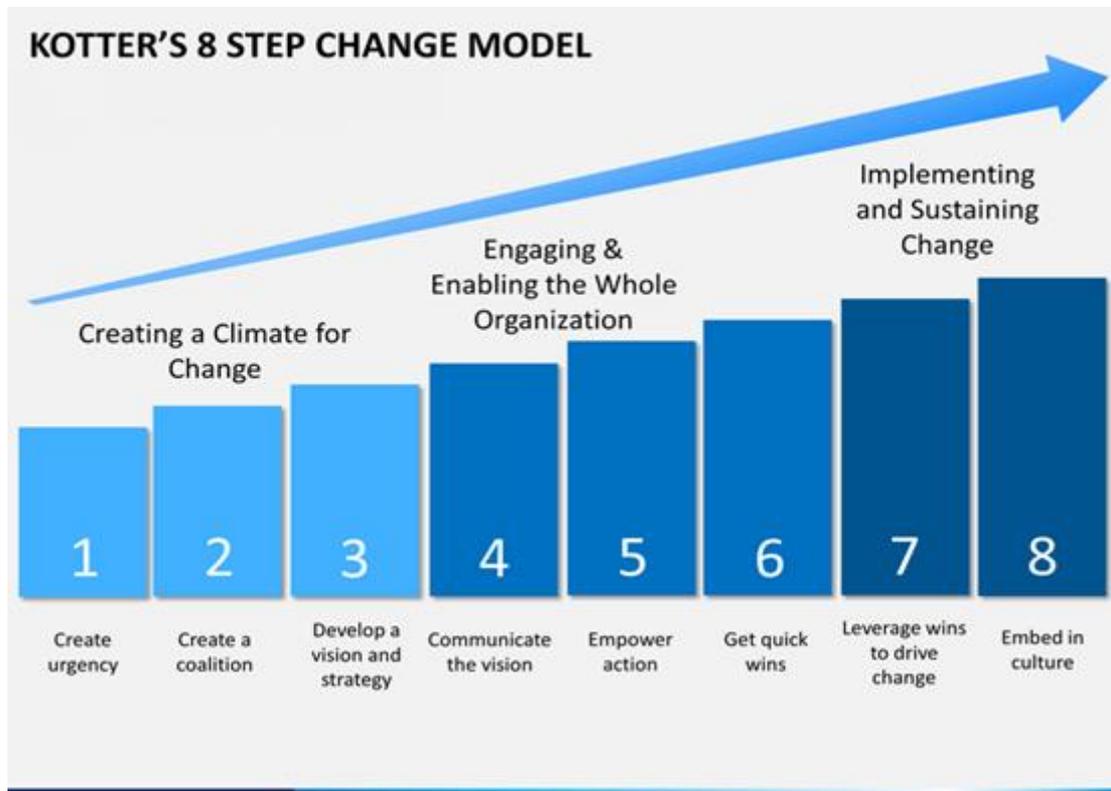
Vision. Vision can be understood as "a picture of the future with some implicit or explicit commentary on why people should strive to create that future" (Smith et al., 2014; Britton, 2017). A change vision is imperative to develop strategic initiatives (i.e. actions towards vision) (Das, 2019); clarifies the direction of the change and thus simplifies many of the decisions that must be made (Britton, 2017; encourages employees to move in the right or desired direction (Britton, 2017; and organizes the actions and efforts of many people in an effective way (Kotter, 2012).

According to available literature the change vision, should fulfill several characteristics such as: it should be tangible and should frame the future in a positive light for most (Smith et al., 2014); it should be comprehensible, concise and easily communicable in order to facilitate its acceptance – avoid too complicated or vague visions (Das, 2019) although created by the guiding coalition it should consider the thoughts, experiences, and feelings of the employees and other stakeholders so as to compel them to dedicate their time and effort (Abraham, 2019; Britton, 2017).

Strategy. According to Hee and Shanmugam (2019) and Pollack and Pollack (2015) the energizing and focused strategy will realize change vision by launching a wide variety of projects and actions (i.e. mentoring project, developing communities of practice, role redefinition, introduction of software supported discussion forums and analysis tools, development of seminars focused on knowledge sharing, etc.). It is therefore the key strength for accomplishing the vision and the leading team should prepare and implement a detailed action

plan, allocate resources and timeframe in order to put strategies into action (Hee and Shanmugam, 2019).

Figure 18: Kotter's change model
Source: https://medium.com/@KodiakRating/what-is-change-managements-role-in-the-digital-transformation-of-scm-35c490e95c8f

4. Communicating the change vision.

The next phase of the change process concerns the effort of the leading team to persuasively and persistently communicate the strategic vision; as Kotter (2009) argues acceptance is the crucial part for success of any change plan while most of the change plans fail due to rejection (Hee and Shanmugam, 2019). Some authors argue that at this phase except the new vision and strategy, also new organizational objectives, behaviors and expectations have to be systematically communicated (Britton, 2017; Galli, 2019). On parallel, Kotter (1996) notes that managers underestimate the amount of communication required to develop a consistent understanding.

Ansari and Bell (2009, p. 159) have identified the need to communicate the change as one of the two most important stages in Kotter's process - given that the power and effectiveness of the change vision increases exponentially the more people understand it and are committed to it (Britton, 2017). It follows that adequate time and effort should be devoted to spreading the message(s) (Pollack and Pollack, 2015). In this respect, it is also useful to remind that effective communication must be simple and understandable (i.e. should not include jargon or technical information that is not readily understood by the intended audience) and messages easily remembered (Hee and Shanmugam, 2019; Britton, 2017). Furthermore, every means possible to communicate the new vision and strategies for achieving it has to be used including, for example, employee meetings, small group meetings, memos, newsletters, emails, social media, posters, and direct interaction - with senior leaders actively engaged in presentations and the organization's communications department co-organizing the campaign (Britton, 2017; Pollack and Pollack, 2015;Das, 2019).

5. Empowering broad-based action/ Empower employees for broad-based action.

The fifth stage in Kotter's process is to empower action. As aforementioned, organizational change requires the support and the participation of employees and stakeholders at all levels. When employees are empowered and involved in the process, they gain a sense of ownership and responsibility of the change projects. That is why "employee empowerment" is an important aspect of the change process (AlManei, et al., 2018; Britton, 2017). As Kotter (2012) puts it employees won't participate or can't move the vision forward when they are powerless; thus the organization must empower them to act in support of the change based on a shared sense of purpose and the breaking down of walls that impede or prevent action (Britton, 2017).

