Translational Service Research And Design Methodology: What it is, What it is not, What it might be

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1 Introduction

The persistent “translational gap” between scientific discovery and applied innovation poses significant social and economic challenges. Despite rapidly growing knowledge creation and technological advances, implementation into impactful services often lags, translation into real-world applications frequently remains slow, and investments are uncertain. This paradox calls for a systematic methodology that enables the progress from discovery to implementation in ways that enhance human well-becoming.

To address this need, we introduce the Translational Service Research and Design Methodology (TSRDM) for systematically accelerating the progress from scientific discoveries to implemented service innovations that foster human well-becoming (Jones, 2005; Spohrer et al., 2013; Westfall et al., 2007).

TSRDM draws inspiration from diverse research, design (Matsumura & Leifer, 2013; Norman, 2013), engineering and management approaches such as translational research (Woolf, 2008), design science research methodology (Hevner et al., 2004; Peffers et al., 2008), service engineering (Böhmann, 2004), software engineering (Gruhn & Striemer, 2018), or working backwards (Bryar & Carr, 2021).

At the same time, TSRDM sets itself apart through distinctive characteristics. While the "translational gap“ generally refers to the broad range of challenges, TSRDM focuses on two more specific obstacles where many discoveries fail to progress. These obstacles are also referred to as "valleys of death" (Butler, 2008; Gamo et al., 2017; Meslin et al., 2013): first, the need to to cultivate the fertile interface between science and industry (Gamo et al., 2017, p. 1) and second to foster the willingness of the market to invest in the further development of innovations into service products (Moser et al., 2023).

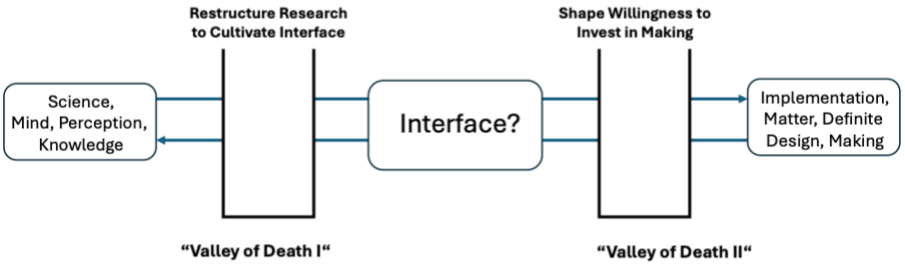

Figure 1 "Valleys of death", Warg et al. (2025) based on “Mind-matter interaction” of Eekels, J., & Roozenburg, N. F. (1991).

This leads to the three questions that motivated the authors to initiate the TSRDM approach:

First: In what ways can research activities be systematically organized to serve as a unified epistemic and methodological foundation for design, engineering and implementation processes?

Second: What conceptual or operational characteristics should such a foundational interface possess to effectively link research outputs with design, engineering and implementation requirements?

Third: Which strategies or mechanisms can be employed to enhance the willingness of stakeholders to invest resources in the implementation of innovations that are grounded in this integrated foundation or interface?

At its core lies service as "unifying language" for research, design, engineering, implementation and management activities. Service understood as the application of resources (e.g., knowledge, goods, activities) for the benefit of another (Spohrer et al., 2007; Stephen L. Vargo & Robert F. Lusch, 2004) is the basis of social and economic exchange. The concepts and mechanisms of service provide the grammar and spelling of this language, while the "services" themselves are its letters and words.

Service is at the core of value co-creation which makes every situation more beneficial and win-win for everyone involved. More practically speaking, all actors depend on diverse service offerings and contribute consciously or unconsciously to the realization of the associated value propositions. As human we depend on these offerings from the moment we wake up and turn on the lights and use running water (utilities), travel or use smartphones (transportation and communication), make purchases (retail, finance), see a doctor (health care), learn through an online course (education), watch a movie or listen to a song (entertainment), eat at a restaurant or stay in a hotel (hospitality), or renew a driver's license (government), (Spohrer et al., 2022). All offerings render services which create value. Activities render services, things render services (Gummesson, 1995, p. 250f). The focus of TSRDM is on the combination of services to create meaningful order as prerequisite for the design, engineering and management of new value constellations (Norman, 2013; Norman & Heuer, 2024).

In this regard TSRDM resonates with Christopher Alexander's notion of a *Pattern Language* (Alexander, 1977). Just as Alexander describes patterns as reusable building blocks that, when combined, form a language for shaping environments, TSRDM conceives of services as combinable units. These services are assembled along broadly applicable design principles and relationships, comparable to how patterns interconnect to form larger structures and wholes in Alexander's framework. Hence, patterns are concerned with the new emerging combinations of buiding blocks or elements for solution design. Arthur (2009) elucidates domain's grammar as mean to determine "[…] how its elements fit together and the conditions under which they fit together. It determines what "works" and what does not work" (Arthur, 2009, p. 77; Weiss, 2023).

The distinctive feature of TSRDM lies in developing and establishing this 'unifying service language' as a systematic methodology for translating knowledge into practice, consistently spanning research, design, and engineering through to implementation. The grand theories (Gregory et al., 2011; Mills, 1959) of Service-Dominant Logic (Stephen L. Vargo & Robert F. Lusch, 2004) and Service Science (Spohrer & Maglio, 2008) serve as foundation and overarching "grammar" that guides the meaningful combination of services. Services are composed along the broadly applicable principles and relationships in a manner comparable to how patterns are interconnect to form larger structures and wholes in Alexander's framework.

TSRDM advances the transfer of service research insights into reusable translational services, patterns and architectures (e.g. Service Dominant Architecture (Warg et al., 2016)) as foundation for the design, engineering, implementation and management of service innovations. It highlights the bridging of research discoveries into meaningful order (Papanek & Fuller, 1972) and structures (Giddens, 1984) of translational services. These services may emerge as mechanisms, principles, patterns or trigger. Translational architectures simultaneously mediate action and materialize as implemented outcomes of the very processes - as combinations of services-, they recursively organize (Fogg, 2009; Matsumura, 2013; Spohrer et al., 2022).

TSRDM thus contributes not only to closing "translational gaps" or more concise the t"valleys of death" but also to cultivating a "unifying language" as sustainable foundation for the engineering of innovations and ecosystems that enhance collective well-becoming.

2 WHY TRANSLATIONAL SERVICE RESEARCH AND DESIGN METHODOLOGY?

TSRDM is the response to a key social and economic challenge: accelerating the progress from scientific discoveries to implemented service innovations that enhance human well-becoming (Jones, 2005; Spohrer et al., 2013).

In the introduction that follows, we set out why the components translational (T), service research (SR), design (D), and methodology (M) are necessary for this purpose.

Why "T" - translational?

The need for this methodology arises from a phenomenon often referred to as "translational gap" or "translation paradox". It captures the idea that even as societies generate more knowledge, better methods, new technologies, and larger investments in research and development, the actual translation and implementation into impactful applications often seems slower, more costly, and investments more uncertain (March, 1991).

The "translational paradox" is a multidisciplinary phenomenon. In pharma Eroom´s law shows a reverse Moore´s law. While computer power doubles every two years, the number of drugs per million dollar spent halves every nine years since 1950 (Scannell et al., 2012). In the medical field, Westfall et al. observed that “it takes an estimated average of 17 years for only 14% of new scientific discoveries to enter day-to-day clinical practice” (Westfall et al., 2007, p. 403).

Across industries, the pace of knowledge and technological discoveries continues to accelerate, yet implementation, e.g. during digital transformation, often lags. The underlying reasons and adaptation challenges are manifold, ranging from the “burden of knowledge” (Jones, 2005), organizational inertia, and scaling bottlenecks, to increasing political and legal requirements, as well as cultural factors such as “innovation fatigue” or leadership challenges (Hanelt et al., 2021; Nadkarni & Prügl, 2021; Vial, 2019; Yee et al., 2025). Sometimes this is due also to the lack in cooperation among scholars and practitioners (no bridge between

theory and practice), as well as among scholars themselves (risk to vertically intend knowledge as silos, despite of the typical multi-disciplinarily of Service Research) (Polese et al., 2018).

The term "translational gap" generally refers to the broad range of challenges of moving scientific discoveries from basic research (often laboratory findings) into practical clinical applications and treatments (Woolf, 2008)

In particular, the two well-documented “valleys of death” (Butler, 2008) constitute critical obstacles at which many promising discoveries stall. The first pertains to the need to restructure academic research in order to foster more fertile interfaces between academia and industry (Gamo et al., 2017, p. 1). The second concerns the necessity of increasing market willingness to invest in the further development and commercialization of innovations (Moser et al., 2023).

Although translational research (Dayal & Heath, 2025) already aims to accelerate the transfer of scientific discoveries from basic research into practical applications, the authors emphasize the persistent need for a unified framework—a methodology capable of systematically and cross-industrially bridging the “valleys of death.”

Why "SR" - service research?

TSRDM draws on the centrality of service as "unifying language" to solve this challenge. Service is the application of resources (e.g., knowledge) for the benefit of another (Spohrer et al., 2007; Stephen L. Vargo & Robert F. Lusch, 2004). Service is the basis of exchange (e.g., social, economic). Service is at the core of value cocreation which makes every situation more beneficial and win-win for everyone involved. More practically speaking, all actors depend on diverse service offerings and contribute consciously or unconsciously to the realization of the associated value propositions. As human we depend on these offerings from the moment we wake up and turn on the lights and use running water (utilities), travel or use smartphones (transportation and communication), make purchases (retail, finance), see a doctor (health care), learn through an online course (education), watch a movie or listen to a song (entertainment), eat at a restaurant or stay in a hotel (hospitality), or renew a driver’s license (government), (Spohrer et al., 2022).

All offerings render services which create value. "The offering and the value consist of many components, some of them being activities (services), some being things (goods). Consequently, the traditional division between goods and services is long outdated. It is now a matter of redefining services and seeing them from an actors (e.g. customer, firm) perspective: activities render services, things render services (Gummesson, 1995, p. 250f). The idea is to focus not on selling of products but on offering services. Or as Don Normann statet I buy a cup because it is a service offering, it holds a drink and keeps it warm (Norman, 2013; Norman & Heuer, 2024).

Service-Dominant Logic (S-D L) offered a coherent way for these thoughts. Goods, activities, technologies and all the other resources and their services are

integrated and replaced by service (in the singular). S-D Logic is the process and narrative of value cocreation. With S-D L Vargo & Lusch (Michel et al., 2008; Stephen L. Vargo & Robert F. Lusch, 2004) shifted the focus of the offering from an output to a process of value creation. In this process value is cocreated by many actors always including the beneficiary. Value-in-use describes the change in wellbeing from the perspective of a focal actor resulting of either direct or indirect service provision.
Service unfolds its value only during its application; this implies that value creation is interactional and relationship oriented. Actor-to-actor networks as service ecosystems are defined as relatively self-contained, self-adjusting systems of resource-integrating actors connected by shared institutional arrangements and mutual value creation through service exchange (Vargo & Lusch, 2018).

Richard Normann similar to Vargo & Lusch also forces to shift the attention "from production to utilization, from product to process, from transaction to relationship" and recognizes the necessity of a "service logic"(Normann, 2001, p. 98f). He interprets that offerings are "frozen knowledge" (Normann, 2001, p. 115) and suggests that firms need to rethink their logic of value creation in order to reveal opportunities in reconfiguring the value constellations of which they are part (Normann & Ramirez, 1993).

But the process logic of value creation sometimes lacks the characteristics of dynamic systems. That is, each instance of resource integration, service provision, and value creation, changes the nature of the system and thus the context for the next iteration and determination of value creation. Networks are not just aggregations of relationships; they are dynamic systems (Vargo & Lusch, 2018, p. 248).

Service Science (Spohrer & Kwan, 2009; Spohrer et al., 2007) addresses this shortcoming. Service Science models service and its essential inter-relationships and abstracts them as dynamic service systems (service system entities, responsible actor) that collaboratively create and deliver services. Spohrer et al. (Spohrer et al., 2007) define a service system, the basic unit of analysis, as a dynamic value co-creation configuration of resources, including people, organizations, shared information and technology, all connected internally and externally to other service systems by value propositions. Service systems are open systems (1) capable of improving the state of another system through sharing or applying its resources, and (2) capable of improving its own state by acquiring external resources. Service (eco) systems are dynamic structures because they continuously adjust in the process of mutual value creation (Spohrer et al., 2008).

