People-first PPPs for Services (4PS): a possible way of developing society

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Abstract. The digital technologies and systems have considerable impacts on the development of entities, countries, and society. More than just finding solutions, they support the considerable expansions of human activities to observe critical situations of development and overcome them. To face up to these expansions, following service science, development is based on service ecosystems with an informational infrastructure comprising an information base, organizational and digital architectures. All activities of development are multidisciplinary, multi-institutional, multinational, and, what's more, they combine many aspects, societal, digital, political, legal, ethical. Despite their heterogeneity, the private-public partnership for services (4PS) provides them with a framework to foster efficiency, cognitive unity, and identity. Finally, this approach enables a clear picture of how the development and its outcomes are democratic, inclusive, responsible, and accountable.

Keywords. development of society, informational knowledge, transdisciplinary, contributory service, cognitive continuity, adoption, service system, complex service, PPP, 4PS.

1 Introduction

Digital technologies are often considered as tools providing solutions to problems, that are supposed to be crucial for the development of entities, nations, and societies. Today, many of these solutions stem from visions of artificial intelligence. They assume that, faced with such complex situations, human intelligence no longer has the capacity to extract substantial information from such vast quantities of data to make relevant development decisions, whereas artificial intelligence will. While such a perspective may well be interesting for motivating innovators of digital technologies, it seems immature for the development of the society.

Conversely, there is another way of looking at the role of digital in society. It is illustrated by many successful digital implementations as information systems, which automate most of business processes, enable heterogeneous actors to access, share, and manage information in real-life situations, support efficient activities, and even create new situations, new activities.

New expectations arise from the potential of new digital technologies. For instance, in the domain of Public-Private Partnership (PPP), which is "a tool to accelerate and attract investment in infrastructure" to develop nations, people in charge of them consider now that "digital technologies offer the potential for an improved management of resources and for changes in production and consumption patterns towards a circular economy by filling information gaps, reducing transaction costs, increasing efficiency, enabling new business models and making new forms of economic activity viable" [1]. The perspective of digital design oriented to the development of entities, nations, and society shifts from a human centered one to a humanity centered one [2].

So, at the level of humanity, any entity has a human part and a digital part. Although these parts are genuinely distinct in terms of modes of innovation and development, bodies of knowledge, responsibilities towards the future, they must be in concordance with each other discussing together despite their differences and agreeing on the decisions taken during all phases of development, in a conscious, responsible, and accountable manner. And, consequently, the claim of the authors of [3] is so crucial: "we get the future we invest in, so responsible actors must learn to invest wisely and systematically in improved win-win interaction and change". Furthermore, in this book, they contribute to place the AI era in a mature way for the future.

Paul Maglio, one of the pioneers of Service Science, recalled in [4] that service science was defined, since its infancy in 2010, as "the systematic search for principles and methods that can help us understand and improve all

kinds of value co-creation" [5]. Service Science is precisely the missing science to enable consistent discussions, in particular between the human parts and the digital parts of an entity. Its own knowledge enables specialists from different disciplines to discuss together in a conscious, responsible, and accountable manner, with the purpose to creating transdisciplinary services. Consequently, an entity has three parts, the human part, the digital one and the service part, the latter being responsible for the concordance between all these parts, at the levels of "structural compatibility (consonance)" and of "a common finality or shared purpose (resonance)" according to the viable system approach [6].

This is the context of this paper to explore the society development thanks to services. It first presents service science concepts critical for this topic: service intention, way of contributing to service, information base, cross-pollination space, informational infrastructure, service canvas. It then presents two crucial concepts for this topic: service system or complex service, and People Public-Private Partnerships for Services (4PS). It is oriented to socially conscious service systems design [7].

2 Service

2.1 Activities and contributors

Contributors to a service exchange with other contributors, in particular through information stored in the service by themselves or others. The service contributors are actors or builders. **Actors** fulfil responsibilities or perform activities through the service. **Builders**' activities and responsibilities concern the service itself in all phases of its life cycle – creation, design, exploration, implementation, operationalization, maintenance, evolution, expansion [8]. These activities concern the domains of administration, steering, watchfulness and monitoring of actors' and builder' activities, creation and implementation, compliance, feeding of core information.