Therefore, this stage focuses on two crucial processes. First, the leading team will have to identify and remove all the obstacles/barriers (i.e. structures or systems) that undermine the vision and/or hinder the transformation (Abraham, 2019; Hee and Shanmugam, 2019; Das, 2019; Galli, 2019). For this to happen, in the first place, the leading team should prepare an assessment, as, for example, a short survey, to discover the current obstacles faced by the employees (Hee and Shanmugam, 2019). Additionally, actions such as the following should be undertaken: change averse manager(s) should be identified and replaced or re-

trained (Chappell et al., 2016), excessive bureaucracy be eliminated or curtailed (Abraham, 2019), discussions with all business units held in order to remove structural barriers to empowerment, along with the improvement of the relationships between Human Resources and Communication teams (Pollack and Pollack, 2015), and so on.

Second, the leading team must provide support to the change process. In this respect, empowerment encourages and inspires people to implement and adapt to change (Hee and Shanmugam, 2019); according to Kotter (2012), innovative ideas and actions should be encouraged as well as risk taking. Relevant actions may include specific employees' training focusing on the vision and organizational expectations; the encouragement of employees to provide suggestions, identify hazards and report misses, to get involved in the program and procedure reviews (thus providing tools that are useful and accessible) as well as to act as decision makers in the field when responsible managers are not available (Britton, 2017).

6. Generating short-term wins.

As Kotter (2012) argues, short-term wins maintain and build additional momentum and motivation for the change effort; therefore, the identification and communication of short term wins help to encourage continued support for the change effort (Britton, 2017) as stakeholders (leading team, staff/employees and others) have a sense of success in achieving the goals in the early stages (Abraham, 2019) and a proof that the effort and sacrifices are worth it (Britton, 2017) This can be attained through simple projects that can have easy wins (AlManei, et al., 2018) and which will be visible throughout the organization, unambiguously successful, and clearly related to the change effort (Kotter, 1996). Such short term wins provide justification for the new direction as well as the data the leading team needs to refine the vision and narrow down specific strategies (Britton, 2017; Das, 2019).

Furthermore, the identification and communication of short term wins creates opportunities to celebrate gains and to recognize individuals who working diligently on the change effort have contributed to the successes so far in the process. (Das, 2019). It follows that one of the leading team's tasks will be to put together a reward system that, on the one hand, will cherish the continued

effort in trying to implement change while, on the other hand, will acknowledge the endeavor and current successes (Abraham, 2019).

Figure 19: Kotter's change model
Source: Kotter (1996)

7. Don't give up: Consolidate gains and produce additional change.

The seventh step in the change model concerns the consolidation of gains ('do not give up'); indeed, the leading team needs to use the thus far (short-term) achievements as a bedrock for justifying and pursuing other (possibly much larger and more difficult) goals which will eventually move the company toward its ultimate goal and end state in larger chunks (Kotter, 2012; Abraham, 2019). The consolidation of gains and the achievement of more change, against setbacks and tendencies to revert back to the old way of doing business, involves pressing on, delivering more change, and increasing rather than decreasing the resources dedicated to the change process; it also takes a long time to complete, particularly in larger organizations (Kotter, 1996). This, in turn, underlines once more the need for solid leadership, clear direction, and good programme management (Smith et al., 2014).

It follows that at this stage the leading team will have to keep the high urgency level (Hee and Shanmugam, 2019) and maintain organizational interest in the

change (through new messages, etc.). According to (Kotter, 1996, p. 133) "Whenever you let up before the job is done, critical momentum can be lost and regression may follow. Until changed practices attain a new equilibrium and have been driven into the culture, they can be very fragile".

On parallel, the leading team will have to streamline and restructure the goals given that, on the one hand, as the change process evolves new goals and ideas/projects as well as additional resources are developed and, on the other hand, policies, systems, structures and employees that are not consistent with/ supportive to the novel vision have to be changed or abolished (in the case of employees, the team may also hire, develop, and promote those who could help) (Hee and Shanmugam, 2019; Britton, 2017; Das, 2019; Galli, 2019). According to Pollack and Pollack (2015) at this stage it is also important to resist the manoeuvres of other parties from subverting, or changing, the program approach; and quite an effort may be required for this.

8. Anchoring new approaches in the culture.

In order to characterize a change process as successful, such a change must be sustained after the process of changing is complete (AlManei, et al., 2018; Britton, 2017); this, in turn, implies that change must be anchored in the organizational culture (Kotter, 2012). Culture is important because it indoctrinates individuals into the ethos of the organization and influences the attitudes, actions, and behaviors of employees throughout the company (Kotter, 2012). Kotter underscores the fact that seemingly successful change efforts can be overtaken by an organization's culture if the latter is not in line with the change that was implemented. Therefore, culture needs to be constantly monitored and the change reinforced by, for example, continually communicating the benefits. (Smith et al, 2014).

Table 5: Kotter's 8-Step-Change-Model in Practice

STEPS	STAGE	ACTION REQUIRED	PITFALLS
1.	Create a Sense of Urgency	• Examine market and competitive realities for potential crises untapped opportunities. Convince at least 75% of your managers that the status quo is more dangerous than the unknown. Underestimating the difficulty in driving people from their comfort zones	• Underestimating the difficulty of driving people from their comfort zones. • Becoming paralyzed by risks.
2.	Form a Powerful Guiding Coalition	• Assemble a group with shared commitment and enough power to lead the change effort. • Encourage them to work as a team outside the normal hierarchy.	• No prior experience in teamwork at the top. • Relegating team leadership to an HR, quality, or strategic planning executive rather than a senior line manager.
3.	Create a Vision	• Create a vision to direct the change effort. • Develop strategies for realizing that vision.	• Presenting a vision that's too complicated or vague to be communicated in five minutes.
4.	Communicate the Vision	• Use every vehicle possible to communicate the new vision and strategies for achieving it. • Teach new behaviors by the example of the guiding coalition.	• Under-communicating the vision. • Behaving in ways antithetical to the vision.
5.	Empower Others to Act on the Vision	• Remove or alter systems or structures undermining the vision. • Encourage risk taking and nontraditional ideas, activities, and actions.	• Failing to remove powerful individuals who resist the change effort.
6.	Plan for and Create Short-Term Wins	• Define and engineer visible performance improvements. • Recognize and reward employees contributing to those improvements.	• Leaving short-term successes up to chance. • Failing to score successes early enough (12-24 months into the change effort).
7.	Consolidate and Produce More Change	• Use increased credibility from early wins to change systems, structures, and policies undermining the vision. • Hire, promote, and develop employees who can implement the vision. • Reinvigorate the change process with new projects and change agents.	• Declaring victory too soon—with the first performance improvement. • Allowing resistors to convince "troops" that the war has been won.
8.	Institutionalize New Approaches	• Articulate connections between new behaviors and corporate success. • Create leadership development and succession plans consistent with the new approach.	• Not creating new social norms and shared values consistent with changes. • Promoting people into leadership positions who don't personify the new approach.

