Perceived Quality of Artificial Intelligence in Smart Service Systems: A structured Approach

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Abstract. Smart Service Systems are becoming increasingly important in almost all industries and areas of life. In order to make use of data from the Internet of Things for individualizing and automatizing service offerings, Artificial intelligence (AI) is a key technology. However, only little is known about how users and potential customers perceive quality of these AI-based Smart Services and how companies can develop them accordingly. To this end, our paper presents a framework concept for addressing quality of Smart Services systematically. The framework integrates known and novel quality aspects and thus supports a systematic and quality-focused development. In addition, our paper presents exemplary AI-relevant quality aspects in more detail. First of all, AI-based Smart Service Systems will be characterized in more detail and existing quality concepts will be presented in order to enable a holistic quality assessment.

Keywords: Smart Services, Artificial Intelligence, Quality.

1 Introduction

The progressive developments in digitalization and, in particular, the increasing integration of physical objects with sensor technology and communication capability are changing the existing service systems in nearly all industries and areas of life [1]. The data collected on the Internet of Things permit comprehensive conclusions about the condition of the physical objects, their utilization and their application-specific context. This information provides the basis for offering individualized and sometimes automated smart services, which constitute individually configurable bundles of bundles of products, digital services and physically delivered services [2]. The development and provision of such service packages require an orchestration of physical objects, technologies, data, persons and organizations – thus smart services are understood as complex service systems [3]. Methods of artificial intelligence (AI) play a key role in tapping the potentials of individualization and automation within such systems [4]. For example, AI is used for autonomous extraction of the information required for individualization from a large pool of data, some of which are not structured at all, or for a more automated or even autonomous provision of smart services, for example, by the use of physical or digital robots [5].

Notwithstanding the undeniable opportunities, many enterprises face a number of challenges in the development of smart services [6]. Among other issues, the question arises of how smart service systems can be designed in such a way that the added value perceived by potential customers outweighs the risks involved, such as poor protection of sensitive data or loss of control [7]. The design of the AI elements plays a significant role in this regard as well: On the one hand, self-learning algorithms and autonomous systems can add value by way of individualized provision of services. On the other hand, the loss of personal relationships and the use of complex and therefore non-transparent algorithms have a negative impact on the risk perceived. Research on smart service systems and the use of artificial intelligence is still in its early stages in this regard and provides hardly any knowledge about the expectations of potential customers [8]. There is also a lack of suitable concepts, methods and tools to develop smart services systematically [9]. In this context, one of the key issues is to better understand the perception of quality by potential customers of smart services and thereby support business in the development of successful and accepted solutions [10]. Even though established concepts exist already regarding quality perceptions of individual elements of smart services (e.g. digital services), knowledge about the perceptions of data-based bundling or the use of AI methods and tools is scarce to date.

2 AI-based Smart Service Systems

2.1 Characterization of Smart Service Systems

With a view to providing a systematic view of the quality of AI-based smart service systems, these are characterized first. Despite their increasing significance, a distinct definition of smart services has not yet evolved in the scientific literature. Nevertheless, it is possible to identify in the existing conceptual publications some common characteristics that are relevant for our article [11, 3]:

- Smart services are based on physical objects equipped with sensor technology and with networking capability, referred to as intelligent products [12], which collect status, utilization, and environment data [13].
- The provision of smart services is based on intensive utilization of data, where sensor data, user-generated data as well as data from external sources are used [14].
- The data available are collected on digital platforms, analysed and interpreted by algorithms and transformed to application-specific information [15].
- Based on the information acquired, smart services represent service packages customized to the specific context and individual needs of customers [2].
- Depending on the type of smart service, they can comprise digital and physically delivered service elements in varying proportions [16].

These characteristics of smart service systems are highly significant for the development of an integrative framework for quality assessment. The relationship between AI and smart service systems is described in more detail in the next section.