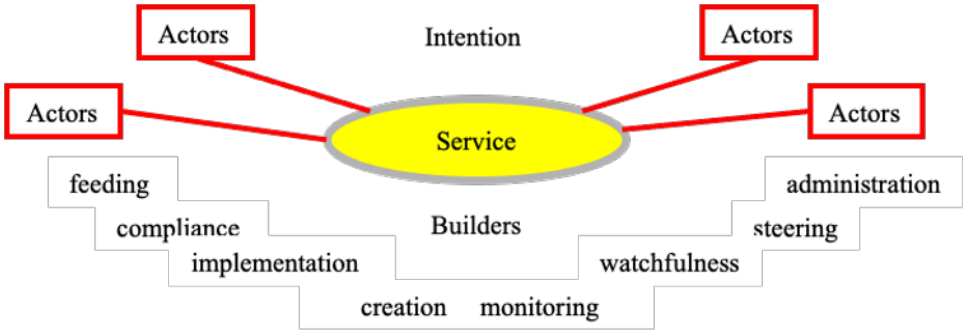

Fig. 1. Service activities

2.2 Service intention

All service contributors must know the **intention** of the service they are to pursue. It provides them a benchmark and facilitates the cognitive unity among contributors. It also provides a basis for presenting the service to external partners.

It comprises several components:

- **The declaration of intention** which presents the domain of exploration.
- The crucial targeted **situation** to overcome. The situation concerns different sectors of activities, different entities, and even different nations. Therefore, the intention involves different **stakeholders.**
- The **issues**: they look at the ecosystem to be induced by the service, and it describes stakeholder issues related to profession, management, business model, decision-making process. The list of issues serves as a continual reference throughout the service construction.
- The **value proposition** to explain how the service will contribute to the expansion of the activities, and thereby bring value. It also estimates the risks to be avoided, in the exploration and implementation of the service.
- The **service business model** [9] to be continuously updated as new discoveries emerge from explorations.

The intention is continuously improved and refined, to be more and more precise and formal, thanks the discoveries of the explorations throughout the service construction process.

2.3 Information base

The **information base** of a service is described using informational models, well known in information systems engineering [10,11]. They concern classes and relationships, actions, business and integrity rules, roles to determine rights and responsibilities, compliance with legal, regulatory, ethical, contractual, scientific, technical, standardized knowledge. They are the foundations of its information base. All these models constitute an informational language around the service. All contributors can read them. In this way, contributors can understand, discuss, and improve the issues raised by these models on the insertion of the future service into the ecosystems concerned. These models have a determinant role to establish the **informational infrastructure** composed with the information base and the digital and organizational architectures, covering all the digital and organizational implementations put in place to make the service operational. It is thanks to the informational language that contributors may propose evolutions whose interest may be shared, opened to criticism, improved, or rejected by the others engaging their own responsibility.

Contributors must highlight **informational knowledge** of their own domain that they consider essential to build the service. Informational knowledge must be actionable in the sense that activities performed through the service must be able to process it – create, update, retrieve, delete. It must be expressed in the informational language to be understandable by other contributors. This informational knowledge is often unknown in the contributors' body of knowledge: they must discover it, by discussing with contributors of other domains involved in the service. They can explore how future activities of their domain performed through the service can be nested in the activities of other domains thanks to the informational knowledge. And that is true for all contributors involved in any facet of the service: activity, information, digital, compliance, steering.

The figure 2 below shows the different kinds of informational knowledge in an **information base**. The information base is represented by the yellow ellipse. It includes the informational knowledge of activities represented by the red ellipse, that of digital by a blue ellipse, that of compliance by the orange ellipse, and that of steering by the cyan ellipse.

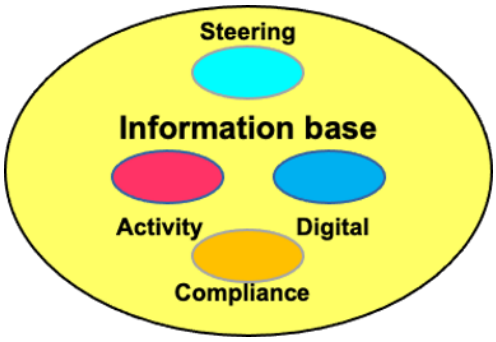

Fig. 2. Information base

Since a service is trans-disciplinary, trans-institutional and even trans-national, the contributors are heterogeneous from the point of view of their professions, their responsibilities, their entities. Even if they speak the same mother tongue, they will not necessarily understand each other. In fact, they speak the language of their profession, conduct reasoning familiar with their profession or their entity, which are often incomprehensible by other contributors. Thus, they lead to cognitive confusion.