Service Science, since the beginning, is being a research initiative with fundamentally multi-cultural roots. **Although they come from various and diversified disciplinary domains, service scientists seek a common terminology and language** (Spohrer & Maglio, 2008).
‘During its infancy as a new discipline, there is nothing wrong with treating service science as an umbrella term encompassing everything that has the term service in its name’ (Alter, 2012, p. 23). Accordingly, the Service Science community during this 2 decades (2006-2025) has attracted scientists from many

cultural domains, united by their interest in contributing to a better understanding and knowledge of the service-centered and service-oriented phenomena that characterize our lives just as much as socio-economic actors (Katzan, 2008). Service Science has been based upon a strong multi-disciplinarity and has aimed to improve, through its various contributions, the understanding and management of the complex phenomena characterizing the planet and its major issues today (Basole & Rouse, 2008), giving service scientists the opportunity to integrate different knowledge domains enriches their interpretative models and seems to be a wise way to address the complexity and dynamism characterizing business and social contexts today (De Santo et al., 2011; Ng et al., 2009).

Taken together, service research provides a "unifying language" by guiding the designer with general concepts to model actor specific value constellations in a manner analogous to grammar and vocabulary forming sentences. This leads us to the meaning of design and architecture to transform the "vocabulary and grammar" of the grand theories (Gregory et al., 2011; Mills, 1959) of Service-Dominant Logic (Stephen L. Vargo & Robert F. Lusch, 2004) and Service Science (Spohrer & Maglio, 2008), which articulate broadly applicable principles and relationships, into a language for the individual context.

Why "D" - design?

Victor Papanek states that the design process is constituted by the planning and patterning of any act toward a desired, foreseeable end (Papanek, 2019, p. 3). Design is defined as "the conscious and intuitive effort to impose meaningful order". This is emphasized because system design shows that a system made up of component parts will change eventually as each part is changed (Papanek & Fuller, 1972, p. 275). (Papanek & Fuller, 1972). "Design must become an innovative, highly creative, cross disciplinary tool responsive to the true need of men." (Papanek & Fuller, 1972).

Shikake Design comes from the Japanese word shikake, which roughly means device, trigger, or mechanism that induces action. In research, Shikake Design is a design methodology that focuses on creating physical or psychological triggers in the environment that nudge people toward desired behaviors - often without them consciously realizing it (Matsumura & Leifer, 2013). "A shikake is a physical and/or psychological trigger for behavior change" (Matsumura & Fruchter, 2013). Or more concise "a trigger that induces a specific behavior to solve a social or personal problem" (Matsumura & Leifer, 2013).

Design Science Research Methodology interprets design as an "act of creating an explicitly applicable solution to an problem" (Peffers et al., 2008) and that serves as a commonly accepted framework (Baskerville et al., 2018; Hevner et al., 2004; Peffers et al., 2008).

In order to not only design and plan concrete processes and structures but also to implement them systematically as innovative solutions, architecture is required. Architecture is understood as both the process and the output

of planning, designing, and constructing structures (e.g. buildings, service platforms), (Alexander, 1977; Gamma et al., 1995; Safin et al., 2010; Warg & Deetjen, 2021a).

Service Dominant Architecture (SDA) is derived from S-D Logic and Service Science. SDA is a construction plan for the collaborative creation, building and application of value propositions on digital service platforms. As structure SDA is plan and result of the processes it recursively organizes. For this purpose, services (both business and technical) required for the implementation are assigned to the five SDA systems as patterns. Following this design principle, each solution and each use case increases the density of services (resource density). By linking institutional arrangements with (design) patterns Service Dominant Architecture enables the involvement and coordination of actors in the entire and organized process. For example by the definition of rules, tools or formats for service exchange. In the sense of Giddens (Giddens, 1984) "duality of structure" SDA is both structure (patterns) as the medium (design patterns) and outcome (instantiated patterns) of the conduct and processes it recursively organizes (Spohrer et al., 2022; Warg & Deetjen, 2021b).

This brings us to the last letter of TSRDM, the M. The methodologies to create and constitute systematically and cross-industry a reusable catalog (a pattern language) of design solutions - mechanisms, principles, patterns, services, linkages, events, triggers - each applicable within a specific context to address a defined problem.

Why "M" - methodology?

From an engineering perspective, TSRDM entails the systematic development of services that transforms heterogeneous resources into innovative outcomes. It applies design principles and patterns to configure services in a coherent, purpose-driven sequence. In this regard, architectures such as the *Service-Dominant Architecture* (Warg et al., 2016) exemplify structures that serve simultaneously as the medium and the output of the processes they organize (Giddens, 1984). Such architectures are instrumental in cultivating a high density of services - a foundational condition for innovation arising from combinatorial evolution (Arthur, 2009) and the emergence of novel value propositions.

Design theorizing (Gregor et al., 2020; Lee et al., 2011) allows such systematic development of services. Accordingly, SDA is understood as theory-ingrained artifact based on S-D Logic and Service Science principles from which related design principles are derived. Consequently, S-D Logic and Service Science serve as kernel theories delivering required “justificatory knowledge” as foundation and explanation for the SDA conceptual design (Gregor et al., 2020, p. 1226; Weiß et al., 2023) For example, SDA allows to systematically develop service on basis of real practice oriented use cases (“incremental innovations”) and solutions (“principles and patterns”), to overcome previously described transfer gap and serve as “interface” translating solution designs and service into new “social practices” and “routines” (normative) by triggering organizational learning processes (Peters et al., 2014). Methodology needs to reflect and clarify how new solutions and practices diffuse the organization for example with support of

organizational learning processes to get permanent memory of the organization and as outcome of accompanying processes of institutionalization (Scott, 2014).

The need for systematic service development arises from the increasing demand for service offerings. Procedures, methods, and tools should be used to ensure a systematic approach (Meiren, 2006; Meiren & Barth, 2002). "Service Engineering as a new inter-disciplinary approach deals with methods, (reference-)models and tools for a systematic development and implementation of services. It is located at the interface of informatics, business administration and social science" (Nüttgens et al., 1998). Böhmann et al. (Böhmann, 2004; Brettreich-Teichmann et al., 1998) define service engineering as the "...methodical development and construction of (service) products and systems."

"Software engineering research is all about understanding the nature of software processes, finding appropriate architectures of software systems, and identifying the essential and value-creating activities in software development. There is an urgent need for concise solutions to these issues, which are key to industrial software development. That is why, software engineering research and high-end software development in practice go hand in hand" (Gruhn & Striemer, 2018).

TSRDM could help in avoiding the "silos" effect in Service Research. Polese et al. (2018) proposed some insights to affirm that Service Science community, in striving to better achieve its challenging goals, must go far beyond the knowledge silos and vertical knowledge that have traditionally characterized scientists' backgrounds and studies (Polese et al., 2018).

Scholars and practitioners should always cooperate to merge as much as they can different backgrounds, experiences, competences and expertise, in order to achieve more consistent results in interpreting and managing ongoing phenomena, as they are scalable, replicable, and iterative or not. So this, Service Science, Management, Engineering and Design (SSMED) over the years continues to be inherently based on reflections derived from engineering, computer science, sociology, design, law, philosophy, ecology, management and marketing (Spohrer & Kwan, 2009). This is perfectly consistent with the call for interdisciplinary in the study of Service Systems and Smart Service Systems (Barile & Polese, 2010b), which in several fields of interest, powerfully describe a number of features for any devices currently, such as smart-cities, smart-phones, smart-grids, and smart-boxes.

This fosters again the need to use different knowledge to approach and solve (or avoid) different problems. It's true everywhere, in Healthcare, Tourism, Energy, Education, Retail, Logistics and ICT, in which progress in a variety of technologies (not only in computer science) bridges the evolution.

Furthermore, advances in Smart Service Systems have enhanced the shared vocabulary among disciplines (Spohrer et al., 2007), connecting different perspectives on Smart Service Systems, including data collection, analytics, and information delivery (Maglio et al., 2006). In this sense, the intelligence of Smart Service Systems is derived not from intuition or chance but from systemic methods

of learning, service thinking, rational actions, social responsibility and networked governance (Barile et al., 2012; Mele & Polese, 2011), all of which are principally based upon a multi-disciplinary approach to understanding service exchanges (reality) (Vargo & Lusch, 2016).

From the recent debates of the Smarter Planet Forum concerning programs at US universities (https://www-03.ibm.com), we know that Service Scientists can benefit from a multi-disciplinary perspective, making a Smarter Planet mandates the adoption of such a perspective. Service Scientists, therefore, should attempt to leverage their work by helping universities to develop their Service Science edu-programs into Smarter Planet 'Research Centers' and 'Think Labs'. According to this scientific positioning, Service Science has been promoted worldwide through higher education and MBA programs based upon a T-Shaped mindset that proposes vertical knowledge coupled with, and supported by, transversal and general knowledge (Demirkan & Spohrer, 2015).

To go through this, the way of searching and exploring surrounding contexts needs to be improved anytime, by including even new elements, evolve, adapt, in order to be really helpful and insightful as we demand today.

3 A Discussion at the NFS as a Starting Point of TSRDM

At the Naples Forum on Service 2025 I (Markus Warg, a co-creator of TSRDM) asked Steve Vargo, co-founder of Service-Dominant Logic (S-D L), what he thought needed to be done to make S-D L or Service Science more relevant to practice. He replied that in his opinion this is not the role of base or grand theories.

After repeated reflection, I have come to the conclusion that Steve Vargo is right. The task of a basis or grand theory is to explain social and economic mechanisms in an abstract and holistic way; developing relevance for practice is not its task. However, this left open my question of how the discoveries of theories can be better transferred into practice. The usual research methods such as conceptual paper, design science research or case studies are either conceptual or practical in nature and if they combine both sides then they usually bridge the gap in a very specific way of object definitions.

Summarized: how to bridge the gaps between scientific discoveries and their practical implementation in service innovations to improve the progress of human well-becoming?

4 WHAT IT IS

The following enumeration serves as a basis for the ongoing refinement of the understanding of what the TSRDM is:

- a cross-industry methodology for accelerating the progress from research discoveries into practical outcomes and behavior changes that improve human well-becoming

- a "unifying language" fostering the research based development of reusable services and their translation into practice with translational architectures that serve as meaningful order for the composing of services and as medium and output of the processes they recursively organize

- shift to multiple disciplines medicine, information systems, architecture, software engineering, ...

- turn away from "cases in silos"

- broader level of abstraction

- trigger to build knowledge, translational foundations and solutions for behavior change and tangible outputs (e.g. artifacts) for ....

- multi service systems perspective. People are busy in multiple service systems like family, work, mobility, ...

- inspired by diverse research, design and engineering approaches such as translational research (Woolf, 2008), design science research methodology (Hevner et al., 2004; Peffers et al., 2008), software engineering (Gruhn & Striemer, 2018) or shikake design (Matsumura & Leifer, 2013)

4.1 Translational Research and Valleys of Death as Foundational Sources

4.1.1 Origins of Translational Research.

Translational research is a bridge between academic science and practical evidences. Such a bidirectional path “from bench to bedside” and back (Abraham et al., 2012) advocates robust, bidirectional information flow (Zerhouni, 2005) and more effective collaboration involving academia, industries, and patients (Andersson, 2012)~~,~~ and TSRDM aim fits with this.

For a long time, in Medicine, the logic of Translation is used to face to new challenges in Research. Translational Medicine (T-Med) principal goal is to speed the development of new compounds of medical protocols and/or treatments to improve patient’s quality of life. In order to achieve this purpose, translational medicine calls for a synergy between epidemiology, basic research and clinical trials, and is strongly based upon innovation management and research development in medicine. For this reason, a managerial view of translational medicine is particularly prolific in terms of insights for researchers and clinicians who place efforts to improve health service (Wang, 2012).