2.2 Artificial Intelligence in Smart Service Systems

The concept of artificial intelligence refers to IT solutions and methods completing tasks autonomously, where the underlying rules for processing are not explicitly predefined by humans [17]. The umbrella term of AI combines different concepts for model forming, various learning methods and algorithms [18]. The superiority of AI in comparison with conventional analytical methods stems from its capability to process and structure large amounts of data autonomously. Some of the main reasons for the growing significance of AI are, on the one hand, the existence of large amounts of data produced by the increase in physical product networking, which constitute an essential basis for the application of AI and, on the other hand, the decreasing cost of processing power required for data processing [4]. Machine learning methods are the technological core of AI. These algorithms extract information autonomously, recognize regular patterns in data, adaptively respond to a changing environment and predict future events. The typical domain of AI is wherever highly complex and very large volumes of data exist that are unmanageable for humans. Mastering this complexity generates value, for example, in form of new customer insights for an individual adaption [19].

The possibilities of gathering information by pattern recognition and the prediction of future events by the use of AI have a high impact on smart service systems since the use of these methods offers numerous opportunities: The development of new services, raising the degree of individualization or automatic performance of activities of service employees. At the same time, AI also changes the nature of the encounter and interaction between provider and user. The potential for individualization and automation of an AI-based service depends on the extent to which the algorithm supports the personnel or should intervene in the activities in a way which is transparent to the customer or may perform them completely autonomously with the customer [8]. The application of AI in smart service systems is illustrated in figure 1, using the well-known layer model.

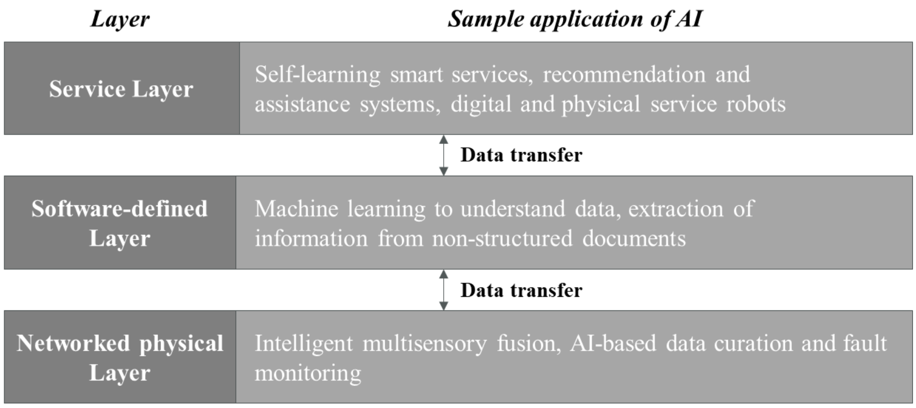

Fig. 1. Sample application of AI in smart service systems
(Source: [2] and [4])

The model comprises three layers, where the networked physical layer is used as the basis for data acquisition. The next higher layer is a software-defined layer, where data processing occurs. The findings gathered from this layer are utilized at the service layer to develop and deliver individualized and to some extent, automated solutions. Tasks can be efficiently supported or even performed autonomously by AI applications at each of these layers. Sensing technology used for acquiring and transmitting the data may be susceptible to errors and, for example, produce spikes or fail completely for certain periods. The loss of data quality thereby incurred can be compensated by AI by detecting implausible or missing values and replacing these by estimated values. Frequently this often involves not only individual sensors but entire infrastructures and wide networks of devices, the collective data of which need to be arranged in an intelligent way. Moreover, usually data from outside sources are used for contextualization and also require curation. At the software-defined layer, information and findings are extracted from the data and the advantages of machine-based learning methods can unfold here. Once the model calculations have revealed regular patterns and which characteristics are interrelated when certain events occur, the personnel at the service layer can be supported in their work by AI systems or it is even possible to develop self-learning and autonomously acting smart services (e.g. chatbots). In this way, AI knowledge can be used to extract knowledge about situations, personal habits and preferences of customers to produce an individual adaptation which improves the resulting quality of the solution.