Source: Kotter (2007)

According to Kotter's change management model in order to foster a culture that supports change the leading team can a) train and develop (the next generation of) leaders that support the new vision (Britton, 2017; Das, 2019) and b) strive to create new social norms and shared values consistent with changes; successes must be communicated and the relevant behaviors recognized, supported, and encouraged (Das, 2019).

Kotter's model has certain **advantages and disadvantages.** Pollack and Pollack (2015) maintain that Kotter's change model has been recognized as one of the most well known approaches to organizational transformation, the mainstream wisdom for leading change and the most compelling formula for success in change management. Proponents stress that its popularity owes to its direct and usable format (Pollack and Pollack, 2015) or the fact that it is relatively easy to follow (Galli, 2019). According to Das (2019) practitioners favour the model due to the clarity of purpose in each of its 8 phases; the model clearly demonstrates the major contents and the core of each step (Galli, 2019). Additionally, the model is helpful as it focuses on the preparation and the acceptance of the change while its focus on communication makes it useful for the traditional hierarchies as well (Galli, 2019).

Criticisms on Kotter's model focus on the fact that, first, it is not general enough to embrace some kinds of change (Ansari and Bell, 2009) and, second, that the model describes what has to be done but provides little guidance (is not sufficiently detailed) on how it should be achieved (Pfeifer et al., 2005; Appelbaum et al., 2012). It seems that while there is a significant body of literature providing advice for practitioners, there is dearth of research (critically) addressing the practicalities of change management, i.e. how to actually implement change and relevant techniques (Pollack and Pollack, 2015). Others argue that the model is overly planned; that is does not represent the realities of organizational life (Hay et al., 2001) or that the actual factors that are to be considered throughout a change programme are much more than these stated through Kotter's model (Appelbaum et al., 2012; Das, 2019 Pollack and Pollack, 2015); that once the process of Kotter's change management model begins, it is hard to convert the direction, or that if the individual needs are ignored, then change activity may well lead to employee frustration (Galli, 2019).

From a practitioner's point of view the main point has to do with the complexity of change process implying that: a) not all the 8 steps are relevant/ suited to

diverse environments thus the need to add other conceptual frameworks (Ansari and Bell, 2009); the steps are not always sequential while some of the model's phases may not be relevant in some contexts (Appelbaum et al., 2012); there is a gap in documenting the actual implementation of the model in real-life situations as the model is designed to provide a framework and starting points, rather than, as aforementioned, offer a step-by-step action plan (Stragalas, 2010: 31).

Nonetheless according to Appelbaum et al. (2012) and Pollack and Pollack (2015) there are still few case studies in the academic literature that enquire into how exactly Kotter's change model has been used in practice, while according to Sikorko (2008, in Pollack and Pollack, 2015) "… *no single model can provide a one-size-fits-all solution to organizational change*".

Pollack and Pollack (2015), with reference to the practical use of the model, summarize their findings as follows: Kotter's model has been interpreted as linear while in practice the process has been found to be significantly more complex; despite the need for adaptations to suit certain circumstances, the process was found effective in terms of managing change; in practice, more than one guiding coalitions/ leading team may be needed to be able to address all agendas which, nevertheless, implies that different stakeholders or guiding coalitions may start the change process at different time and with differential progress; it follows that stakeholders have to be treated individually, not as part of a one-size-fits-all package and, change processes are relevant at both the organizational level and at the level of separate stakeholder groups as the process evolves more groups may be needed to provide leadership in various parts of the change programme which means that the leading team will have to maintain alignment between these different groups as well as to adapt its vision to the local level circumstances and needs; finally, the eight stage process is an accurate description of the change process at the individual group level.

At this point it is worth mentioning that, as By (2005) argues, contra to the planned approach emphasizing the different stages which an organization will have to go through in order to move from an unsatisfactory state to a desired (future) state, an emergent approach arises claiming that:

- Rather than seeing change to be top-down driven, the emergent approach tends to see change driven from the bottom up.
- Change should not be perceived as a series of linear events within a given period of time, but as a continuous, open-ended process of adaptation to changing circumstances and conditions.
- The approach suggests change to be so rapid that it is impossible for senior managers effectively to identify, plan and implement the necessary organizational responses. Therefore, the responsibility for organizational change has to become increasingly devolved.
- Uncertainty of both the external and internal environment that makes this approach more pertinent than the planned approach
- Change is a process that develops through the relationship of a multitude of variables within an organization.
- Apart from only being a method of changing organizational practices and structures, change is also perceived as a process of learning.

Kotter (2012) himself recognizes the changes that have taken place in organizations as a result of **globalization** and the challenge to stay competitive amid constant turbulence and disruption (Table 6).