Despite the importance of T-Med for the patient, indeed translational medicine has a wider view, since it produces different values for different actors looking at various aspects of this medical approach (Littman et al., 2007). For academics, it represents the chance to confirm and validate novel concepts or to find new ones out with the hope they could turn into effective clinical applications and be relevant to human disease (Marincola, 2003); for patients as well as for clinicians, it refers to the need of accelerating the capture of the biomedical research benefit, wishing the gap between "what we know and what we practice" to be bridged (Davis et al., 2003); for those who invested in, translational medicine provides financial returns (Wang, 2012).
Hence T-Med is characterized by a variegated list of benefits and stakeholders; nevertheless, it seems possible to identify a unifying purpose, capable of complying with the expectations and needs of all involved actors (Littman et al., 2007), once we higher the level of observation and analyze its beneficial effects on society. The ultimate goal of translational medicine, in fact, may be identified in the development of new treatments and insights for the improvement of health across populations (Woolf, 2008). This implies that T-Med (also called translational research) not only aims to produce values and bring them to the patient. Its essence lays in validating the potentiality of novel discoveries whereas enhancing the success, feasibility and efficiency of discovery validation. In other words, its ultimate goal lays in identifying in the process of clinical testing to human disease (through direct observation) what the obstacles are (Mankoff et al., 2004) and allowing basic scientists as well as physicians to share their expertise to identify and compare the challenges at the interface between basic and clinical investigation, proposing integrated and integrating solutions to increase the efficiency of the process (Davis et al., 2003).
By "translating" findings into diagnostic tools, medicines, procedures, policies, and education; translational research is the bridge between academic science and clinical practice. Such a bidirectional path "from bench to bedside" and back (Abraham et al., 2012) advocates robust, bidirectional information flow (Zerhouni, 2005) and more effective collaboration involving academia, industries, and patients (Andersson, 2012).

T-Med realizes synergies between basic research and clinical research because not only can knowledge obtained through basic research be conveyed to the application stage but also clinical applications may apply an important stimulus to fundamental research to enable real progress in the medical field. The result of this process is the creation of a bidirectional flow between the patient and the laboratory, accelerating the transfer of information and knowledge gained through scientific research to clinical practice, thus improving the conditions of patients. The mutual exchange of information between basic research and clinical research allows, therefore, the evaluation of different pathophysiological aspects under experimental conditions and the application of this knowledge to human beings through clinical research.

Translational research as the missing piece of the puzzle. The concept of translational research originally comes from clinical research and is intended in bridging two key "gaps" by first moving discoveries from "bench to bedside" and second "into clinical practice" (Sung et al., 2003). Translational research is to

bridge basic and applied research to find innovative treatment for societal benefit (Dayal & Heath, 2025; Kong & Segre, 2010; Murdock & Stephenson, 2024). This intention expanded to the translational research continuum, emphasizing the broader process of translating research into practice and community health impact (Woolf, 2008). Khoury et al. (Khoury et al., 2007) introduced a four-phase (T1–T4) model, representing the evolution in how translational research is conceptualized.

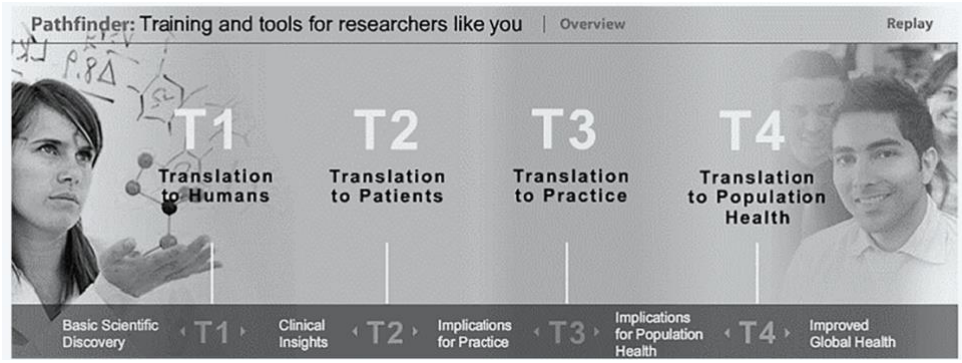

Figure 2 Translation by ***(Blümel et al., 2015)***

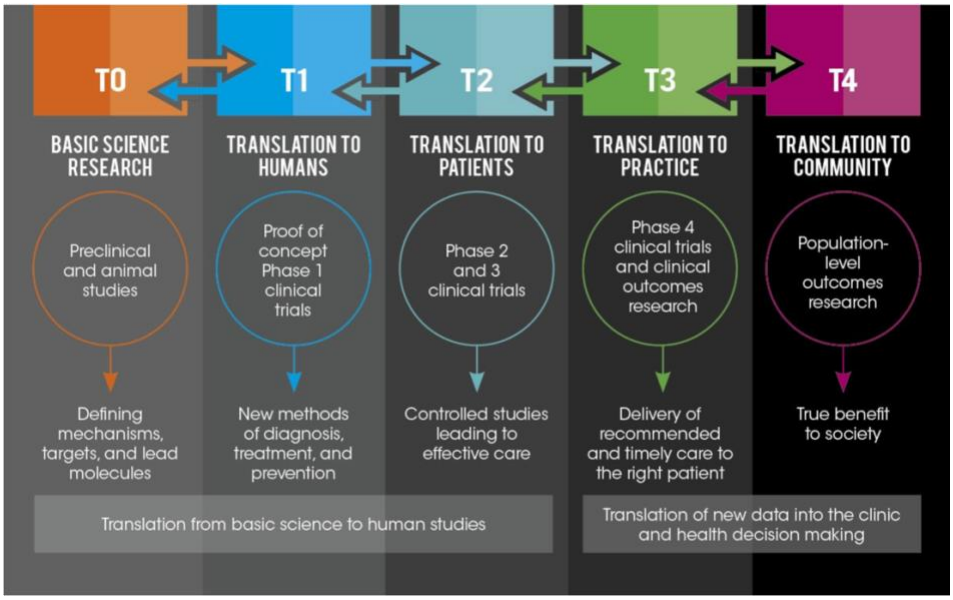

Figure 3 T0 to T4 ***(Haile, 2022)***

Several influential papers are recognized as foundational in defining and shaping the field of translational research. A systematic review identified three main "families" of definitions, each anchored by highly cited original papers:

- **Sung et al. (2003):** This paper is widely credited with formalizing the concept of translational research as bridging two key “gaps” (T1 and T2) in moving discoveries from bench to bedside and into clinical practice. It is one

of the most cited and influential works in the field (Sung et al., 2003).

- **Westfall et al. (2007):** This work expanded on the translational research continuum, emphasizing the broader process of translating research into practice and community health impact (Westfall & Mensah, 2018).
- **Woolf (2008):** Woolf's paper is notable for defining translational research as a continuous process, rather than discrete gaps, and is heavily cited in subsequent literature (Woolf, 2008).
- **Khoury et al. (2007):** Introduced a four-phase (T1–T4) model, representing a further evolution in how translational research is conceptualized (Khoury et al., 2007).

4.1.2 "Valleys of Death"

While the "translational gap" generally refers to the broad range of challenges of moving scientific discoveries from basic research (often laboratory findings) into practical clinical applications and treatments; the term "valley of death" is more specific (Butler, 2008; Gamo et al., 2017; Meslin et al., 2013). It represents the two obstacles where many promising discoveries fail to progress: first, "the need to restructure education and academic research to cultivate the fertile interface between academia and industry" (Gamo et al., 2017, p. 1) and second " the willingness of the market to invest in the further development and commercialization of a product" (Moser et al., 2023). In Figure 1, the two "Valleys of Death" are embedded within the "mind–matter interaction" framework established by Eekels and Roozenburg (Eekels & Roozenburg, 1991). Their model systematically explores the persistent frictions between the domains of science and engineering, emphasizing their fundamentally divergent aims, problem types and methodological approaches. While science is primarily directed towards perception and the generation of generalizable knowledge through observation, abstraction, and theory-building, engineering design is characterized by the transformative synthesis of solutions to concrete problems. Despite these distinctions, science and engineering remain deeply interwoven and mutually dependent, with frequent cross-fertilization of insights, methods, and results that underpin progress in complex technological and societal contexts (Eekels & Roozenburg, 1991, pp. 198–203).

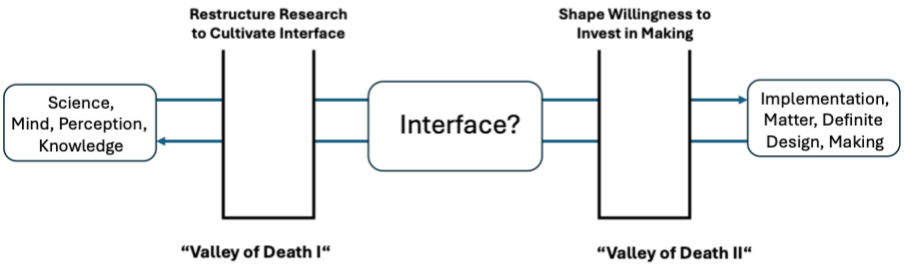

Figure 4 "Valleys of death", Warg et al. (2025) based on "Mind-matter interaction" of Eekels, J., & Roozenburg, N. F. (1991).

4.2 Three Questions at the Core of TSRDM

This leads to the three questions that motivated the authors to initiate the TSRDM approach.

First: In what ways can research activities be systematically organized to serve as a unified epistemic and methodological foundation for both engineering practice and implementation processes?

Second: What conceptual or operational characteristics should such a foundational interface possess to effectively link research outputs with design, engineering and implementation requirements?

Third: Which strategies or mechanisms can be employed to enhance the willingness of stakeholders to invest resources in the implementation of innovations that are grounded in this integrated foundation or interface?

4.3 A Unifying Service Language

The Translational Service Research and Design Methodology (TSRDM) intends to establish a unifying language for research, design, engineering, and implementation because it centers around the concept of "service" as the fundamental basis of exchange and value cocreation across disciplines. TSRDM integrates diverse fields by framing service as the application of resources (knowledge, goods, activities, information) for the benefit of others, providing a common grammar and vocabulary to model, design, engineer and implement solutions.

TSRDM parallels natural language through its use of service concepts as semantic units (words), design principles and patterns as syntax (structure and combination rules), and value creation in context as pragmatics (meaning/pragmatic use in situations). This mirrors how natural language conveys meaning by combining signs (words) into structured sentences interpreted in context. Resuming: info are 'translated', this sustains results 'transfer' and bridges among theory and practice.

In SSME, this "approach" can be very helpful, due to its intrinsic multi-disciplinarity mentioned above (many disciplines, many scientific output to be used, huge potential research implications, a number of insightful overlap and exchanges), due to its physiological practice-oriented features, as well as grounds-evidence, practical-applications (any industry), due to its horizontal, holistic and wide way to deal with nowadays events, facts and circumstances we'd like to investigate, explore, interpret and explain. Let's use a dynamic lens to take a look on a dynamic World and try to properly translate what we already know as a solid base to discover new ones, again and again. This is a validated method worldwide, but not yet experienced so far, as we want to do now.

Intro camparison to natural language

Semantics (study of meaning) is compared to the foundational role of services in value co-creation and exchange in service science.

Syntax (structure and combination) is linked to service design and engineering, where services are systematically combined.

Pragmatics (context and intention in meaning) is mapped to "value in context," reflecting how value depends on networks, actors, and situational context in service logic.

Signs (anything communicating meaning) is equated to services as contextual meaning carriers, evaluated phenomenologically by beneficiaries.

	Language	**Service Language**
Grammar and Syntax	Grammar is the system of rules that governs the structure of a language as a whole, including how words are formed and how they combine to convey meaning. Syntax is the part of grammar that focuses specifically on how words are arranged and combined into phrases, clauses, and sentences	Service
Letters	In semiotics, a sign is anything that communicates meaning (e.g. value) to someone interpreting it. A letter is a written or printed symbol in an alphabet that represents one or more speech sounds in a language, such as A, B, or C.	Services as letters. Goods, activities, information, technologies render services and meaning (e.g. value) phenomenologically and contextually determined by the beneficiary.
Words	A word is the smallest independent unit of language that can stand on its own in an utterance and carries meaning (for example, "cat," "run," "quickly").	Patterns; Service patterns as reusable, evidence-based building blocks

Sentences	A sentence is a grammatically complete unit of language that expresses a whole idea, such as a statement, question, command, or exclamation. It typically consists of at least one subject and one predicate, and in writing usually begins with a capital letter and ends with a period, question mark, or exclamation mark	Architectures; Architectures concern the planning, design, and implementation of structures.