However, this involves some challenges. On the one hand, the technology must be capable of reading different formats of unstructured data, process and analyse large amounts of these in real time, solve problems autonomously and improve itself continuously. On the other hand, the design of AI-based smart service systems accepted by users involves a number of questions: How and on which basis are decisions made? Do users want to interact with a machine at all and do they want to know that their contact is a chatbot and not a person? How can such interaction be designed in an empathetic way? How much decision-making power is automated? How deep should AI intervene in the personal actions of personnel and customers? The following chapters aim at providing initial reference points for the design of smart service systems that are perceived as high-quality service systems and thus accepted by customers.

3 Quality Aspects for Smart Service Systems

3.1 Relevance and Requirements

Safeguarding a high quality is one of the core issues in the development of smart service systems. The challenge is, on the one hand, to include different service elements into the quality view: intelligent technologies, data, digital services and physical services as well as their interrelations. On the other hand, systematic collection and analysis of possibly sensitive personal or operational data involves new risks and insecurities perceived, for example, with regard to data security, the ethics of algorithms or perceived surveillance by sensors [7]. These factors influence the perception of the quality of smart services on the part of the users and for this reason, the conceptualization of perceptions of quality is a core subject of research [10]. The identification of useful quality categories and the criteria to be used for evaluation may support solution providers in their endeavour to meet customers' needs better, create added value and thus establish services successfully in the market. Quality categories and criteria can be used in this context as some kind of development guideline to reduce uncertainties and be applied in different phases of smart service development. For example, quality categories can be used to identify and analyse the requirements of potential customers in a structured way. Specifically in early phases of development of complex service systems, users often find it difficult to express expectations and needs precisely and comprehensively without having predefined categories at hand. Furthermore, the categories and criteria may already be used at an early stage in iterative test cycles to evaluate concepts and prototypes with users and thereby prevent undesirable developments [20]. However, to offer added value to service providers, a quality view should meet some requirements resulting from the characteristics outlined in the characterization of smart service systems [21]:

- It should include all smart service elements perceived by customers.
- A concept should permit an assessment of different design variants of smart services, ranging from entirely digital ones to data-based interactions between people.
- It should be compatible with other models and methods in smart service engineering.
- Specific characteristics of AI-based Smart Services should be considered.

With a view to raising the perception of the quality of AI-based smart service systems, the following section provides an overview of existing approaches to perceived quality as well as about related concepts that are used as a basis

3.2 Existing Quality concepts in the context of Smart Service Systems

For simple products, objective criteria such as, for example, durability or consumption of resources are suitable for a quality assessment from the perspectives of provider and user. However, since smart service systems are complex solutions, users in particular lack the technical knowledge to make an objective assessment. Moreover, many service elements of smart service systems have a high degree of intangibility (e.g. digital process activities, algorithms and data), which makes an objective assessment even more difficult. Objective quality criteria are therefore substituted by the subjective construct of service quality. This describes the ability of a provider to produce the quality of a primarily intangible service that requires the participation of the user in accordance with the user's expectations at a certain level of requirements [22]. Hence, the quality of the smart service system should attain a specific performance level, which in turn is defined from the perspective of the users. With a view to making perceived quality measurable, numerous constructs have evolved in science, which permit assessment on the part of users by means of quality categories and criteria [23].

Probably the most widely used quality model for services provided by persons is the SERVQUAL model of [23]. The model comprises five different quality dimensions (tangibles, reliability, responsiveness, assurance and empathy) that are used by customers to evaluate service quality. There are also other models and approaches in scientific literature, which make service quality measurable either in other industries or with other or specific focuses of research. Numerous different quality models also exist for digital services offered on the Internet. For example, [24] have transferred the SERVQUAL model to digital services and highlighted the categories of efficiency, system availability, fulfillment and privacy as generally applicable quality criteria in the E-S-QUAL model.

In addition to monolithic quality models, there are also approaches that consider the quality assessment of combined smart service elements [25]. E.g. [26] address hybrid service packages with a combination of the quality dimensions from SERVQUAL and E-S-QUAL, [27] combine dimensions from SERVQUAL and Technology-Acceptance-Model (TAM) for quality assessment of product/service systems. However, there is no model known to the authors that address all elements of a smart service.