Table 6: The 20th and 21st century organizations compared

THE 20TH CENTURY ORGANIZATION	THE 21ST CENTURY ORGANIZATION
Structure • Bureaucratic • Multilevel • Organized with the expectation that senior management will manage • Characterized by policies and procedures that create many complicated internal interdependencies	**Structure** • Non-bureaucratic, with fewer rules and employees • Limited to fewer levels • Organized with the expectation that management will lead, lower-level employees will manage • Characterized by policies and procedures that produce the minimal internal interdependencies needed to serve
Systems • Depend on few performance information systems • Distribute performance data to executives only • Offer management training and supports systems to senior people only	**Systems** • Depend on many performance information systems, providing data on customers especially • Distribute performance data widely • Offer management training and support systems to many people
Culture • Inwardly focused • Centralized • Slow to make decisions • Political • Risk averse	**Culture** • Externally oriented • Empowering • Quick to make decisions • Open and candid • More risk tolerant

Source: Kotter (2012)

In this respect, Kotter (op. cit.) argues that

- the most successful organizations will have a persistent sense of urgency; complacency will be unacceptable
- companies will maintain this sense of urgency with state-of-the-art performance information systems
- teamwork will become more prominent as a way to deal with the rapid pace of change; teams have the expertise and flexibility that individuals lack to lead organizations in a changing world
- there will be greater need and opportunity for leaders who can create and communicate vision; successful organizations will act like leadership incubators
- employees will be given the authority to manage their own work groups
- unnecessary bureaucracy will be eliminated
- companies will embrace flatter, leaner structures and cultures that value risk-taking; the moto 'two structures (i.e. hierarchy and network) – one organization' will dominate
- strategy should be viewed as a dynamic ongoing process of "searching, doing, learning, and modifying" (i.e. constantly seeking opportunities, identifying initiatives that will capitalize on them, and completing such initiatives swiftly and efficiently)
- the eight 'accelerators' (see below) are the activities that inform strategy and bring it to life; together, the network and the accelerators can serve as a continuous and holistic strategic change function continuously accelerating momentum and agility and imparting a kind of strategic 'fitness'.

Kotter (op. cit) taking on board criticisms about the 8-steps model and the emergent environment in which organizations will have to function now proposes an 8-accelarators model (Fig. 20) as follows:

1. Create a sense of urgency around a single big opportunity.
2. Build and maintain a guiding coalition.
3. Formulate a strategic vision and develop change initiatives designed to capitalize on the big opportunity.
4. Communicate the vision and the strategy to create buy-in and attract a growing volunteer army.
5. Accelerate movement toward the vision and the opportunity by ensuring that the network removes barriers.
6. Celebrate visible, significant short-term wins.
7. Never let up. Keep learning from experience. Don't declare victory too soon.

8. Institutionalize strategic changes in the culture.

Figure 20: Kotter's accelerators
Source: Kotter (2012)

According to Kotter (op. cit.)

(1) The steps are often used in rigid, finite, and sequential ways, in effecting or responding to episodic change, whereas the accelerators are concurrent and always at work. (2) The steps are usually driven by a small, powerful core group, whereas the accelerators pull in as many people as possible from throughout the organization to form a "volunteer army" (3) The steps

are designed to function within a traditional hierarchy, whereas the accelerators require the flexibility and agility of a network.

2.2.2 Individual Change management models

### 2.2.2.1 Hiatt's Change Management Model - ADKAR

The ADKAR change management model is an individual-target change framework, developed by Hiatt in his effort to enhance change in individuals who are the objects of change in organizations. According to Hiatt and Creasey (2012, in Britton, 2017) successful change depends on the individual thus efforts should be directed at addressing individual concerns. They characteristically argue that

"*A perfectly designed process that no one follows produces no improvement in performance. A perfectly designed technology that no one uses creates no additional value to the organization. Perfectly defined job roles that are not fulfilled by employees deliver no sustained results. Whether in the workplace, in your community or in government, the bridge between a quality solution and benefit realization is individuals embracing and adopting the change*"

The ADKAR model focuses on the large organization; it aims at providing a framework to facilitate a large-scale transition (Galli, 2019; Wong et al., 2019). ADKAR is the abbreviation of the five building blocks of Hiatt's change management model (Das, 2019) or, in other words, the five milestones an individual, unit, or group must achieve to change successfully (Wong et al., 2019). These are:

- ✓ **Awareness** of the need for change
- ✓ **Desire** to support the change
- ✓ **Knowledge** of how to change
- ✓ **Ability** to demonstrate new skills and behaviors needed for the change
- ✓ **Reinforcement** to sustain the change.
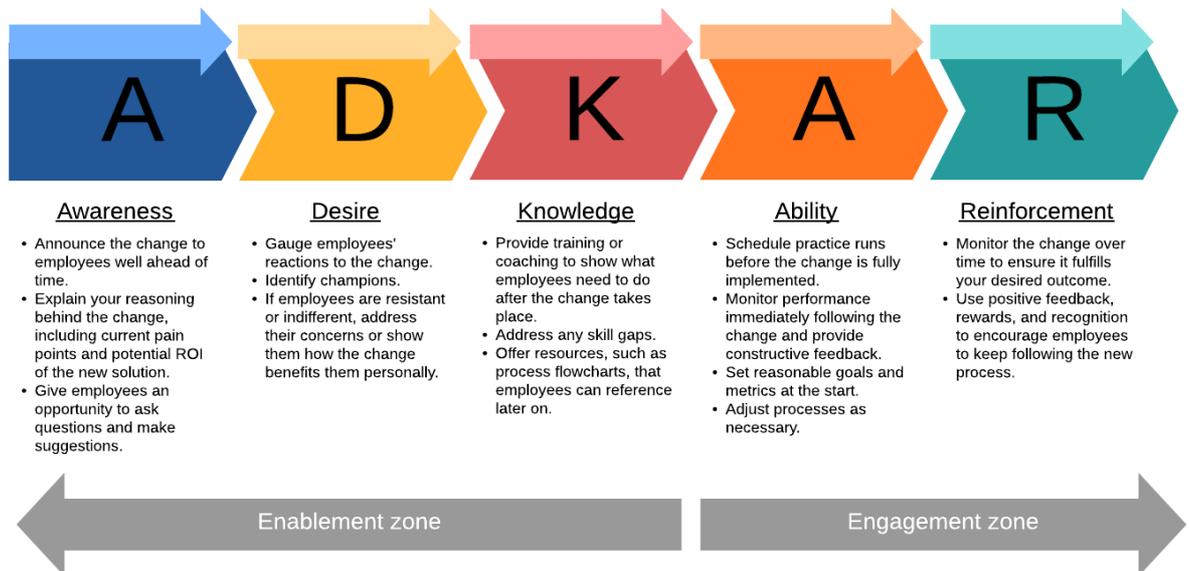
Figure 21: Hiatt's ADKAR model
Source:https://www.lucidchart.com/blog/using-the-adkar-model-for-change-management

1. Awareness. The first step of ADKAR concerns awareness, i.e. the degree to which individuals are clear about the forthcoming changes as well as about their necessity and significance which, in turn, will affect their choice to participate (or not) in the change effort (Das, 2019; Galli, 2019).