They must express their position in the informational language. Then, despite their heterogeneity, they can understand each other with the perspective to design informational models essential for the service construction. They exchange views and continue explorations, not usual in their own activities, throughout the process of designing informational models.

They need a special space, named cross-pollination space [12], to support all activities around the service design and implementation, the informational models, the information base of the service. This space is also very important, to allow contributors to better understand the interlacing of their activities and receive the help they can expect from the service, while performing their activities.

It takes a central place in their cognitive cohesion. It facilitates the passage of the cognitive disruption caused by the emergence of the created and implemented service, to the cognitive continuity essential to the actors, to serenely assure their own activities. It is an instrument to facilitate the design and implementation of service adoption processes by actors, and not just adaptation processes. This approach is close to that of "emergence and phase transitions in service ecosystems" [13].

2.4 Way of contributing to service

2.4.1 Contributory service governance

All service contributors must be aware of the general principles they must follow to contribute. As example, here is the frame of the contributory service governance [14] which considers only contributory service. A contributory service is:

- Democratic: it must be open to criticize, refute, or revise. Its sense should be accessible to all concerned persons, as well as its informational models, its digital implementation, and its embedded knowledge, to allow consistent debates, requests, revisions, evolutions, or expansions.
- Accountable and responsible: it is constructed to be resilient to changes in its environment and sustainable in the face of evolution and expansion, at all levels: digital, informational and activity ones. It includes elements for watching the impact of the service on the ecosystems concerned. It includes elements designed to place its contributors in a resilient and sustainable cognitive situation to face up to their activities and responsibilities.
- Inclusive: it includes elements enabling the people concerned to master the meaning of service; it includes elements enabling the detection of people concerned by cognitive drop-out, or even exclusion under the pressure of the introduction of the service; it includes elements that enable interested people to take part in the process of exploring, revising, evolving, expanding, or smoothly integrating the service into society.

2.4.2 Protocols between contributors

A service gives rise to new "relationships formed by actors that interact for the benefit of the whole system in which they are involved. They find own benefit from the benefit created for the system in which they live and act" [15] (A4A approach). In this way, new situations arise where information is exchanged between actors, and most of them require protocols to foster fluid attitudes and behaviors among actors, and the establishment of lasting, trusting relationships between them. These protocols are formalized by rules and practices that actors must respect with others. They concern, for example, modes of information sharing, coordination of activities, co-creation of service expansions and even co-creation of new services.

2.5 Service canvas

The core elements of a service can be synthetized in the service canvas. It comprises: the intention, the way of contributing, and the informational infrastructure.

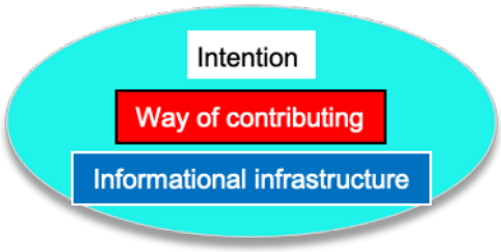

Fig. 3. Service canvas

3 Complex service

Entities facing broad situations, like Smart City, often require a broader, more committed response than a set of disparate, scattered services. They require service systems. A service system is described [16,17] as "a dynamic value co-creation configuration of resources, including people, organizations, shared information (language, laws, measures, methods), and technology, all connected internally and externally to other service systems by value propositions". All the services, which compose a service system, its core services, are no more disparate and dispersed: the service system determines their composition in an order where they all support each other, especially in their exchanges and evolutions.

Let CS be a service system composed of core services cs: cs1, cs2, cs3. This composition covers all the service canvas dimensions of the core services cs. Therefore, CS is considered as a service in its own right, called a **complex service**, with all the properties of a service presented above, and its canvas is obtained by the composition of the cs canvas.

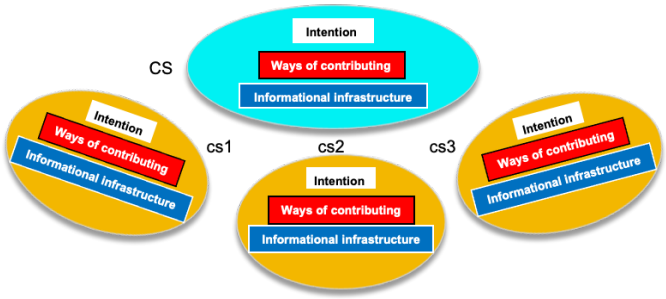

Fig. 4. Canvas of the complex service CS and of the core services cs1, cs2, cs3

3.1 Composition of canvas

Here are a few highlights of the canvas composition.