Table 1 Service as unifying language

The methodology also draws on the idea of pattern languages, inspired by Christopher Alexander's architectural pattern language and the Gang of Four's software design patterns, which organize reusable design solutions (patterns) into a coherent language. Just as pattern languages enable structured problem-solving and knowledge transfer through combinable building blocks, TSRDM uses translational services and architectures as reusable patterns for designing and engineering innovations consistently across contexts.

Intro pattern language

Pattern languages like those by Christopher Alexander and the Gang of Four (Gamma et al.) serve as foundational interfaces for engineering and implementation by providing a structured, coherent set of proven solutions to recurring problems, enabling effective communication, design, and knowledge transfer across complex systems.

Christopher Alexander's original concept of pattern languages in architecture frames patterns as interconnected design problems and solutions organized in a language-like structure. This allows engineers and designers to approach complex problems through decomposition and iterative design. Each pattern in the language connects to others, highlighting relationships and guiding the solution process with contextual knowledge. This creates a shared vocabulary and methodical approach for collaborative design and problem-solving, empowering users to create scalable and adaptable systems.

Design Patterns by Gamma et al. as Architectural Interfaces in Software

The Gang of Four (GoF) design patterns extend Alexander's conceptual framework into software engineering. These 23 classic patterns provide tested, reusable solutions to common software design challenges, such as creation, structure, and behavior of objects and classes. By offering a shared language and standard interface for describing architectural components, they enable software engineers to communicate clearly, design flexible and maintainable systems, and accelerate the implementation of reliable software architectures. The GoF patterns abstract complex system details into manageable modules, facilitating extensibility and scalability in system design.

How they serve Engineering and Implementation

- **Shared Language and Vocabulary: Both Alexander's pattern language and Gamma's design patterns create a common language that helps cross-disciplinary teams understand, discuss, and develop complex designs clearly and efficiently.**
- **Structured Problem Solving: Patterns provide blueprints and guidelines that encapsulate best practices, reducing design errors and improving implementation quality.**
- **Modularity and Reusability: By decomposing problems into patterns, systems can be built from interoperable and reusable components, enhancing robustness and ease of maintenance.**
- **Contextual Guidance: Patterns describe the context, problem, and solution, linking to related patterns, which supports iterative refinement and adaptation to evolving requirements.**

- **Facilitation of Knowledge Transfer: They act as interfaces for capturing and transferring expert knowledge, making tacit design experience explicit and sharable across projects and teams.**

In summary, pattern languages by Alexander and Gamma serve as foundational engineering interfaces by structuring design knowledge into interconnected, reusable, and communicable patterns. This enables methodical, scalable, and collaborative engineering and implementation across domains such as architecture and software development.

In summary, TSRDM acts as a unifying, systematic methodology that translates scientific discoveries into practical implementations by providing a shared, evolving language of services—analogous to a natural language with its semantics, syntax, and pragmatics, and structured like a pattern language with reusable design components (not only in terms of terminology or vocabulary, but properly concerning a deeper and epistemological point of view at first). The translational approach is a worldwide validated research method that derives from studies in Medicine. Information are 'translated' to test novel concepts or to find new ones out (Davis et al., 2003; Wang, 2012). This sustains results' 'transfer' from previous scientific works and bridges among theory and practice ("what we know, what we practice"), with a lot of research benefits. This fosters interdisciplinary collaboration, accelerates innovation, and bridges the translational gaps between science and application.

In scientific contexts, the phrase "service as a unifying language" often refers to the use of service concepts as conceptual frameworks that integrate diverse disciplines and perspectives by focusing on value co-creation and the dynamic exchange of applied knowledge and resources. This approach is found especially in Service-Dominant Logic and Service Science literature, where service functions as a common conceptual ground or "language" that bridges gaps between technology, business, and human-centered social domains. Service understood as the application of resources for the benefit of another is common denominator or meta-concept that shifts the focus from goods or static resources to applied competencies and interactions creating value jointly among actors.

Translational Service Research and Design Methodology (TSRDM) draws on the grand theories of Service-Dominant Logic and Service Science and emphasizes the pivotal role of service as a unifying conceptual language to facilitate the integration and translation between research and practical implementation. By iteratively refining a shared set of service-based terminologies and frameworks, TSRDM enables interdisciplinary value co-creation across domains such as research, design, service engineering, software engineering, and the implementation and management of innovations. This approach fosters multidirectional knowledge exchange and supports the systematic transformation of theoretical insights into contextually relevant, actionable solutions.

4.3.1 Services: Activities render Services, Things render Services

"Customers do not buy goods or services: they buy offerings which render services which create value. The offering and the value consist of many components, some of them being activities (services), some being things (goods). (Gummesson, 1995, p. 250)

"The traditional division between goods and services is long outdated. It is now a matter of redefining services and seeing them from a customer perspective; activities render services, things render services. The shift in focus to services is a shift from the means and the producer perspective to the utilization and the customer perspective" (Gummesson, 1995, p. 251) in (Gummesson, 2008; Stephen L Vargo & Robert F Lusch, 2004, p. 328).

"From a relational point of view, in fact, competitive behaviour today seems to be based no longer upon dyadic relationships between actors but rather upon a many-to-many relational pattern involving supplier networks and customer networks with dense and intricate connections (Gummesson, 2004).

These connections can seldom be limited to relationships among business actors; they must, instead, be considered within a wider set of actors that include many more involved parts, thus starting from a B2B relation to encompass B2C, C2B and C2C relationships (Gummesson & Polese, 2009).

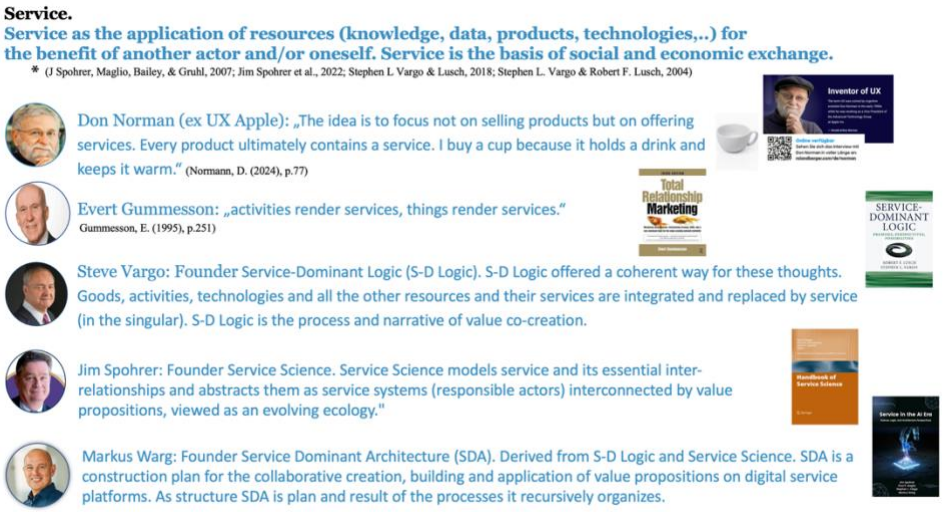

Figure 5 Services and Service (in the singular) as a process

4.3.2 Service is the Fundamental Basis of Exchange

4.3.3 Service-Dominant Logic as Process of Value Cocreation

According to Vargo et al. (Spohrer et al., 2022; Warg & Frosch, 2023) "a logic is a conceptual lens for observing the world and understanding how it works. It is also sometimes referred to as a mental model or a paradigm". Logic is about better

mental models in people to improve interaction; it exists within the minds of people and become dominant when they improve people's capabilities and practices for interactions and outcomes. Over the past centuries the dominant logic of economic exchange was based on the exchange of goods as manufactured output. This Goods-Dominant Logic focuses on tangible resources and transactions. Service Dominant Logic is an alternative to Goods-Dominant Logic, because it maintains that exchange is better understood in terms of service-for-service than in terms of goods-for-goods. Service Dominant Logic is about the process and outcome of actors applying resources, such as knowledge, for the benefit of others in exchange for others providing service for them" (Spohrer et al., 2022; Stephen L. Vargo & Robert F. Lusch, 2004). The process of value co-creation according to Service Dominant Logic is focused on the participation and interaction of networked human and non-human actors (Lusch & Vargo, 2008). The interactive relationship during the process of value co-creation results in added value that improves one's wellbeing as own state or condition (Vargo & Lusch, 2016). In this process actors e.g. companies as carrier of operant and/or operand resources engage by acting on resources (Löbler, 2013). Operant resources, such as competences, are those that act upon other resources to create benefit; while operand resources are resources which must be acted on to be beneficial, such as natural resources, goods and money (Constantin & Lusch, 1994; Vargo et al., 2010).

Service Dominant Logic is a meta-theoretical framework for explaining the process of value co-creation through actor engagement and service exchange. In this process resource-integrating actors (human and non-human) are connected by shared institutional arrangements and mutual value creation through service exchange. That way they are forming institutionally coordinated service ecosystems (Vargo & Lusch, 2016; Vargo & Lusch, 2018). In this ecosystem structures actors are aligned by value propositions and need to interact in order for a focal value proposition to materialize (Adner, 2017).

4.3.4 Service Science and Dynamic Structures of Service (eco) Systems

Service Science as transdisciplinary field, enables siloed disciplines with different terminologies and methods to communicate, collaborate, and innovate by adopting the service lens and modelling service systems as an integrative language of value co-creation and resource integration. Service-Dominant Logic (SDL) explicitly promotes service as the philosophical foundation and unifying theoretical framework for understanding markets, organizations, and technologies in terms of interconnected service ecosystems sharing knowledge, institutions and capabilities.

Referring to Spohrer et al. (Spohrer et al., 2022) Science can be viewed as a knowledge creation service. Science is about better models of the world both complex natural and social systems. Service Science grounds the nature, scientific understanding and management principles needed to understand and improve service and service innovation. Service Science models service and its essential

interrelationships and abstracts responsible actors e.g., companies as service systems (service system entities) interconnected by value propositions (Spohrer et al., 2008; Spohrer & Maglio, 2008; Spohrer et al., 2022).
Service systems are defined as dynamic value co-creation configurations of resources, including people, organizations, shared information and technology, all connected internally and externally to other service systems by value propositions (J. C. Spohrer et al., 2008). Service systems are characterized as open systems (1) capable of improving the state of another system through sharing or applying resources and (2) capable of improving their own states by acquiring external resources. In this context, economic exchange depends on reciprocal value creation between service systems This recursive service system definition highlights the fact that service systems have internal structures (intra-entity services) and external structures (inter-entity services) in which responsible actors (entities) coproduce value directly or indirectly with other service systems. Individuals, families, organizations, teams, nations, and economies all represent instances of service systems (Kieliszewski et al., 2018; Spohrer et al., 2007).

Any service system can be observed as a structure of interconnected elements, to understand how it behaves it is necessary to see its systemic functioning. “Each instance of resource integration, service provision, and value creation, changes the nature of the system to some degree and thus the context for the next iteration and determination of value creation” (Spohrer & Maglio, 2008; Vargo & Lusch, 2011)

"In service system’s interactions there is also a need to consider the less visible relationships among all of involved entities (suppliers, enterprises, individuals, clients, stakeholders), which strongly contribute to the competitiveness of the whole system (Polese et al., 2009). Each node that acts as a part of service business processes represents a foundational partner and supports the whole system in its enjoyment of network advantages (resource-sharing, synergic interactions, common purpose, group power) for global value creation"(Barile & Polese, 2010b; Polese et al., 2009).

4.3.5 Service Dominant Architecture as Plan and Purposeful Structure

Service Dominant Architecture was published in 2014 by Markus Warg. It operationalizes core concepts of Service Science and Service-Dominant Logic.

SDA Perspectives: SDA can be viewed from a conceptual and an applied perspective:

(1) firstly, SDA as a conceptual framework (Blaxter, Hughes, Tight, 1996; Leshem & Trafford, 2007) in the understanding of a structure as a virtual order (Giddens, 1984), or design pattern like a construction plan (Alexander et al, 1977; Gamma, Helm, Johnson, Vlissides, 2000) of five systems (Cardoso et al, 2015; Luhmann, 1996; Spohrer, Vargo, Caswell, Maglio, 2008).

(2) secondly, SDA as tangible structure instantiated (e.g., based on platform technologies) by at least one (responsible actor) entity (Giddens, 1984). The instantiated structure consists of five systems including the SDA service catalog as system of shared institutional arrangements (Spohrer & Maglio, 2008). SDA applied within an actor-to-actor network facilitates the process and coordination of service exchange and mutual value creation (Vargo & Lusch, 2016).