According to Wong et al. (2019) this stage focuses on several processes such as: identify the areas that would potentially be the most challenging for the staff during the transition; make sure that staff members are aware of the upcoming changes and why these changes are important and necessary; ensure that all staff members had the opportunity to get informed; ease the staff's feelings of anxiety and/or loss; and provide the staff with the latest information surrounding the transition (through, for example, short informational presentations; the Q&A panels to address questions and concerns and dispel misconceptions; individual discussion and/or group meetings, etc.).

For Hiatt five factors can influence successful awareness building in individuals:
- A person's view of the current state;
- How a person perceives problems - an individual's cognitive style impacts how they perceive the need for change and how they solve problems;

- Credibility of the sender of awareness messages - and the organization's history with change;

- The presence of misinformation or propaganda in the background conversation;

- Contestability of the reasons for change The presence of external and observable drivers (Hiatt, 2006: 9, 15-16)[63,64]

2. Desire. In this stage, i.e. after awareness building which is ADKAR's first objective, the desire to participate in the change is stimulated through incentives. As Das (2019) argues, if people know what they would benefit from participation in the change endeavour, they would be motivated to get involved. This stage focuses on several processes such as: build the desire to change; investigate whether people are willing to accept the changes (Galli, 2019); provide staff with a level of control to ensure an active role; involve the staff in planning and decision-making in order to create a desire to participate and support the change (Wong et al., 2019).

For Hiatt four factors may contribute to group or individual desire to embark on change:
- The nature of the change (what the change is and how it will impact them)
- The organizational or environmental context for the change (their perception of the organization)
- An individual's personal situation
- What motivates them (those intrinsic motivators which are unique to an individual) (Hiatt, 2006: 18)[65].

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[63] "It is more difficult to build awareness for change with internal drivers or reasons that are debatable than it is with external and observable drivers" (Hiatt, 2006, p. 13)

[64] An individual's vista of state of the art; how an individual discerns issues/problems or crises; plausibility of the awareness campaigner/advocate; circulation of unsubstantiated information or rumors; contestability of the rationale for change (Das, 2019).

[65] The nature of the change (what the transformation effort is and its ramifications on individuals); the organizational or environmental circumstances for the change (individuals' perception of the organization or environment that is subject to renewal); personal situations severally; what prompts or motivates individuals or group (those endogenous motivators which are distinctive to individuals) (Das, 2019).

These, according to Wong et al. (2019) imply individual discussions, group meetings, surveys, etc.

3. Knowledge. The third building block in the ADKAR model toward realization of the change is knowledge, that is, a representation of how the implementation of the change should be realized. Consequently, this stage focuses on processes dealing with the investigation of whether people master the necessary knowledge to operate the change management (Galli, 2019) and provide staff with the knowledge on how to change (Wong et al., 2019). Therefore this stage encompasses: the development training sessions (technical and competency training) tailored to each individual's role and assigned work especially focusing on skill sets as well as behaviors required to effect 'the change' (Hiatt, 2006: 23), comprehensive enlightenment on the utility of tools, processes, and systems, and comprehension of change novel roles as well as responsibilities (Das, 2019); on parallel, staff members should be given the opportunity to identify any potential workflow issues and provide feedback (Wong et al., 2019).

Again, according to Hiatt four factors impact the successful achievement of the knowledge element of the model:

- The current knowledge base of an individual;
- The capacity or capability of this person to gain additional knowledge;
- The resources available for education and trsining;
- The access to, or existence of, the required knowledge (Hiatt, 2006: 27).

4. Ability. The fourth building block of the model is ability, that is, a demonstrable capability of the individual to practice the acquired knowledge and attain desired outcomes (Das, 2019). Therefore, in this stage the staff should be provided with all the essential resources to adapt to their new environment, tackle upcoming challenges, find solutions, and deliver improved results Wong et al. (2019).

According to (Das, 2019), for Hiatt (2006) the essential elements that could influence the ability of an individual to engage in the change are an individual's:
- psychological inhibitions;
- intellectual capability;
- cognitive time frame to develop the required abilities;

- and accessibility to resources to enhance the development of novel abilities.

Wong et al. (2019) state that at the end an individual or group will own a well-developed identity, a strong sense of purpose, defined unit processes, and a solid understanding of member roles and responsibilities.

5. Reinforcement. This stage focuses on the sustainability of the changes implemented. In ADKAR reinforcement has three-fold purposes:

- ✓ Sustenance of the change and prevention of people from backsliding into old behavioral patterns or job performance
- ✓ Building of momentum in the transition period
- ✓ Creation of historical remains which people could remember in the next change occurrence

Given experiences of failures owing to the quick reallocation of resources and support to new projects soon after implementation of a certain change, Wong et al. (2019) argue that there is need for an ongoing provision of support to troubleshoot issues related to new workflows, technology, and facilities to *reinforce* staff as well as feedback meetings to give managers and staff the opportunity to talk through the struggles of their work and share lessons learned. As Hiatt argues reinforcement and celebration of change snowballs the "readiness and capacity for" change (2006: 41).

Finally, for Das (2019) reinforcement's success could be determined by:

- ✓ the extent that it is meaningful and specific to the person impacted by the change;
- ✓ the degree that it is linked with real accomplishments;
- ✓ the degree that there is dearth of negative ramifications for coveted behavior;
- ✓ the degree that mechanisms for accountability are set up.