- Since CS has a wider scope than any of the core services cs, the CS intention encompasses the cs intentions, the CS value proposition is larger than just the sum of the cs value propositions, and the CS stakeholders are cs stakeholders and, possibly, new stakeholders interested in the new dimensions of CS.
- Since the complex service CS is composed of core services cs, all cs contributions are CS contributions, and therefore, all cs contributors are CS contributors.
- An important aim of a complex service is to ensure that core services are no longer dispersed, isolated from each other. Thus, for any cs, contributors of other core services or of the complex service, who need to access and even manipulate cs information, become actors of cs. The cs protocol between its contributors must be adapted to these new contributors.
- It is recommended that CS and all cs have the same contributory service governance to facilitate contributor behavior.

The CS information base is built on the cs information bases. Two main situations can arise:

- *Two* core services cs1 and cs2 can have informational overlap: they share a same set of information. Since cs1 and cs2 belong to the same complex service CS, there must be a protocol to govern the interwoven activities of cs1 and cs2 contributors on the informational overlap to maintain the information consistency. This protocol must be added to the CS protocols between contributors.
- *Several* core services share the same set of information. Such a situation creates a critical situation of redundant information with the risk of inconsistent information at the CS level. Across all these core services, it requires scattered ongoing efforts to update and verify information, guarantee its accuracy, maintain trust, and ensure its protection and access. This situation can lead to the creation of a new core service, called an **information common good**, inspirated by the natural common goods [18], whose information base is the common set of information, and which guarantees the information consistency to all core services concerned.

3.2 Steering a complex service

The steering committee of a complex service CS is responsible for the CS canvas and of its relations with the canvases of its core services. Its mode of activity is consistent with its way of contributing. In the case of information common goods, it is responsible for providing the management rules by establishing their informational commons [18], and then it is responsible for managing them.

Because of the wide scope of CS intention, the mode of construction CS is **exploratory**. Indeed, the intent is too vague to serve as a basis for design. The exploratory approach is based on initiatives in concordance with the intention. The CS steering committee must be open to initiatives coming from any CS contributors. It establishes a **service innovation roadmap** [19] and decide which initiatives to launch as explorations. It will monitor them through a **service initiative committee**, composed of the initiating team and other CS contributors who want to get involved. When an exploration is completed, its results trigger the review, refinement, or expansion of the service innovation roadmap as well as the intention and the informational infrastructure.

Complex service and its core services **evolve** under the impetus of innovations and expansions envisaged by contributors, or under the pressure of changes in the environment. Any CS evolution can lead to the evolution of certain core services. In the same way, evolution of core services can lead of the evolution of the complex service and other core services. Then, some crucial questions arise, and their answers must be included in the CS protocols between contributors.

- Who is proposing an initiative to help CS/cs evolve? A team of initiators, composed of CS contributors.
- Who decides whether to launch, reject or put on hold the initiated evolution? The CS steering committee.
- Who manages the activities of the evolution process? The service initiative committee.

- Who monitors the activities of the evolution process? The CS steering committee.
- Who assumes accountability and responsibility for the evolution? Both, the service initiative committee, and the CS steering committee.
- Who manages the ecosystem created from the CS? The CS steering committee.

4 People-first Public Private Partnership for Services (4PS)

Many of broad issues mentioned above in complex services concern the development of society. Service Science has already illustrated how digital potential can be invaluable in supporting it [20]. Since the responses to these issues have wide-ranging effects on society, require a long timeframe, and involve multiple public-private partnerships, public authorities are major stakeholders, and their mode of governance is important to consider [21].

Face such similar issues, the infrastructure sector is used to setting up collaboration between public authorities which have the legitimacy to develop, and private companies which have high level knowledge, savoir-faire, and experience. Such a collaboration requires a legal framework to govern calls for tenders, selection, establishment of contracts between the concerned parties. This legal framework tends to guarantee or enforce values such as fairness between parties, as well as probity and accuracy.