Five Systems Orchestrated with SDA Design Patterns: In the following the five systems of SDA and their roles are introduced (Warg, Weiss, Engel, 2015; Warg, Weiss, Engel, Zolnowski 2016):

1. System of Operant Resources: The system of operant resources is the heart of the SDA. It represents the workbench, where the various resources and capabilities are brought together and processed. For this, this system applies certain logics or processes. In line with S-D Logic, the focus is on intangible capabilities, previously defined as operant resources (like competence, knowledge, skills, software code), which are used and brought together to (co-) create value propositions. The emergence of value propositions is dependent on the achievable level of resource density. A high resource density positively impacts the possible combinations and thus the emergence and creation of innovative value propositions.

2. System of Interaction: The system facilitates value in use and value in context by enabling the application of capabilities bundled in value propositions. Interaction enables resource integration and service exchange between actors and by this new resources with value creating potential.

3. System of Participation: The concept of co-creation includes other (external) actors as co-producers of the value proposition. In this process the system of participation enables actor-to-actor orientation and the participation of other actors by coordinating actors and facilitating the process of resource integration.

4. System of Operational Data Stores (Data Lake): From an actors (e.g. organization) point of view, data received and generated by interacting with other actors (e.g. customer) should be systematically recorded and evaluated in real time. In this way, data and knowledge about the preferences and the context of other actors like customers can be build up continuously.

5. System of Institutional Arrangements (service catalog): As rules, institutions enable the coordination of actors and the access to and use of resources. In conjunction with design pattern, institutions enable the coordinated creation of solution designs by connecting actors, and enabling the integration of resources.

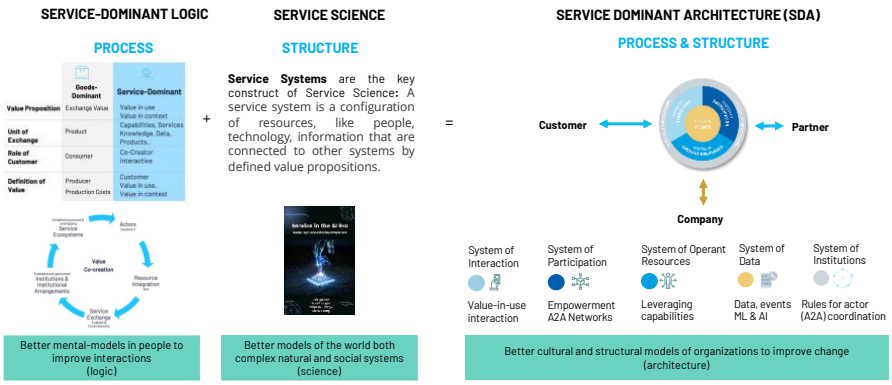

Figure 6 Service Dominant Architecture derived from S-D Logic and Service Science

SDA facilitates the design and modeling of interactive strategies and value constellations by

1 Modeling the value constellation (e.g. customer-partner-company)

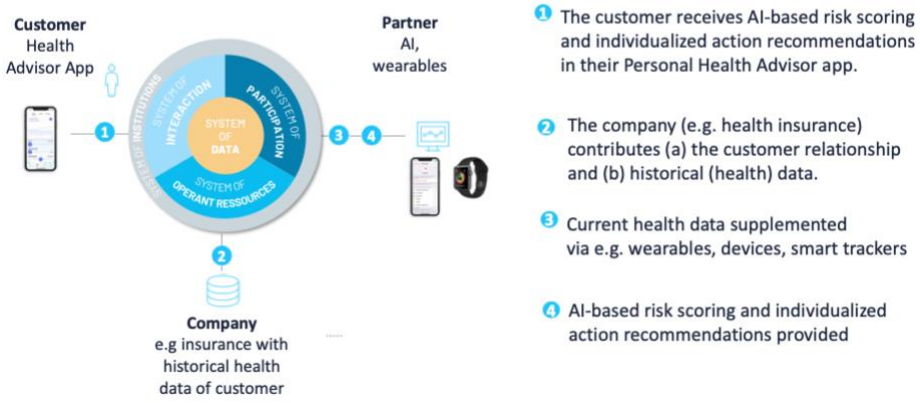

Figure 7 Modeling of a value constellation with SDA (example: individualized AI based stroke prevention)

2. Modeling the customer journey and the services

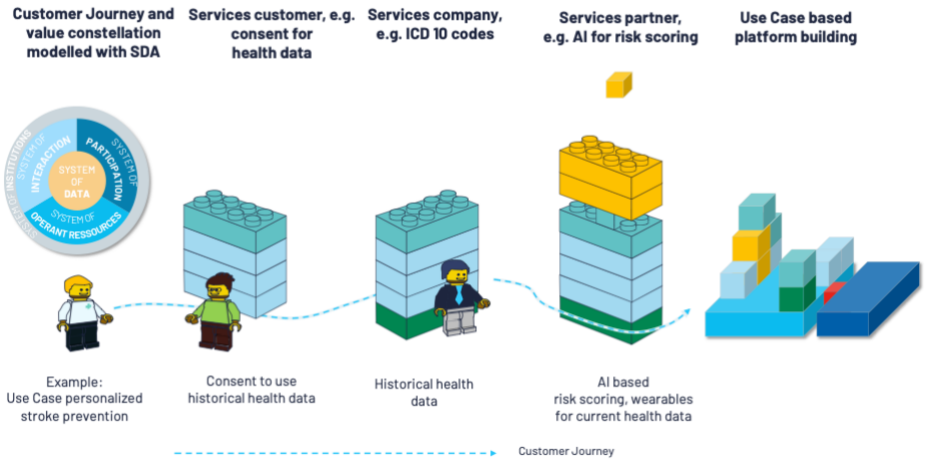

Figure 8 Modeling the customer journey and the services

Leading research questions are: which are idenfiable situational mechanisms for successful transfer, and when does it fail to achieve required objectification by actors in a given organizational context (transformational mechanisms), and how need transfer activities be shaped and designed?

SDA methodology follows the following value creation pathway to be outlined as incremental improvement and innovation with translating technoloy into workable and implementable artificats, which trigger and support activities (action), create symbolic systems and are evaluated in relational systems (legitimation, best practices) by actors through co-creation activities, based on newly introducted "resource integration patterns," which are then implemented by the SDA and translated through abstraction into design knowledge (principles and patterns).

Introduced "routines are learned and renewed in relational systems" (Scott, 2014). According to, the transition from "habitualization" to "objectification" is a key aspect to understand transformational mechanisms at work (Scott, 2014).

"In the abstract domain actors elaborate on and formulate appropriate design principles. On this level, DSR research takes focus on abstraction activities (generalization) to develop a design theory to ease the solution search in targeted domain (Gregor, 2006; Weiss, 2023) . Design principles contain often a basic idea, expected effect or specific purpose which is translated into a working technology (Arthur, 2009). Engineers "[…] design and construct artifacts" (Arthur, 2009).

Design patterns are a concrete configuration of technical rules, mechanisms and means used for the instantiation of design principles. Design patterns capture design knowledge in the instance domain, because instantiated IT artifacts usually regard a specific, unique situation, setting or context (Baskerville et al., 2018).

Design pattern refers to the concrete instance solution, whereas design principle is linked to the abstract solution" (Weiß et al., 2023). In contract, design patterns refer "[…] to the concrete instance solution, whereas design principle is linked to the abstract solution. This reflects the fact that design principles can be implemented in various ways and means achieving the same aim and outcome. Design patterns are concerned with the new emerging combinations. (Arthur, 2009) elucidates domain's grammar as mean to determine "[…] how its elements fit together and the conditions under which they fit together. It determines what "works" (Arthur, 2009).

Design patterns reflect knowledge often reducible to rules of thumb from previous experience what works and what works not in a given context and which domains should be selected and combined to achieve a goal or outcome to solve the instance problem (Arthur, 2009).

"Designers construct from the domain they know" (Arthur 2009, 79). (Arthur, 2009) argues further that domain or body of knowledge […] provides a language for expression, a vocabulary of components and practices designers can draw from".

4.4 Service Science & Research (Pillar I of TSRDM)

4.5 Translational Services and Architectures as Foundational Interface (Pillar II of TSRDM)

4.5.1 Translational Services

4.5.2 Translational Architectures

4.5.3 Emergence of properties and institutionalization in ecosystems

(Vargo et al., 2022) describe four steps (or orders) in the process of emergence of properties and institutionalization within service ecosystems. These steps explain how new properties and patterns emerge and stabilize in complex social systems such as markets. As demonstrated in figure 4 first-order emergence accounts for the appearance of novel outcomes from ad-hoc resource integration and service for service exchange. Novel outcomes (like new services or solutions) emerge unpredictably from these ad hoc interaction. The first-order outcomes are often fragile and may not persist without further reinforcement by service for service exchange. The emergent outcomes depend on, but differ from, the constituent elements (McLaughlin, 1997; Vargo et al., 2022).

Second-order emergence introduces a potential for greater stability and regularity as the emergent property (inter-)acts back on its constitutive elements (Goldstein, 1999; Vargo et al., 2022).
Repetition and reinforcement create habitual patterns and proto-institutions. Some behaviors become more regular, forming routines as the seeds of institutions.

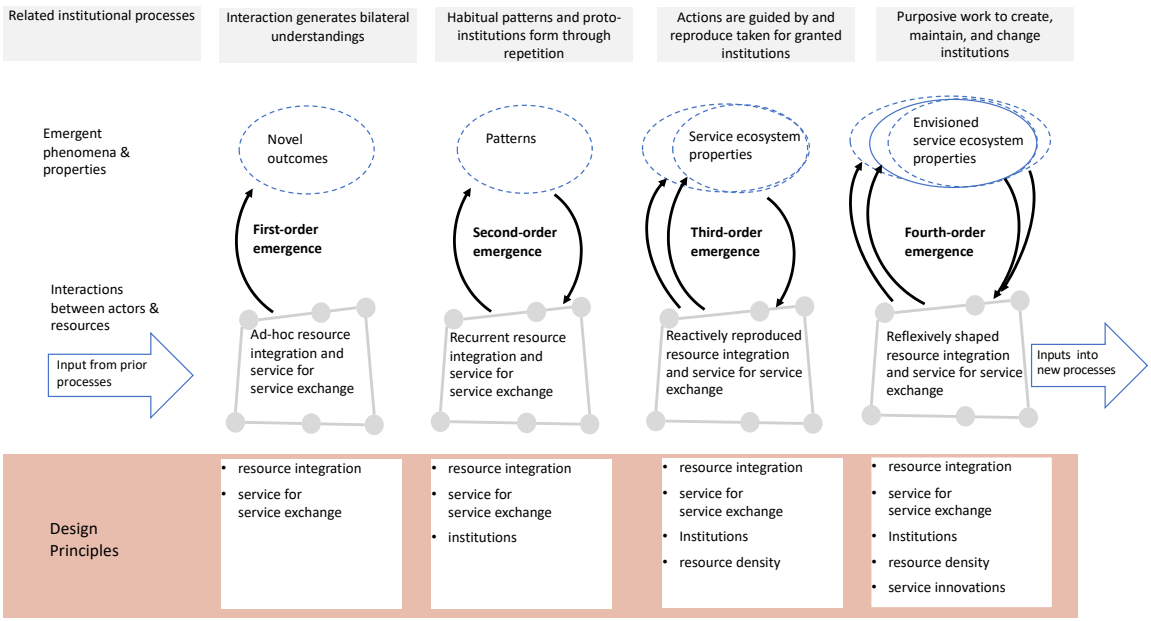

Figure 9 Design principles, emergence and institutionalization processes based on (Vargo et al., 2022)

In systems capable of third-order emergence, actors are able to recognize and to reproduce their resource integration and service exchange based on emergent patterns. Such actors exhibit a persistence of internal structures or a type of memory (Ladyman et al., 2013; Martin & Sunley, 2012) that enables pattern recognition. This in turn allows emergent patterns to be reproduced and solidified. Institutions as rules and norms become taken for granted. Institutions guide and

stabilize interactions, creating quasi-predictable structures (Barile & Polese, 2010a; Holland, 1992; Vargo et al., 2022).