Furthermore, there is no distinct and specific model for the perceived quality assessment of AI-based services to date. Nevertheless there are indeed related publications addressing the design of AI applications, which therefore fit the objective mentioned in previous section. For example, with regard to the acceptance of AI, one of the questions is how to design the interaction between users and machines in a meaningful way that is compatible with human needs. This implies that major ethical and social issues about the use of artificial intelligence get into focus in addition to the technological development. However, with regard to such discussions it should be noted that social compatibility is not determined directly by technology but rather how it is used in the first instance. It is necessary to find and define an appropriate framework for this. For quality assurance of AI-based decisions, there are already some principles available which can be used in designing the framework of use. In the first place, it is important to establish transparency and traceability. This is true for both the calculations and the decisions taken on this basis. As a consequence of the complexity of the processes, traceability is ensured only to a limited extent, however, efforts should be made to achieve it as far as possible. Moreover, such decisions and their formation have to be documented. This is the only way how information can be given about the parameters used for the decision, which in turn generates transparency. In addition, the consequences of the use of AI have to be revisable if certain decisions should be obviously wrong and human intervention and correction becomes necessary. One criterion associated with this addresses the users' wish to remain the final decision-making instance in case of doubt. This is true at least until the outcome quality of AI reaches a level which is generally accepted by the stakeholders involved [28]. The framework for explaining the acceptance of AI in customer contact situations proposed by [8] is a key contribution to the identification of quality aspects of AI-based smart service systems. In this context, the self-service technology model according to [29] serves as a basis involving various influence factors regarding the open-mindedness towards and long-term adoption of new technologies. On this basis, [8] supplement another three factors for the acceptance of AI applications: Security concerns, trust, and perceived discomfort. The first two factors appear to be intuitively plausible as prerequisites for the acceptance of AI applications. Customers recognize the added value of AI-based services such as, for example, speed or convenience, and want to benefit from these. However, this requires sharing personal information which is basically worth to be protected. This loss in privacy requires advance trust in the service provider; otherwise the advantages of AI-based applications cannot be utilized. The aspect of perceived discomfort requires a more detailed explanation: this relates to any suggestions of the algorithm which ignore social norms and may therefore cause discomfort. In summary, the use of AI enables the customer to utilize individually tailored services, save time and generate more comfort. However, these advantages involve the risk of severe failures of service delivery, loss of control and curtailment of privacy

3.3 Assessment of existing approaches

The approaches identified in literature provide a suitable basis for a concept of quality perceptions in smart service systems and initial reference points for relevant quality categories and criteria. However, none of the approaches identified includes all service elements of a smart service system or allows a comparative view of different design variants. Those approaches which address more than one service element usually combine existing quality models, however, are not conceived for the specific characteristics of AI-based smart service systems or address only partial aspects of perceived quality. Moreover, the quality models are not geared to the systematic development of integrated service packages and therefore their structures are not mutually compatible. For this reason, the next chapter of the present article proposes an integrative conceptual framework which incorporates the existing quality categories and criteria but also supplements these with additional aspects and, hence, accommodates the specific character of AI-based smart service systems.

4 Integrative Conceptual Framework for Quality Assessment of AI-Based Smart Service Systems

4.1 Structure of the Integrative Conceptual Framework

The integrative conceptual framework, which was first introduced by [30], is structured as a matrix and comprises 12 design fields of smart service systems. They can be evaluated using the predefined quality categories and criteria (cf. figure 3). Structuring the horizontal axis was done using the design dimensions of resource, process and outcome to achieve compatibility with existing tools and models of smart service engineering [31]. Structuring along these dimensions is also frequently applied in current service research, for example, for smart service system structuring or assessing the effects of digitalization [32]. The resources dimension comprises resources required for the smart service system, i.e. technical infrastructures, products, algorithms, technologies and competencies of individuals. The process dimension describes the delivery of the smart service as a sequence of activities of the stakeholders of the ecosystem and is characterized by interactions between people (customer and provider), information systems (e.g. digital services) and physical objects (e.g. intelligent technologies and sensors). The outcome dimension addresses the perception of the usefulness of the various service elements as well as the overall solution from the customer perspective. Evaluating the various dimensions enables developers to obtain more precise information about potential causes of negative perceptions of quality and address these more specifically in subsequent development cycles. A negative overall perception may be attributable either to the delivery process or to the resources employed; the related measures for improvement derived therefrom differ accordingly.