ADKAR Elements	Factors Influencing Success
Awareness of the need for change	• A person's view of the current state • How a person perceives problems • Credibility of the sender of awareness messages • Circulation of misinformation or rumors • Contestability of the reasons for change
Desire to support and participate in the change	• The nature of the change (what change is and how it will impact each person) • The organizational or environmental context for the change (his or her perception of the organization or environment that is subject for change) • Each individual person's situation • What motivates a person (those intrinsic motivators that are unique to an individual)
Knowledge of how to change	• The current knowledge base of an individual • The capability of this person to gain additional knowledge • Resources available for education and training • Access to or existence of the required knowledge
Ability to implement required skills and behavior	• Psychological blocks • Physical capabilities • Intellectual capability • The time available to develop the needed skills • The availability of resources to support the development of new abilities
Reinforcement to sustain the change	• The degree to which reinforcement is meaningful and specific to the person impacted by the change • The association of the reinforcement with actual demonstrated progress or accomplishment • The absence of negative consequences • An accountability system that creates an ongoing mechanism to reinforce the change

Figure 22: Factors influencing success in ADKAR model
**Source:** Das (2019)

The ADKAR model has been used as a tool for conditioning the organization for change (Galli, 2019); as a training tool, i.e. for the structuring of tailor-made training programmes/ courses aiming at meeting the needs of multifaceted change implementation as well as to steer communication, training, sponsorship and coaching activities in the course of change processes (Wong et al., 2019); and, as a diagnostic tool in case of a floundering change (Das, 2019).

Hiatt's model has certain **advantages and disadvantages**. As aforementioned, the ADKAR model was invented to integrate change into government, business, and the society with the individual level in focus. This evidence-based change management model, on the one hand, creates a clear and simple language for change across all levels thus facilitating the incorporation of the change strategies into everyone's everyday work life and, on the other hand, provides

the ability to scale across large and diverse organizations as it provides an understanding of how people change (Wong et al., 2019).

On the other hand, critics mention that the model, focusing on the individual, may not work in a hierarchy structure, which is typical in large organizations, where senior management certainly has more influence and final say on change direction (AlManei et al., 2018). Others, like Das (2019) refer to the model's failure to address macro 'program management'; to differentiate between the roles and responsibilities of management and leadership; or to address the necessity for leaders to attend to the "emotional dimension" of people. Additionally, (Galli, 2019) mentions the difficulty to implement this model into a project since there is no list of steps to guide the implementation of the change management in the project.
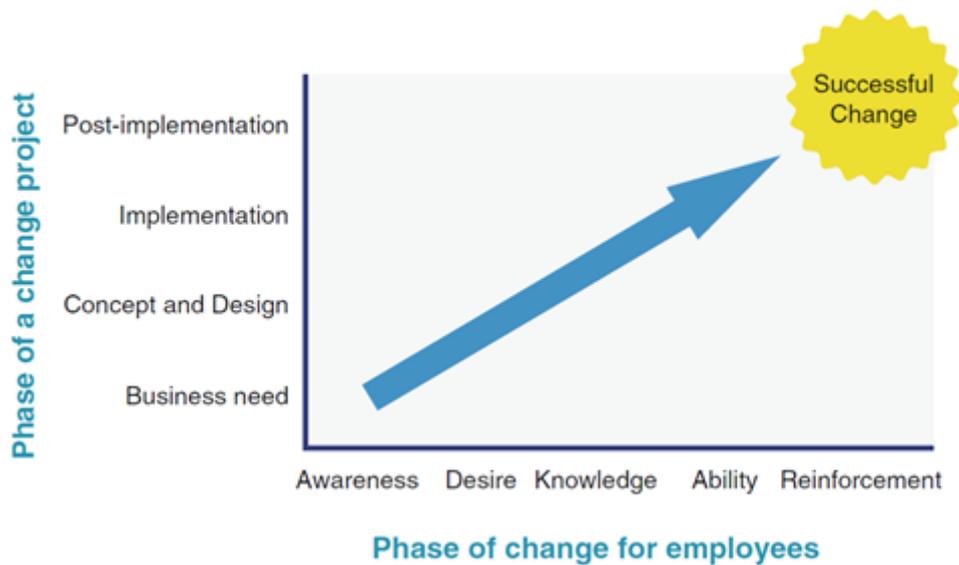
Figure 23: The ADKAR model
Source: Abdulkadhim et al. (2015).

2.2.3 Synthesis of Lewin, Kotter and Hiatt

The three abovementioned models are considered leading change management models, very well-known, widely tested and not outdated in terms of both publications and in real life, i.e. in the overall, contemporary field of change management (Das, 2019). All these models demonstrate that the barriers or

resistance must be removed through a resistance-reduction strategy. They also underline, on the one hand, the need for engagement of organizational members in the process of the change and, on the other hand, the ownership of change by all who will be affected by it. Additionally, they include the need for the consolidation of the organizational change. Finally, a key element in all of them is the crucial role of communication.

According to Worley and Mohrman (2014) both Kotter's model and ADKAR are compatible with Lewin's three-stage-change model in the sense that they can fittingly be mapped onto Lewin's three-stage-change model.

They thus maintain that Kotter's model can be integrated in Lewin's model as follows:
Lewin's unfreezing process:
- establishing a sense of urgency;
- creating the guiding coalition;
- developing a vision and strategy; and
- communicating the change vision

Lewin's moving process:
- empowering broad-based action; and
- generating short-term wins

Lewin's refreezing process
- anchoring new approaches in the culture

Similarly, Hiatt's ADKAR model can be integrated in Lewin's model, as follows:
- Awareness, and
- Desire

(A and D in the ADKAR model) reflect Lewin's unfreezing process
- Knowledge, and
- Ability

reflect Lewin's moving process
- Reinforcement

reflects Lewin's refreezing process.

Therefore, the three change management models can be 'amalgamated' as follows:

Unfreezing process
At organizational level

- Establishing a sense of urgency
- Creating the guiding coalition
- Developing a vision and strategy
- Communicating the change vision

At individual level

- Awareness
- Desire

Moving process

At organizational level

- Empowering broad-based action
- and generating short-term wins

At individual level

- Knowledge
- Ability

Refreezing stage

At organizational level

- Anchoring new approaches in the culture

At individual level

- Reinforcement

Then it is easily seen that the three models, on the one hand, share some similarities while, on the other hand, each of them does not contain certain components. For example, both Lewin and Kotter find that the full preparation must be done before the real start of the organizational change. But while Lewin's model is hard to follow since it ignores change activities such guidance

per step is provided by Kotter's model. The explanation about each step in Kotter's change model contains more in-depth analysis than the other two models. And, while ADKAR focuses on individual change management Kotter's model assign the senior management heavy responsibilities to initiate and operate organizational change. Therefore, the three models emphasize different things which, in turn, make them most suitable and effective in different situations; the models' application circumstances differ thus they might be the most effective models in different situations.