In fourth-order emergence actors intentionally shape resource integration and service exchange to influence the service ecosystem properties. This requires actors with the capacity to envision how their interactions with others affect the service-ecosystem properties. Both the emergence literature and S-D logic recognize this characteristic as reflexivity. Reflexivity and institutional work drive ecosystem evolution or transformation by designing, maintaining or disrupting institutions (Ellis, 2006; Kjellberg, 2018; Martin & Sunley, 2012; Vargo et al., 2022).

4.6 Service Design & Engineering (Pillar III of TSRDM)

4.6.1 Service Design

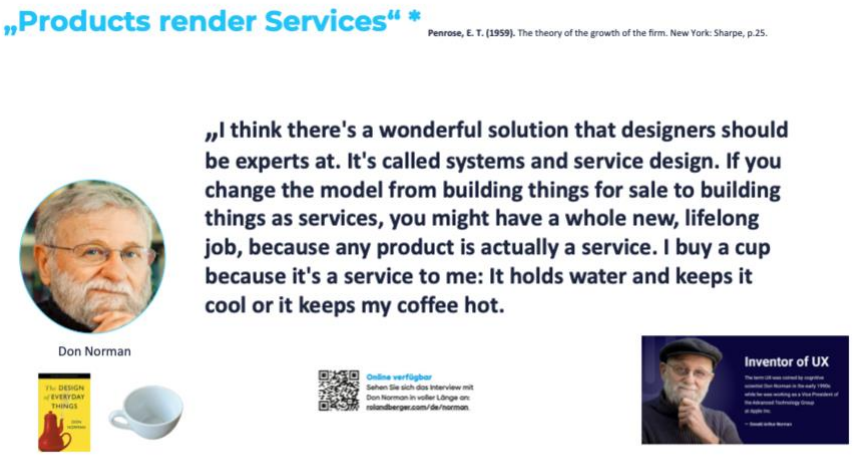

Figure 10 The idea is not to focus on products but on offering services (Norman, 2013; Norman & Heuer, 2024)

The idea is to focus not on selling products but on offering services. Every product ultimately contains a service. I buy a cup because it holds a drink and keeps it warm (Norman, 2013; Norman & Heuer, 2024).

However, his foundational ideas about user-centered design and human-centered design emphasize focusing on user needs, experiences, and the value that products provide to people. He stresses designing products based on the functions and benefits they provide to users rather than the product as a physical object alone

"These subtle controls over behavior reflect a concept that has been called "affordance." The word affordance was originally coined by the perceptual psychologist J. J. Gibson in 1966 to refer to the actionable properties between the world and an actor (a person or animal or, today, many artificial devices). In other words, an affordance is a relationship. For example, a chair has the affordance of support, which makes it serve as a chair, but only for the proper-size object. A small chair might not afford support for a giant (or an elephant). Some chairs can be thrown, but this affordance is limited to people strong enough to lift and throw it. Chairs offer support to nonanimate objects—for example, books and papers—but only if of appropriate size and weight. I introduced Gibson's term to the field of design in 1988 in my book The Psychology of Everyday Things. Designers usually care whether a person perceives that some action is possible (or in the case of perceived antiaffordances, not possible). How are affordances perceived? Actors are not necessarily aware of all the affordances. Sometimes they discover new ones by accident, by their observations of other people, or through instruction" (Norman, 2023, pp. 35–26).

"In 2008, I proposed that we consider the cues that allow the perception of affordance to be conceptually separated from the relationship itself: I called the cues "signifiers" and the relationship "the affordance." Appropriate signifiers allow us to behave appropriately with thousands of new things that we encounter in our lives even though we may never have seen them before or never been instructed on how to use them. Note that although signifiers are usually used to help actors discover the relationship offered by the affordance, at times it is desirable to hide or even eliminate all signifiers to allow for private usage of something, a usage known or discoverable only by those who are told the secret. Similarly, false affordances can be used to mislead in many creative ways, some beneficial, others harmful. In a similar fashion, antiaffordances can be used to prohibit some activities (and false signifiers may make it seem that an activity is prohibited even though it still can be done)" (Norman, 2023, p. 36).

Shikake

Shiakake.

- "A shikake is a physical and/or psychological trigger for

behavior change" (Matsumura & Fruchter, 2013). "A trigger that induces a specific behavior to solve a social or personal problem" (Matsumura & Leifer, 2013).

- "A shikake is a new concept of the synthetic approach that includes engineering, psychology, and design. The above definition of a shikake was first stated in (Matsumura, 2013)" (Matsumura & Leifer, 2013).
- "The physical trigger is used to ignite the psychological trigger, and the psychological trigger works as a driving force for changing behavior" (Matsumura & Fruchter, 2013).
- "A shikake is not a trap to force or trick people, but a way to encourage people to change behavior by presenting them with possible alternative behaviors in an attractive way" (Matsumura & Fruchter, 2013).
- "A shikake is likecooking. Understanding cooking is not the same as listing the ingredients, seasonings, and cooking devices. To be good at cooking, the best combination of ingredients, seasoning, and food preparation methods must be understood. The same thing can be said about a shikake. The mechanism should be understood as the best combination of the fundamental elements. We consider that the mechanism could be automatically extracted from the best practices as a "pattern" of elements once we construct a database of shikakes with el-ements" (Matsumura & Fruchter, 2013).

Shikake Design Process.
"The point of a shikake approach is to solve a problem by behavior, not by function. This is the most unique and significant point of the shikake approach. We have to utilize this point in considering the shikake design process. The first step is to identify a core problem. Then we have to identify a behavior that might solve the problem. We call such behavior as "behavior solution". Then we proceed to consider a shikake that can induce that behavior. In this process, shikake trigger categories and the shikake trigger matrix could be used to initiate shikake ideas. Based on these considerations, we tentatively proposed an outline of the shikake design process as follows.

1) Identify core problem.
2) Identify behavior solution.
3) Design a shikake with the help of the shikake trigger categories and the shikake trigger matrix.
4) Rapidly prototype the shikake.
5) Refine and return to 2) through 4)" (Matsumura & Leifer, 2013) .

4.6.2 Service Engineering

Service engineering: (Böhmann, 2004; Brettreich-Teichmann et al., 1998) define service engineering as the "...methodical development and construction of (service) products and systems." The need for systematic service development arises from the increasing demand for service offerings. Procedures, methods, and tools should be used to ensure a systematic

approach (Meiren, 2006; Meiren & Barth, 2002). " Service Engineering as a new inter-disciplinary approach deals with methods, (reference-)models and tools for a systematic development and implementation of services. Itis located at the interface of informatics, business administration and social science" (Nüttgens et al., 1998).

Alternativer Text (falls gewünscht):

In the 1980s, the first scientific papers on service development in the Anglo-American region were published under the term “New Service Development” (cf. Shostack 1982; Scheuing/Johnson 1989). In Germany, service engineering has established itself since the 1990s as an independent discipline that applies engineering approaches to the development of services (cf. Böhmann, 2004; Spath et al. 2013). This discipline aims to enable the systematic and repeatable development of services, with a focus on the design of high-quality services and a high level of customer orientation (cf. Meyer/Zinke 2018; Richter/Tschanderl 2017). The framework concept of service engineering is based on a phase-oriented definition of services, which encompasses the design dimensions of potential, process, and result, as well as a market dimension that integrates market requirements and customer needs (cf. Fähnrich/Opitz 2006; Bullinger/Schreiner 2006). Specific models, methods, and tools are required for each dimension to ensure holistic development. Formalized process models play a crucial role in the systematic development of services by structuring the phases from idea to market launch (cf. Meiren 2011). These models help companies establish regularities, avoid redundancies, and learn from mistakes (cf. Meyer/Böttcher 2011). Numerous process models have been developed which, despite differences in the industry in which they are applied, have much in common in terms of phases, methods, and tools (cf. Kim/Meiren 2010). A meta-study identified key development phases such as “idea generation,” “requirements analysis,” and “implementation” (cf. Kitsios/Kamariotou 2019). Specific methods and tools are assigned to the phases to support implementation (cf. Eversheim et al. 2006; Bullinger/Schreiner 2006).
A key success factor is the integration of customers into the development process, as their knowledge and skills are crucial for achieving quality goals (cf. Alam/Perry 2002; Meyer 2003). Customers can be involved in all phases of development, from idea generation to testing (cf. Russo-Spena/Mele 2012). In particular, the involvement of customers in testing to evaluate concepts is important, as empirical studies have shown (cf. Witell et al. 2014). The possibilities for customer integration depend on the design type of the process models.

4.6.3 Software Engineering

Software engineering: "Software engineering research is all about understanding the nature of software processes, finding appropriate architectures of software systems, and identifying the essential and value-creating activities in software development. There is an urgent need for concise solutions to these issues, which are key to industrial software development. That is why, software engineering research and high-end software development in practice go hand in hand" (Gruhn & Striemer, 2018).

"Sooner or later, all service-oriented architectures run into the problem that there are a large number of services that often cannot be clearly distinguished from one another. These are often overlapping functionalities that represent more or less specialized variants. However, service-oriented architectures are only truly useful if existing functionalities can be found and integrated without adaptation. This goal is pursued through catalogs, classifications, and more or less extensive search support. This involves criteria (entry) according to which services are included in catalogs (e.g., comprehensible description, classification, utilization, degree of testing) and according to which they are also removed from the catalog (exit) (e.g., lack of utilization, further development and migration to successor services, faulty functionality, lack of service level). One tool for managing services is to maintain multiple catalogs (content clusters, technical clusters). The use of the concept of services in software engineering often requires application in the business domain (pure business services) and the use of business architecture specifications in software design. This involves the decomposition of service catalogs and services." Volker Gruhn

4.6.4 Service Dominant Architecture as Output

SDA as ouptut of the process ofvalue cocreation it recursively organizes. "The technical implementation of SDA can be compared to Lego. Open source and cloud platform technologies form the base plate. Technical, functional and business services are implemented as generic or specific bricks. Each brick is preconfigured with the five roles as systems. The base plate and the bricks are coordinated via SDA service catalog that sets the rules and standards" (Spohrer et al., 2022).

Guiding principles:

- **Services as a structuring paradigm**: Build once – use many times. We design our digital services so that they can also be reused for other processes, service-, and customer journeys.
- **Service Catalog for managing services:** In the service catalog, the services are managed and documented. Through the catalog, services can be found and accessed.
- **Service-Dominant Architecture (SDA) as enterprise architecture:** SDA serves as enterprise architecture and thus as organizational logic for business processes and IT. It is the blueprint for a service platform and assigns the services to the five SDA systems: Connecting partners and external solutions, enable interaction, data, capabilities of the company and institutions as rules for actor and resources coordination.

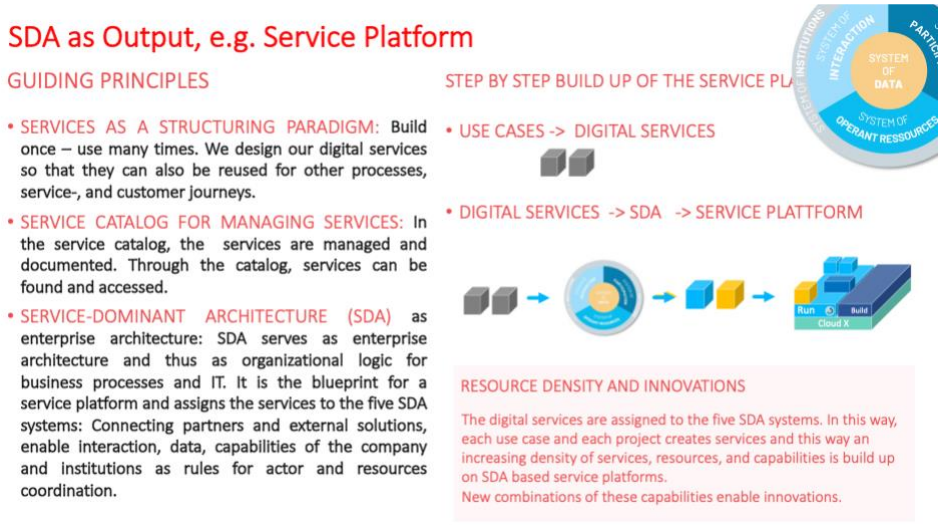

Figure 11 SDA as Output, e.g. Service Platform

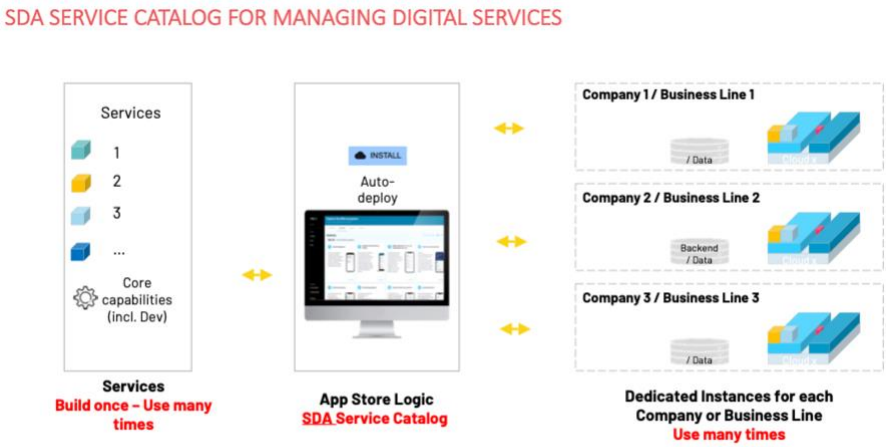

Figure 12 SDA Service Catalog for managing digital services

4.6.5 Implementation & Management

5 Doing Research, Design & Engineering with TSRDM

Coming back to the "valleys of death" and the three questions that motivated the authors to initiate the TSRDM approach:
First: In what ways can research activities be systematically organized to serve as a unified epistemic and methodological foundation for design, engineering and implementation processes?
Second: What conceptual or operational characteristics should such a foundational interface possess to effectively link research outputs with design, engineering and implementation requirements?
Third: Which strategies or mechanisms can be employed to enhance the willingness of stakeholders to invest resources in the implementation of innovations that are grounded in this integrated foundation or interface?