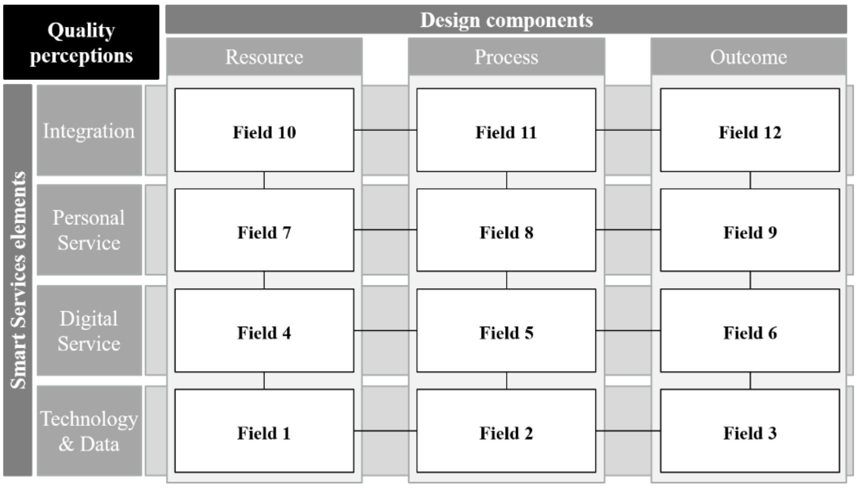

Fig. 2. Conceptual framework for quality assessment of smart service systems (Source: [30])

The vertical axis of the integrative conceptual framework comprises the perceivable elements of an AI-based smart service system: Technology and data, digital services and services delivered physically. These are derived from the layer model of smart service systems (cf. figure 1) and were adjusted to the perspective of users and the elements perceivable to them. The “Technology and data” service element comprises the basis of data acquisition and transmission, i.e. physical objects with networking capability, which collect status, usage and context data. While field 1 of the conceptual framework considers the fundamental equipment as well as aesthetic aspects of the intelligent technologies, field 2 addresses the perceived quality of the technologies in the delivery process. Among other items, this also involves AI techniques which make it possible to integrate and pre-condition the various sensor data. Field 3 holds quality categories which make it possible to evaluate the data basis acquired by means of the intelligent technologies from the user’s perspective. The data basis produced is used as a structure factor in the “Digital services” service element together with ready-made content and algorithms created by the provider (field 4). These are translated into different forms of added value in a digital process, utilizing also other information, user activities or networked objects (field 5). New insights about the current condition or the usage process emerge (e.g. of a physical object, of one’s own body, of public infrastructures). They already constitute per se an added value of the digital service within the smart service system and are evaluated in field 6. Furthermore, however, it is also possible to create digital value-added services from the data basis generated such as, automated forward-looking route planning or other personalized recommendation systems. Aspects like the design of standardized interfaces, real-time data availability as well as the development of transparent algorithms are key success factors of AI-based service systems. In addition, working out privacy and security concepts for the data, part of which are highly sensitive, plays a key role in the design of digital services. Frequently there is some conflict between the necessary anonymization of the data and the creation of appropriate added value by the individualization of data [33]. Moreover, the use of AI techniques leads to new and automated forms of interaction in the digital process. In addition to digital services, services delivered physically will continue to play a key role in AI-based service systems also in the future [16]. In this context, two different forms can be distinguished. On the one hand, these are personal services, the resources of which are the capacities and competencies of personnel as well as physical infrastructures of the provider (field 8). On the other hand, services delivered physically may also be provided by automated or autonomously acting systems made available by the provider as a structure. Both forms are characterized by an interactive process between providing and requesting units which requires physical activities (field 8). A parcel delivery service is an example of the two forms. Parcel delivery may be performed by a person using suitable equipment (vehicle, digital assistant, etc.) or by an autonomously acting service robot (e.g. a vehicle or a drone). The perceived benefit of the solution or the physical intervention is addressed in field 9 of the conceptual framework. In the short and medium term, the processes of services provided by persons will particularly comprise activities for solving complex tasks that require creative, intuitive or empathetic abilities of personnel or physical interventions on persons themselves or in their close personal environment [34]. On the other hand, repetitive knowledge-based routine tasks will increasingly be provided with the aid of AI-based digital services and are therefore addressed in the fields 4 to 6.