According to AlManei et al. (2018) ADKAR and Lewin's model with their focus on individual change are more aligned with smaller scale/scope projects while Kotter's eight steps more closely aligns with larger scale changes (see Fig. 24)[66].
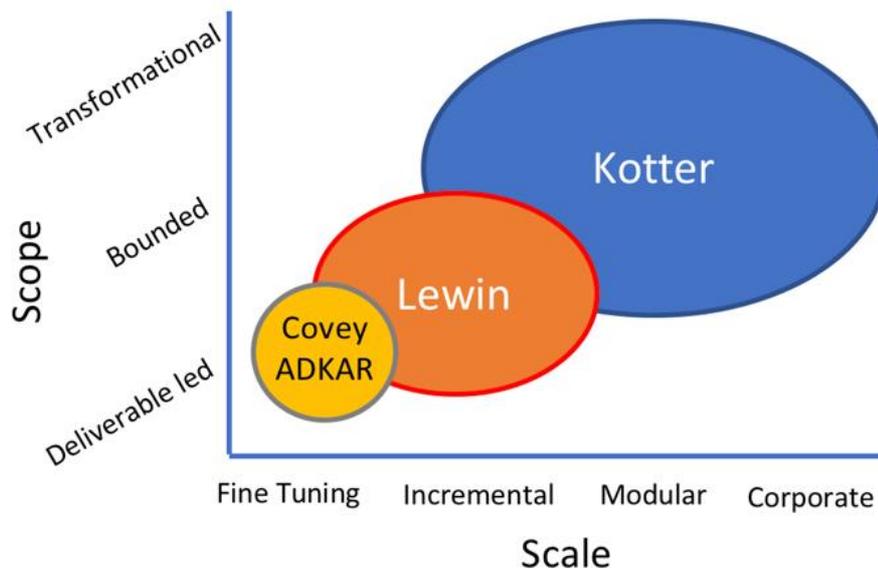
Figure 24: Change theories linked by project size
Source: AlManei et al. (2018).

One should, of course, expect that whenever a significant organizational change is attempted several problems are encountered. There are several barriers that

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[66] In Fig. 23 Covey's (1989) work is also included. According to the author of the book "The 7 Habits of Highly Effective People" the highly effective person performs seven habits. The Private Victory habits are as follows: Habit 1, Be Proactive; Habit 2, Begin with the End in Mind; and Habit 3, Put First Things First. The Public Victory habits are as follows: Habit 4, Think Win-Win; Habit 5, Seek First to Understand Then To Be Understood; Habit 6, Synergize; and Habit 7, Sharpen the Saw.

may impede any change process and the leading team must be aware of the nature of the resistance they will face and address such difficulties before unfreezing will take place. For Alkaya and Hepaktan (2003) usually the following three types of problems are encountered in change attempts. First is the problem of power; significant changes imply the possibility of the status quo being modified in parallel with changes in the organization culture. Second is the problem of anxiety: people are always concerned (i.e. whether they be needed in the new organization and their skills will be valued, and how they will cope with the new situation) when they have to move from something that is known toward something that is unknown. Third is the problem of organizational control as change frequently undermines existing systems of management control, particularly those that are embedded in the formal organizational arrangements.

The same authors also cite Strebel and Välikangas (1991) according to whom there are four basic forms of forces of resistance to change:

> "*rigid structures and systems reflecting organizations, business technology, and stakeholder resources that are not consistent with the forces of change; closed mindsets reflecting business beliefs and strategies that are oblivious to the forces of change; entrenched cultures reflecting values, behaviors and skills that are not adapted to the forces of change; counterproductive change momentum driven by historical or other change drivers that are not relevant to the most urgent forces of change*".

On their part, Woodcock and Francis (1994) identified 14 such difficulties: 1) Unclear aims; 2) Unclear values; 3) Inappropriate management philosophy; 4) Lack of management development; 5) Confused organizational structure; 6) Inadequate control; 7) Inadequate recruitment and selection; 8) Unfair rewards; 9) Poor training; 10) Personal stagnation; 11) Inadequate communication; 12) Poor teamwork; 13) Low motivation; 14) Low creativity. To these one may also add: organizational culture; resistance by staff; slow response to change; lack of time management; shortage of funds; doubts concerning the definitive objectives; the amount of changes; impracticalities that pause the requirements; significant technology costs; lack of technical capacities and skills; lack of information and unfamiliarity of staff members with their roles to provide

support to change so that they are not able to adapt to change and new processes (Alkaya and Hepaktan, 2003; Mogogole and Jokonya, 2018).

On the other hand, Alkaya and Hepaktan (2003), based on their extensive literature review, propose three key stages of successful change (Fig. 25).
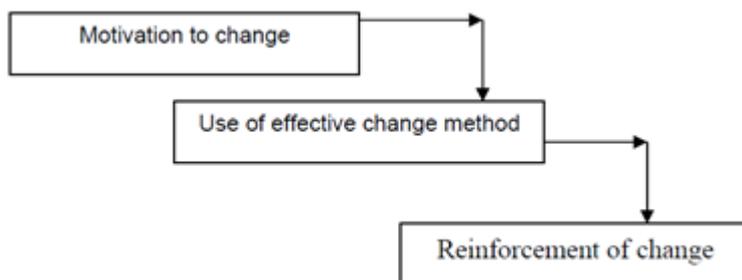
Figure 25: Key stages in effective change
Source: Alkaya and Hepaktan (2003)

Furthermore the authors make some comments on/recommendations for each of these stages. With reference to the first stage which concerns the development of motivation to change among both the initiators and the implementers of change, the authors note that motivation to change depends a) on whether it is worthwhile to change (re: a rough, at least, calculation of the positive and negative outcomes) and b) on whether the change be successfully carried, i.e. the belief (or not) that it is possible to change and that a change effort will be followed by success. The latter involves the building of self-efficacy through a variety of personal experiences. As far as the second key stage is concerned, the authors argue that once sufficient motivation to change exists, the use of an appropriate change method is crucial. To this end, i.e. the identification of an appropriate change model, the situation of the organization must be examined and based on such an analysis a decision for the change type must be taken.