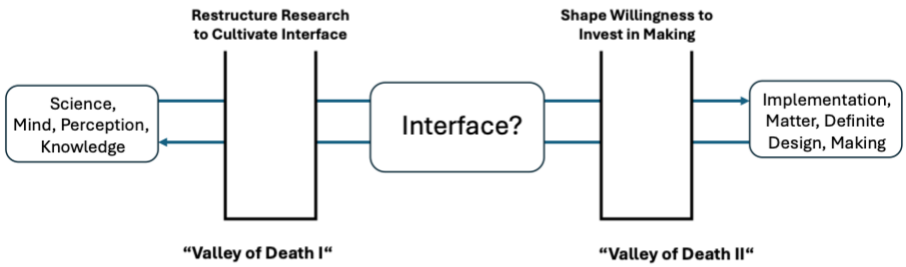

Figure 13 "Valleys of death", Warg et al. (2025) based on "Mind-matter interaction" of Eekels, J., & Roozenburg, N. F. (1991).

For answering these questions TSRDM draws on the centrality of service as basis for social and economic exchange and on "services" as structuring paradigma. As methodology TSRDM focuses on: "Three Pillars", an "Eight-Step Process" and the "Linkages and Transitions" within this process.

5.1 The Three Pillars of TSRDM

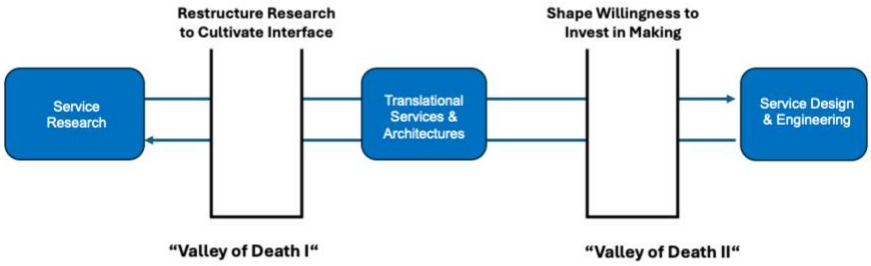

Figure 14 The three pillars of the TSRDM process (Warg et. al 2025)

5.2 The Eight-Step Process of TSRDM

Premises.
To apply results from prevoius studies as Translational Research sustains, we need to check some important aspects in advance before starting. Specifically, the context of application needs to be properly explored; is it similar in terms of features, dynamics, actors involved, layers, interactions‘ mode, etc.? How much scalable such a solution/proposal can be intended there? Are there some issues dealt with using same methods? Are there any results highlighted already to be compared or distinguished?
So, a first check on the ground we’d like to investigate is foundamental to start approaching with a Translational Research lens.

TSRDM in steps.
The **Translational Service Research and Design Methodology (TSRDM)** comprises a process of eight core steps, systematically linked to ensure relevance, rigor, consistency and impact. These steps represent a nominal sequence that researchers may iterate through as needed rather than strictly following linearly:

1. **Objectives Definition, Translational Gap, and Problem Identification**
   Define and justify the specific translational gap, explaining why addressing it is valuable. This step grounds the research in a relevant real-world issue and motivates the research effort.

Here, a preliminary explaination concerning the studies already conducted to analyze the same issues should be done. Which findings we have currently? Why they are not enough? This helps in outpoint the „gap“ and how to bridge/cover it.

2. **Perceptions, Methodological Considerations, and Research Design**
   Describe the perception of the challenge or translational gap based on the problem definition. Ideate objectives for a solution. Identify and align conceptual approaches and research designs to effectively model the challenge.
   Here, an scientific alignment among problems and solution need to be found. This derives from the match between the specifics of methods and of issues to explore. The data-transfer (ora data-translation) need to have a sort of linear pairing to be inteded as correct and appropriate.

3. **Knowledge Base**
   Build a knowledge base incorporating grand theories such as Service-Dominant Logic and Service Science, which address the processes and structures of value co-creation, along with other relevant sciences, theories, models, and concepts.
   Here, Service Research (S-Dl and SSME among others) represents a Grand Theory appliable in (almost) any cases, due to their foundational premises, based on general purpose, horizontal concepts, and multi-part contributions. Insights in terms of servitization, service ecosystems, value co-creation, resoruces‘ integration, institutional arrangements, phase transitions, dynamic interactions, layers design, evolving balance and smartness could help in approaching every situation with a huge number of interpretative instruments.

4. **Objective-Related Solution Mechanisms**
   Develop objective-related knowledge, mechanisms, models, or desired behaviors aimed at bridging the translational gap.
   Here, the demonstration process is crucial. It should be accurate and solid. Usually, it starts from very well-known statements, authored and published before by high-ranked journals or discussed during recognized scientific and international events. It’s a careful and prudent step-by-step approach, in order to use the existing knowledge as it is worldwide cited, to be used for our scope, with the right meaning, a comprehensible language and an acceptable correspondence.

5. **Translational Services and Architectures**
   Define translational services, including activities, functions, objects, triggers, design principles, design patterns, building blocks, systems, service systems, or architectures that facilitate fertilizing the interface between science and implementation.
   Here, the Service (singular term) doesn’t state for such an activity, but it is something more. It begins as a specialized competence applied somewhere for a specific final goal and turns into a defined approach in doing things. Consequently, the design or architecture become service-oriented or service-

centred, as well as systems (intended as nested set of interacting elements aimed to reach a common shared finality) transform into service systems, due to the intrinsic meaning to be at someone service, to help, to fit, to solve together any issues. So this, the service new concept can be insightfully used for translational works.

6. **Service Design and Engineering**
   Apply the translational services and architectures to service design, action design, engineering design, software engineering, service engineering, software design, artifacts, or tangible solutions to achieve targeted behaviors. Here, the theory-practice bridge definitively appears. Service Research (SR) ground and applications deserve to be considered as the main target for Translational Research (TR); in this the convergence SR/TR emerges, due to their main aim to apply scientific and theoretical principal results into practical evidences (more in SSME than in S-Dl, indeed), exaclty as it happens in the translational process. Basicly, many findings coming from studies to implement interpretative models for understanding the reallife, show how (and how much) it's possible to use new data, new info, new reflections, new conceptualization, to check if they work (as novelty) in practice, for testing new engineering solutions, for designing new SW, for monitoring some performances, for planning original strategies.

7. **Definitive Design and Implementation Research**
   Describe the definitive design. Conduct implementation research or studies on proof of concepts, frameworks, models, instantiations, or implementations.
   Here, there is the consolidation moment of Translational Research mode in action. After conducting the translational process and transfering insightful information, and validating/confirming the scientific discoveries as tested on field, a new level of knowledge come out, a inedited reserach design, now intentable as novel, definitive.

8. **Outcomes and Ends, Service Demonstration**
   Research on outcomes and ends (valued states), service demonstration, and behavior evaluation, including findings and knowledge building.
   Here, as SSME proposes, outcomes, side effects and spillovers take place. Because of its typical propositions, the knowledge spreads according to new evidences on how something works and how we can interpret and manage related phenomena. It's normal, it's specific for SSME, it's want we need to do in practice.

This cyclic and iterative linkage ensures methodological coherence and that the research maintains **rigor** (through grounding in theory and methodical evaluation), **consistency** over the three pillars (by building upon the grand theories of Service-Dominant Logic and Service Science), **relevance** (by addressing practical problems), and **impact** via effective and demonstrated implementation.

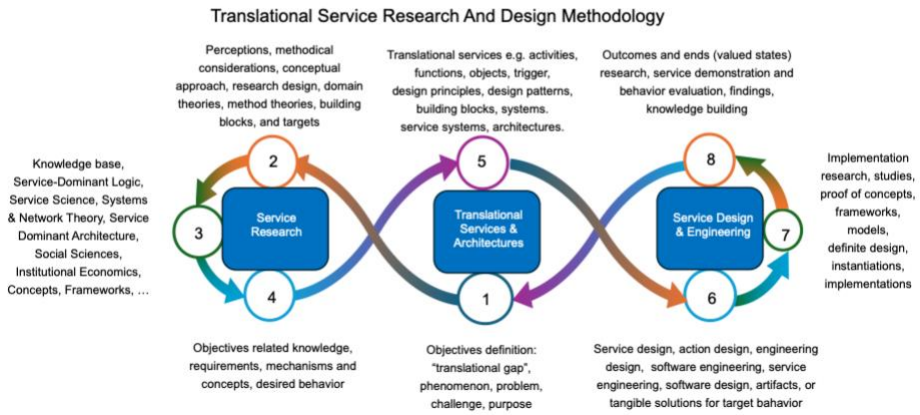

Figure 15 The TSRDM process

As in the pic, this cycle embrace three macro-areas (service research, translational research, service grounds). The eight steps outlined before are around, in infinitive passages, self-feeding themselves, and restarting again.

TSRDM functioning.
Purpose. What is the translational gap? What we need to explain in terms of ongoing facts or events? Why did we not do before (what is lacking here)? First, to translate info, we must overview which info we already have and which not; this helps in defining the gap (as scholars use to do in Literature). Further, we have to investigate why previous attempts (if they are/were) failed in interpreting our research focus (lack of definitions, lens, vision, approach, contextualization).

- The process begins with describing the translational gap and defining the research objectives.

Deconstruction. The reality is complex, intricate, diffucult to understand and then explain, so very soon we need to change in perspective or use different mode of analysis. At first, a problem should be seen as a whole wih a wide overview (holistically) and in the maintime separated in a set of elements, bracking down it in pieces connected with each-others (reductionistic approach), by using the zooming in – zooming out way of study. This helps in defining the building blocks composing the phenomenon, by distinguishing perceptions (from several POVs), targets (from sereral Actors), pertinent domains (from several disciplines), and allows to detect which block deserves to be investigated more.

- The definition of objectives leads to methodological considerations, identification of conceptual approaches, and the formulation of a research design.

Service factotum. Having defined the problem and overcome the alternatives, we have selected the focus and are now ready to apply the knowledge we can derive from Service Research (Axioms, FPs, smart-applications, recent advances, and so on). Which insight is right for us at the moment? Are we speaking about the

cooperative approach among actors (co-creation), or the point of view (ego/eco), or the elements we need to sustain an equilibrium (resourcefulness), or the influences coming from outside (downward causation), or the potential convergence of such a behaviour (consonance), or the dynamic interactions (A2A/A4A), or the evolution of events (phase transition), or (multi-contextualization) or anything else? The Service Research has a huge data-base (more than 20 years of publications) that can be used to identify the topic most adherent to any specific situation.

- The construction of the knowledge base is directly linked to the formulated objectives and the selected conceptual approaches.