Distinguishing between the perceptions of quality of digital and personal services makes it possible for enterprises to apply the same conceptual framework within the smart service system for the development of various types of service offerings and take their specific characteristics into account: From digital information services (e.g. data visualization) through digital value-added services (e.g. digital parking lot booking) to digitally supported and physically delivered services (e.g. demand-driven waste collection). The "Integration" service element was added to the conceptual framework as another core element because synchronization of the above described service elements and safeguarding a constant quality level across all service types and activities between the various parties involved should be regarded as essential drivers for the development of high-quality smart service systems [35]. In addition to the integration of structure factors (field 10), particularly the integration of digital and physical process elements (field 11) and the perception of the overall benefit of the smart service system (field 12) are key items to be assessed.

4.2 Quality Aspects for AI-Based Smart Service Systems

The preceding section presented the structure of the integrative conceptual framework that is used for structuring categories and criteria for the quality assessment of smart service systems. In addition to numerous well-known criteria, also some data-specific and AI-specific quality criteria were identified and included in the conceptual framework from the expert interviews and a follow-up search in literature. Figure 4 shows a selection of these criteria along the 12 fields of the integrative conceptual framework that can be utilized together with other categories and criteria for the assessment of the perceived quality of AI-based smart service systems.

Table 1. Summary of sample quality criteria with relevance for AI

No.	Description of quality field	Exemplary quality aspect with regard to AI or data
1	Perception of the intelligent technologies used for data acquisition as well as external data sources.	• Appropriateness of sensor measurement intervals for use case • Perceived relation between required data and promised value • Selection of external data sources for the application • Perceived surveillance or discomfort using smart technologies • Transparency and understandability of a privacy concept
2	Perceived quality of the use of intelligent technologies (e.g. wearables) and data curation.	• Convenience of the use of smart technology in customer journey • Intuitive and low-error operation of technology • Perceived control over data acquisition process • Trustworthiness of technology • Intrusiveness in personal space and domains
3	Perception of the data basis generated and the contribution of the technologies and data to the overall benefit.	• Reliability of connectivity and data transfer • Trouble-free data transmission to back-end • Up-to-dateness, precision and completeness of the data • Perceived credibility of the results • Relevance of the data for use case • Realization of innovation potentials due to use of data
4	Perception of the predefined content of digital applications and algorithms used.	• Up-to-dateness, transparency of the analysis methods used • Perceived barriers for integrating user-generated data • Compatibility of interfaces with application environment • Protection of the system against unauthorized access
5	Perception of the interactive usage process of the digital service	• Intuitive use of digital tools (e.g. for data analysis) • Naturalness of AI-based interaction forms (e.g. chatbots or voice control)

	adapted to individual requirements.	• Quick & adaptive system interaction • Adaptability of digital processes to real-time data • Ex-post documentation of automated activities
6	Perception of the data visualization and the benefit created from value-added services.	• Perceived support by digital assistants • Constant degree of fulfillment of the service • Added value from use of information • Clarity of data visualization • Reduction of complexity for users • Perceived increase in process efficiency
7	Perception of the personnel required for delivery, the equipment used and the physical environment.	• Credibility and relevance of personnel competencies in handling AI applications • Up-to-dateness and capability of personnel equipment • Safety precautions when using physical service robots • Functional scope of physical service robots
8	Perception of the interactive process, where persons or physical objects are brought in by provider and user.	• Unobstructed access to (real-time) data of users by personnel • Transparent and plausible course of action of the personnel • Short-term and quick adaptation to customer’s wishes and real-time data • Contentment despite AI-based extension of personnel skills and knowledge
9	Perception service result and contribution to the overall benefit and to the personal relationship.	• More efficient delivery with the support of digital assistants and physical service robots • No deterioration of social interactions by digital support • Familiarity because of personal interaction
10	Perception of the integrative quality of the resources used and the stakeholders of the ecosystem.	• Balanced involvement of physical, digital and personal components and functions • Trustworthiness of the stakeholders involved in the ecosystem • Absence of dependence on individual partners or technologies
11	Perception of the	• Coordinated process logic between digital and personal ser-