According to Holden et al. (2008) the key processes and goals of successful change management can be summarized as follows:
- Develop a change that fits the organization and its needs, and implement it in a fitting way

- Be able to anticipate future problems/barriers and deal with them effectively
- Build a shared, agreed-upon understanding of the change
- Create an awareness of the change such that all key stakeholders are accurately informed
- Reduce fear and uncertainty
- Plan and implement a high-quality change that will be useful, 'user friendly' and compatible with the current state of affairs -and promote it as such
- Ensure justice in all that is done
- Manage employees and management reactions including receptivity, resistance, commitment, cynicism, stress, buy-in, and trust
- Ensure that workers are satisfied and make (effective/efficient) use of the change
- Ensure that the change has a positive net benefit for individuals and the organization
- Institutionalize change and secure lasting commitment
- Learn from successes and failures, and adapt as needed
- Demonstrate to stakeholders that change was worthwhile

The same authors also outline the following principles for successful management of organization-level change:

1. Construing change as a systemic, dynamic, and political process

- Adopting a holistic, systems approach
- Considering the dynamic properties of change.
- The political nature of change

2. Preliminary considerations for change: scanning, benchmarking, and change readiness

- Performing an initial scan of the system and its external environment
- Scanning the intra-organizational boundaries of the organization
- Scanning the external environment
- Scan internal readiness for change

3. Personnel: change teams, change leaders, champions and 'end user' involvement

- A "powerful" change team formation
- Identify a competent, dynamic change leader (the change agent)
- Identify Informal employee leaders (champions)
- Identify opinion leaders
- Train employees appropriately on the competencies needed

4. Expected and unexpected events

- Prepare a structured implementation plan.
  - ✓ Desired/Planned outcomes
  - ✓ A vision statement
  - ✓ Contingency plans

5. Buy-in and resistance

- Make a positive initial impression
- Continue to reinforce it
- Maximize the benefits that are relatively important to individuals
- Minimize costs unless the costs are relatively unimportant.
- Persuade
- Openly communicate all positive and negative aspects of the change through all possible channels
- Organizational justice: Promoting a fair and just process of change
- Reduce discomfort and defensive strategies

6. Training, resources, and top management support

- Provide necessary attitudes and skills to make the new structure work
- Provide the competencies necessary to utilize the change
- Secure and maintain management support throughout the change effort

7. Sustaining and adjusting the change

- Monitor evaluate adjust or redesigned over multiple cycles of iteration.

Finally, Kohnke (2017), considering the changed requirements of digitization, proposes an organizational change management approach which embraces four major areas (Fig. 26).
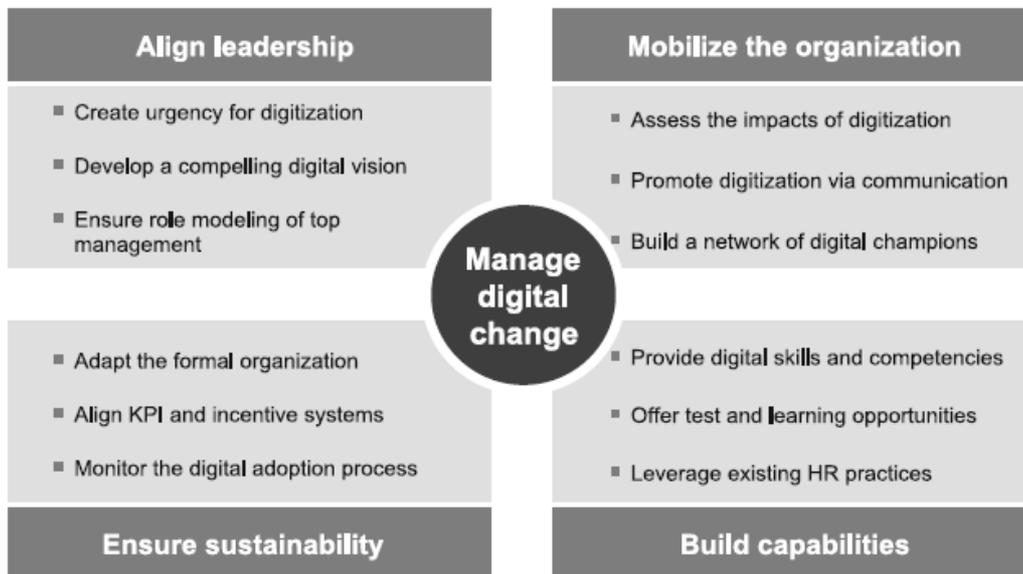
Figure 26: Organizational change management approach for digitization
Source: Kohnke (2017)

The four areas illustrated in Fig. 26 are as follows:

Alignment of leadership: being "*the most important area in a digital transformation program and is the necessary basis for organizational change*", it includes the steps: create urgency for digitization; develop a compelling digital vision; ensure role modeling of top management.

Mobilization of the organization: "*Increasing awareness for digitization and setting the direction is necessary but not in itself sufficient for successful digital transformations. It is also necessary in setting the entire organization into motion towards digitization*". Mobilization thus includes: the assessment of the implications of digitization in the organization; the promotion of digitization through communication; and, the building of a network of digital champions.

Capacities building: "*it is also important to enable the employees to use digital technologies and applications and to leverage them for developing new digital business models*"; therefore the following steps must be taken: build digital skills and capacities; offer test and learning opportunities; and, leverage existing HR processes (like recruiting and talent management processes).

Sustainability assurance: given "*the risk of digital transformation initiatives failing to achieve their objectives because of their losing momentum [i]t is necessary to make the change 'stick' by establishing effective mechanisms to sustain and monitor the digitization process*". In this respect the necessary steps

to be taken are: adaptation of the formal organization to the digital challenges[67]; alignment of the KPI[68] and incentive system (to sustain the process); and, monitoring the digital adoption process.

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[67] For example, as aforementioned, Kotter (2014) proposes a dual operating system that consists of a traditional hierarchy and an additional network structure.

[68] KPI: key performance indicator is a type of performance measurement. KPIs evaluate the success of an organization or of a particular activity in which it engages.

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