Logical transfer. Service scholars addressed lot of topics during the years, many sentences could be cited or resumed or schematized to foster new knowledge. In this sense, starting from what SSME or S-Dl founders said in the past, we can go back up to what we need to define today, by following logical connections and transfer. One examples concerning ecosystems to just clarify:

- Jim and Paul in 2007/8 argued ecology as 10th foundamental premises of Service Science exploitation, focusing on the role of that discipline in supporting the understanding dynamics in the environment (intended as place in which entities operate);

SPOHRER J., MAGLIO P.P., BAILEY J., GRUHL D., "Steps Toward a Science of Service Systems", in Computer, 2007, pp. 71-77.

- Bob and Steve in 2010 proposed a new concept of ecosystems to embrace a set of interactions among actors in a stated moment;

VARGO S.L., LUSCH R.F., "From Repeat Patronage to Value Co-creation in Service Ecosystems: A Transcending Conceptualization of Relationship", in Journal of Business Market Management, n. 4, 2010b, pp. 169-179.

- Sergio, Luca, Francesca e Francesco in 2013, started from them and stressed the passage from ego to eco to enphasize the difference in perspective, both for studing and managing whole problems.

BARILE S., CARRUBBO L., IANDOLO F., CAPUTO F., "From 'EGO' to 'ECO' in B2B rela tionships", in Journal of Business Market and Management, vol. 6, n. 4, 2013a, pp. 228-253.

- Heiko, Francesco and Steve in 2014, focused on service ecosystems value co-creation leverages (and after on institutional arrangements) to affirm that everuthing is interconnected;

WIELAND H., POLESE F., VARGO S., LUSCH R., "Toward a Service (Eco)Systems Per spective on Value Creation", in International Journal of Service Science, Manage ment, Engineering and Technology, vol. 3, n. 3, 2012, pp. 12-25.

- Marie, Linda, Jacquie and Cristina in 2016, used this proposal to find out layers (micro-macro-meso) and define a vertical causal connections in between;

M. Taillard, L.D. Peters, J. Pels, C. Mele, "The role of shared inten tions in the emergence of service ecosystems". Journal of Business Research, 69(8), 2016, p. 2972-2980;

- A number of scholars later tried to use these reflections to explore others fields of interest, by applying what we already „know" on what we don't.
- Someone is working on the evolved concept of smart service ecosystems, not yet consolidated currently.

- The same story is for A2A and A4A, starting from the work of Evert and Francesco that in 2009 enlarging the logic of B2B by going beyond (B2B is not an island, cit.), as well as Steve and Bob focused on the relevance on the relationships of actors instead of their role, overcoming the logic of B2B, B2C, C2C and reaching the A2A new one; further Francesco, Bard, Jaquie, Luca and Roberto stressed the fact that the service is for poeple and no more to people and defined A4A interactions; currently Nabil and others tried to apply the A4A cyclic approach to healthcare, Luca and Angela did the same to marketing, etc.

E. Gummesson, F. Polese, "B2B is not an island!" Journal of Business & Industrial Marketing, 2009; S.L. Vargo, R.F. Lusch, "It's all B2B... and beyond: Toward a systems perspective

S.L. Vargo, R.F. Lusch, "It's all B2B... and beyond: Toward a systems perspective of the market". Industrial marketing management, 40(2), 2011, p. 181-187.

F. Polese, J. Pels, B. Tronvoll, R. Bruni, L. Carrubbo, "A4A re lationships". Journal of Service Theory and Practice, 2017.

Badr, N. G., Carrubbo, L., & Mohtar, L. (2022). How to reach the goal of quadruple aim today in healthcare service ecosystem: Nudges from the A4A approach. *ITM Web of Conferences*, *41*, 01001.

- Objective-related knowledge, requirements, mechanisms, concepts, or desired behaviors are derived from the knowledge base.

Service as password. Translational Research is appliable here because of the new Service conceptualization; as we know, today service has a new standing alone meaning, we don't need more than this to immediately go on. So, if you have to set up a novel algorithms A.I.-based, you can apply the Service as the base of modules' organization and connections, the key to intend a user-friendly application, the logic to implement the interface to interact with all parties usefully, the way to make solutions as much flexible and versatyle as possible, the approach to make users free to use an APP as they effectively need (under the smarter approach and the value-in-use logic), in terms of portability, transferability, contemporaneity, etc. The Service logic is completely transferable into practice applications, well linking mind and make.

- The interface that bridges theory ("mind") and practical implementation ("make") is established through translational services, such as activities, functions, objects, triggers, design principles, design patterns, building blocks, systems, service systems, and architectures.

- Physiologically. Service Research seems to be built to be translated somehow. The existing link among servitization and engineered solutions is almost prepared and ready to be used here. If we need to develop a new proposal in industry, first we have to include Service; if we think on smart-product we remind to service-design (able to make that product „smart"). First of all, on the SSME grounds of applications (smart healthcare, smart logistics, smart tourism, smart security, or more speficically smart phones, smart grids, smart box, smart cities), the smartness itself can be based on Service logics' insights. S.M.A.R.T. is an acronyme (specific, measurable, agreed, realistic and timely) and all the related meanings derive from Service Research. Somthing is SMART

if is thinked, designed, produced and experienced following a service-centred approach. That's why Service Research (SR) is perfect of Translational Research (TR), because since the beginning all studies on service systems and smart service systems have been conducted to find some practical evidence. The multi-culturality is very helpful in this, because many disciplines sustain advance in knowledge for different fields of interest and application. This logic could be appliable elsewhere, everywhere, intrisically, as something perfectly normal.Service design, as well as service and software engineering, including the development of artifacts and minimum viable products (MVPs), is directly grounded in this fund of translational services, all aimed at producing artifacts or tangible solutions that achieve the defined objectives.

The rule is to Stratify. Knowledge calls for new knowledge, thanks to findings we can got from some test in practice based on Service's studies, a consolidated and approved method can arise. Typically, it happens when some sentences has been accepted and shared as valid, ready to be used as antecedentes for something new. For examples, nowadays value is not created and destroyed anymore, all new commercial proposal have been promoted by using the co-creation concept, i.e. involving user (and other stakeholders) in any phase of the process, since the beginning following the logic of co- (co-desing, co-production, co-delivery, etc.). This sedimentation is the way to implement e-platforms, mobile APP, all devices, to facilitate feedback, peer-to-peer reviews, as well as modular chains productions, smart packages, new kind of service fruition, and so on.

- Implementation research encompasses studies of proof of concepts, frameworks, models, definitive designs, instantiations, and implementations.

Innovation is diffusion. In order to enlarge the use of innovative solutions, the information spread is foundamental; in order to motivated and stimulate other discovers, the dissemination of Service Research results is foundamental. It's cyclical, something to be replyed, again and again, to inspire, to instill, to provoke.

- Finally, research focuses on outcomes and valued end states, service demonstrations, behavior evaluations, findings, and knowledge generation.

5.3 Linkages, Frictions and Transitions of TSRDM Process

"Linkages" and "transitions" are key concepts in research on systemic change, social innovation, and transformation studies. They describe interconnected processes of change and the connections between different actors, systems, or events (Wittmayer et al., 2024).

- Linkages describe the connections, interactions, or relationships between different systems, sectors, or actors. These can be material (physical infrastructure), institutional (rules, policies), or social (networks,

collaborations).

- Transitions refer to gradual, substantial changes in societal systems, such as a shift from one technological, social, or ecological regime to another. Transitions are typically processual, unfolding in stages and involving multiple actors, institutions, and domains.

Linking analysis is crucial for understanding how changes in one step of the TSRDM process affect others, so-called "inter-system linkages" are often studied to analyze the spread and scalability of transitions across industries or social contexts. In TSRDM, mapping both linkages (the interactions that enable or constrain these processes) and transitions (the change processes) is vital for explaining complex social change.

What is a "Friction"?

Sutton (Sutton & Rao, 2024) describes organizational friction as anything that impedes progress, saps energy, and consumes time unnecessarily, like poorly designed procedures, burdensome communications, or lack of clarity about roles and responsibilities. He also cautions that many leaders are not aware of their "cone of friction," meaning the unintended difficulties they create for others through their decisions or organizational design.

Not all friction is negative; Sutton distinguishes between "bad friction" (bureaucratic hurdles, inefficiency, wasted effort) and "good friction" (processes that slow action for valid reasons, like promoting thoughtful deliberation or preventing reckless decisions). While bad friction should be minimized, good friction can foster creativity, safeguard ethical behavior, and support better outcomes by encouraging reflection and deeper problem solving

5.4 KEY TERMS AND WORKING DEFINITIONS

We align with the following definitions regarding the essential terms when applying the TSRDM approach (Lynham, 2000, p. 162):Key Term	Definition	Reference
Theory	A coherent description, explanation, and representation of observed or experienced phenomen	(Gioia & Pitre, 1990); (Lynham, 2000)

Theory building	The process or recurring cycle by which coherent descriptions, explanations, and representations of observed or experienced phenomena are generated, verified, and refined	(Lynham, 2000)
Product/intended outcome of theory	Twofold nature (Dubin, 1976): • Outcome knowledge, in the form of explanation and predictive knowledge, for example • Process knowledge, in the form of increased understanding of how something works, for example	(Lynham, 2000); (Dubin, 1976)
Knowledge base	The collection and integrated system of intellectual and practical concepts, components, principles, theories and practices that undergird a discipline or field of study and practice. A knowledge base defines the unique body of knowledge and thus the boundaries of knowledge for thought and practice in a field (informed by Chalofsky, 1996; Passmore, 1997)	(Lynham, 2000); (Chalofsky, 1996); (Passmore, 1997)
Research	Scholarly or scientific investigation or inquiry; close and careful study (Swanson, 1997, p. 10).	(Lynham, 2000); (Swanson, 1997)

5.5 GUIDELINES FOR DOING TRANSLATIONAL SERVICE RESEARCH AND DESIGN

Based on Torraco's (p. 126). (Book s coming to verify) description of theory building and Gioia and Pitre's (Gioia & Pitre, 1990) definition of theory,

"theory building can be described as "the purposeful process or recurring cycle by which coherent descriptions, explanations, and representations of observed or experienced phenomena are generated, verified, and refined" (Lynham, 2002, p. 223)

Theory-Building Concepts	**Functionalist**	**Interpretivist**	**Radical Humanist**	**Radical Structuralist**
Research Goal	To search for regularities and test so as to predict and control	To describe and explain so as to diagnose and understand	To describe and critique so as to change (achieve freedom through revision of consciousness)	To identify sources of domination so as to persuade and guide revolutionary

				practices (achieve freedom through revision of structures)
Theory building goals	To write up results - to show how the theory is refined, supported, or disconfirmed; to show what it tells the scientific community and the practitioners	To write up a substantive theory - to show how it all fits together	To write up a dialectic analysis — to show how the level of consciousness should change	To write up a rhetorical analysis — to show how the praxis should change

Table 2 Research paradigms affecting theory building (Lynham, 2000, p. 172)

6 WHAT IT IS NOT

TSRDM (Translational Service Research and Design Methodology) is not a general-purpose or traditional research methodology; it is specifically designed to bridge gaps between research, design, and engineering, focusing on overcoming the translational gap —the obstacles that prevent scientific discoveries from being pragmatically implemented.

What TSRDM does not include:

- It is not a methodology that works in isolation or can be applied without considering the integration across the disciplines of service research, design, and engineering.
- It is not merely a theoretical framework; it involves practical, actionable steps that guide the translation of scientific insights into real-world applications.
- It does not treat resources like goods, knowledge, or activities separately but subsumes them under the concept of service as a singular structuring paradigm.
- TSRDM is not meant as a fixed or rigid process but an evolving, explorative methodology that develops a unifying language to facilitate translational work.

These aspects differentiate TSRDM from traditional research methodologies that may lack the interdisciplinary integration or the focus on translational challenges inherent in complex social and economic systems

7 WHAT IT MIGHT BE

- A "unifying language" for accelerating the progress of translating discoveries into ...
- A systematic development of of reusable translational services and translational architectures as plan and medium for composing services and processes the recursively organize
- A continuously growing basis for service- and software engineering
- Cross-industry methodology

Figure 16 A Service Lens

8 FINDINGS

9 PRACTICAL IMPLICATIONS

10 OUTLOOK FOR FURTHER RESEARCH

11 CONCLUSION

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