	integrative quality and allocation of tasks among the stakeholders.	vices • Reasonable assignment of activities among users, providers and technical systems • Clear role and task description for user activities
12	Perceived overall benefit of the smart service system.	• Improved match of solution with the individual customer issue • Higher emotional and social added value by the use of AI • Enabling of service-oriented business model variants (e.g. subscription).

The sample list of quality criteria with relevance for AI shows already that numerous different aspects need to be considered for the assessment of smart service systems. Depending on the design of the smart service system, not all of the criteria in the conceptual framework are of interest, because either the service elements do not play a role or the prototype defined at the development level cannot yet be evaluated with respect to the criteria. A useful application in the development of smart services occurs, for example, in the testing phase. For an assessment of a specific smart service prototype in a specific phase of development, the quality categories and criteria included in the integrative conceptual framework need to be selected individually for the specific test groups addressed.

5 Summary and Outlook

The article presents an integrative framework for the quality assessment of smart service systems which includes quality aspects of existing approaches and methods. Moreover, specific quality criteria were supplemented which address the use of artificial intelligence in smart service systems. Arranged in 12 design fields, the conceptual framework is structured in such a way that either all service elements perceived by customers or only those parts that are relevant for development can be explored. In this way, our research contributes to the current discussion about an increasingly collaborative and interdisciplinary development of smart service systems [6] and the distributed value creation on smart service platforms [33]. The integrative conceptual framework can be used, for example, by enterprises to extend quality assessment to service elements provided by third parties (e.g. AI tools), structure quality-related requirements or assess integration activities as a key element of smart service systems. Structuring along the service dimensions of structure, process and outcome additionally permits a technical-logical compatibility with existing methods and tools of service engineering.

The large number of quality categories and criteria identified for the assessment of a smart service system suggests that the conceptual framework is not a suitable measuring instrument for customer surveys like SERVQUAL. Rather, the conceptual framework is addressed to organizations that want to consider relevant quality aspects in the systematic development of AI-based smart service systems and test their fulfillment. Which categories and criteria from the conceptual framework are actually relevant depends on the service elements to be integrated, the development phase and the maturity of prototypes of service elements created. Deliberate focusing on quality perceptions in smart service systems and considering various forms of interaction (human-to-human, human-to-machine and machine-to-machine) makes it possible that the integrative conceptual framework gives a first impression of new methods and approaches that attempt to merge a humanistic and technology-centric service paradigm [36]. Even though the influence of intelligent technologies and data on service delivery is continuously increasing, the subjective perception of potential users and personnel in the development of high-quality smart service systems should continue to play a key role.

However, apart from the potential outlined it is necessary to highlight some limitations of the integrative conceptual framework. To some extent, the quality categories and criteria were adopted from empirically validated quality models and some were supplemented based on expert interviews and workshops. Even though the assessment of smart service systems using the conceptual framework has already proven to be highly useful in several projects in practice, a large-scale validation of the interaction among the criteria and/or categories does not yet exist. It is true that a generally applicable validation can hardly be realized because of the application-specific selection of design fields, categories and criteria and this should be taken into account when utilizing the conceptual framework in practice. Furthermore, particularly the AI-specific quality criteria should be regularly reviewed and adapted because of the rapidly progressing technological options. With regard to the significance and weighting of the individual assessment categories, it is also necessary to consider potential differences between applications, industries addressed and the relevant culture area [37]. For evaluating the significance of different elements and criteria, decision techniques, such as the Analytical Hierarchy Process (AHP) could be applied.

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