Under the impulsion of United Nations Economic Commission for Europe [22], the infrastructure sector renews the traditional instrument of public procurement by introducing a new instrument, public-private partnerships (PPPs), to consider broader situations, like partnerships over long periods, sometimes decades, more complex domains, all kinds of tangible infrastructures such as roads, railways, bridges, hospitals, schools, etc.
However, the PPP framework appears too narrow to consider broader societal development issues such as the UN's 17 Sustainable Development Goals [23]. The UNECE has therefore launched a new PPP type, People-first-Public-Private-Partnerships (PfPPP), to place the needs of the population at the center of PfPPP activities within the SDG framework. Since PfPPP issues are so broad, PfPPP is transdisciplinary, trans-institutional, even transnational.

Thus, PfPPP and complex services have similar intents, with some important differences:

- PfPPP focuses on financial, legal, contractual, anti-corruption aspects [24], whereas complex services focus on the activities.
- The intention of traditional PfPPPs is to provide a tangible infrastructure, whereas that of complex services is an informational infrastructure.
- PfPPP intrinsically considers the specific role of public authorities, which is not the case for complex services.

The People-first Private-Public Partnerships for Services (**4PS**) merges PfPPP and complex services. Here are some of the highlights of 4PS.

Any 4PS is considered as a complex service SC, with its steering committee and canvas.

The complex service SC is decomposed into two core services, which are themselves generally complex services: the Core service for finance (Csf) dedicated to financial, legal, contractual, anti-corruption aspects, and the Core service for activities (Csa) dedicated to the activities to construct SC.
The SC protocol between contributors specify the relations between Csf and Csa contributors.
For each result as tangible infrastructure, there is a specific core service of Csa, whose intention is to steer the realization of tangible infrastructure based on the information stored in Csa.

People of public authorities involved in the 4PS can be effective contributors to the construction of the Csa because of their knowledge. In addition, the public authorities have the role to fulfill, that of **legitimizing** the results of the 4PS initiative at the government level. That is the subject of the next paragraph.
This legitimizing role is generic to all 4PS. So, it might be efficient, at government level, to set up a generic **Informational Public Authority** to fulfill it. This role consists of guaranteeing the public interest in the expansion of the public space resulting from the 4PS implementation in society. To this end, it must watch the 4PS initiatives and activities throughout the 4PS life cycle, from the earliest stages of inception, creation, design, and not just observe the effects of implementation: indeed, at the implementation stage, it is very often too late, and even impossible, to redesign the Csa complex service. Throughout the 4PS construction process, the informational public authority can make recommendations, suspend 4PS decisions to obtain agreement at the government level. It can also identify the need to adjust, modify, or create certain legal regulations to deal with new public situations arising from 4PS. To fulfill these responsibilities, it has access to the canvas of the 4PS complex service and its ongoing evolution. It follows all debates and decisions made around the cross-pollination space of the 4PS complex service. It knows its informational base. It ensures that 4PS complies with legal, regulatory, ethical rules. Finally, it **legitimizes** the 4PS results at the government level.

In addition, the informational public authority can establish a generic way of contributing for any 4PS, and thus transform it into an instrument of socially conscious service systems [7]. It can also take and support initiatives to create **responsible learning centers** [18] to disseminate knowledge, know-how and skills [8] relating to complex services and 4PS.

5 Conclusion

This approach, centered on People-first Public Private Partnership for Services (4PS) of developing society is based on the activities involved in constructing complex services, and is not limited to the financial, legal, contractual, anti-corruption aspects of classic PPPs. By considering the complexity behind the construction of complex services, it enables to investigate the transformation of activities brought about the implementation of these complex services and the issues underlying them to avoid cognitive exclusion through the implementation of adoption processes. By clarifying the spaces where decisions are taken, by considering informational knowledge of the various contributors, which is needed to design the complex service, by encouraging the initiatives of any contributors, it promotes the democratic aspects of the whole 4PS process. What's more, the approach is necessary exploratory, and therefore allows several possibilities to be explored to obtain a result that is much better adapted to the environment, the various interests of the stakeholders, and the possible adoption processes, than either a top-down or bottom-up approach. In this way, it places decision makers, particularly at the design stage, in a more responsible and accountable position since they are required to consider the impacts of their decisions. It enables a genuine approach to innovation, making it clear that it is in concordance with every development in society, at the people level. Furthermore, it allows to consider the most advanced digital technologies in a responsible context. This paper contributes to opening the doors of Service Science to society development and vice versa [14], notably to take into account already in the creation phase the issues of sustainability and resilience [25-28].

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