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Service quality description – a business perspective

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***Abstract*—Business fields characterized by collective activities are numerous and require well-adapted software-based services to improve the efficiency of business collaborations. The design of services supporting the activities in such domains is usually ad-hoc and relies on the know-how of various involved actors. Based on our experience of designing innovative services for Architecture, Engineering and Construction projects, we proposed a service design method involving business actors, service and technical experts and being intrinsically collective. This article focuses more precisely on integrating non-functional (i.e. service quality) aspects of services in such an approach. The service-business practices alignment should not only be tackled from functional but as well non-functional perspective, so that not only business-level service quality requirements are clearly understood and taken care of, but as well that business practitioners get a clear view of all the characteristics of the designed service. While concepts referring to the technical service quality are well-known and vastly used by service experts, what are the concepts defining service quality in terms of specific business context remains an issue to be addressed both by domain practitioners and service experts. We propose in this article an initial business-level service quality model, aimed at qualifying services for construction projects.**

I. Introduction

IN THE age of computing and Information Technology (IT), Architecture, Engineering and Construction (AEC) firms (i.e. largely SMEs) are increasingly making use of internal IT systems to improve their competitiveness. When coming to the use of project management support systems, practitioners have to deal with the uncertainty of construction projects organization. Indeed, these projects involve numerous practitioners for short durations and in various contractual contexts. Work processes cannot really be pre-defined and have to remain flexible enough to fit real projects context. Moreover, service innovation R&D projects often lead to the development of prototypes or demonstrators that only partially reflect the reality of the future final services that will be used by business practitioners. When dealing with "experimental protocols" of service prototypes in these projects, researchers have to find ways to assess quality expectations of future services.

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A. Context

Platforms providing project management services have to be flexible enough to support business actors' activities in collaborative projects, especially in AEC ones. One can observe however that in numerous cases, AEC project management platforms are not surviving the duration of a construction project because they fail to provide adequate support for business processes [1].

Service science brings prospects to such situations. In collaborative business environments the design of services is nowadays often ad-hoc, or relying on the know-how of the involved actors. Service science-based methods are then supposed to increase the success of innovation in services for highly collaborative environments, an example of which are construction projects. From our previous experience when we were led to design innovative services for these projects [2], we noticed the paramount importance of aligning services to business practices. In order to formalize the collective business practices (i.e. the ones involving multiple actors) in these projects together with domain actors, we guided them to agree on the way collaborative tasks are most often performed. Although the process was difficult and required numerous working groups to be held, we managed to define a set of consensual best practices, i.e. collective practices.

B. Design of innovative services for construction projects

Discussed applied work allowed us to understand that service innovation requires a clear understanding of business activities (i.e. practices). Service design should then be intrinsically collective, involving business actors, service and as well technical experts. This would, on one side, enable business actors to refine the requirements regarding the support of their activities, at the same time allowing them a better understanding of services capability. On the other side, the adaptability of IT services can only be successfully reached if domain knowledge has been appropriately considered at the service design stage already.

This lets us envisage that prototyping technical services could be defined for demonstration/experimental purposes before the final service is developed, provided and maintained. In addition, besides functional aspect, each prototype service should be associated, to the extent of possible, with non-functional properties of the future real service. The aim is that final service is clearly understood by business experi-

menters (i.e. early adopters) or that their expectations regarding future service quality are clearly understood by researchers to favor the (commercial) transfer conditions.

Indeed, the development of collaboration amongst business enterprises reinforces the need for an integration of non-functional aspects from the highest level of description of the system (business perspective): in a service-oriented business system, business partner delivering the service remains indeed the owner of the asset; there is no transfer of ownership but only an exchange of information. The business partner consuming the service has therefore to clearly state its expectations in terms of operational level of quality in order to manage its own business risks.

In this article, we discuss how non-functional aspects of services can be integrated in the design of innovative services for highly-collaborative construction projects. We discuss different models for describing them and motivate the need of addressing the quality concern differently at business and technical levels. Whereas technical-level initiatives proposing service quality (reference) models are numerous, research work tackling the same topic from the business perspective is not abundant. We propose an initial business-level service quality model dedicated to highly-collaborative contexts, which is developed in the scope of an ongoing research project (Dest2Co).

The rest of the article is organized as follows: the section 2 introduces the service design method developed within Dest2Co project, with the focus on discussing models for describing service quality. The section 3 presents the synthesized view on relevant related work, and the proposition of business-level quality taxonomy is presented in the section 4. After having discussed a possible application scenario in the section 5, the conclusion will highlight our prospects regarding this topic.

II. Service quality within dest2co method

Dest2Co project (2009-2011) aims at defining a model-based and multi-viewpoints method for the design of services for highly collaborative context. The method takes into account specific concerns of actors involved in service design through the following viewpoints:

- Business requirements viewpoint (BRV) addresses business concerns such as: what are business practices to be applied, what are the needs associated to the use of practices in the business context. This viewpoint is more focused on global objectives than on the realization of services. The central concept to BRV is the one of collective practices [5], whose identification for a given collective situation (i.e. project) is the first step towards the elicitation of requirements.
- Business solution viewpoint (BSV) focuses on how the practice can be accessed as a service, whether some existing practices are already realized as services, what are required interactions to support the use of the service, what is the level of service guaranteed by the provider and required by the consumer etc.
- Technical solution viewpoint (TSV) consists in the view of IT experts on the service. It is created based on the BSV and taking into account technical specificities, architectures, etc.

The three viewpoints are formalized through metamodels and organized according to the architectural framework [ISO/IEC 42010:2007], which aims to organize the models of complex systems. Moreover, each viewpoint covers multiple service aspects so as to fully support the design of services: 1) functional, 2) non-functional and 3) transactional aspect. The detailed presentation of Dest2Co method can be found in [4]. The present article focuses on defining the service quality model that reflects specific non-functional aspects of services for highly collaborative (construction) projects.

The quality of service (QoS) is the umbrella concept abstracting some non-functional aspects of the service. Research in service engineering has seen a number of initiatives aiming to define the concepts covered by QoS, (i.e. quality model, quality taxonomy) [8] [9] [11] as well as to define a language (i.e. metamodel) for expressing service quality characteristics and constraints [8] [10]. Current research aims to exploit semantic technologies to enable the automatic evaluation of QoS of already deployed (web) service, so that services required by the consumer can be dynamically discovered, selected and composed [18][19].

However, in most of the current initiatives, service quality is addressed from predominantly technical perspective, with very few works tackling non-functional aspects of service from the early stages in service development (i.e. from business perspective). While concepts used to express the technical quality of service are clearly understood and vastly used by service technical experts, what concepts define service quality from the business point of view in the specific business context remains an issue to be addressed both by domain practitioners and service experts.

Therefore, in the scope of Dest2Co approach, existing reference models defining "technical" service quality factors can easily be reused at TSV, but can't be directly transposed for business-level qualification of the service during service design (BRV, BSV).

We propose a business-level service quality model to be used within Dest2Co service design method, and eventually for qualifying services in other highly-collaborative contexts. This model is strongly driven by the extensive experience of the experts we have. Nonetheless, it also takes into account the state-of-the-art work on the topic of service quality (seen from different perspectives). The related work is summarized in the following section.

III. Related work on service quality modeling

As already mentioned, a number of service quality reference models exist nowadays. Those adopting technical perspective on quality rely on [ISO/IEC 9126-1:2001] or [ISO/IEC 25010:2011] software quality measurement standards. In addition, most quality models we analyzed have the hierarchical organization as in these ISO standards. Some reference models define service quality attributes as general in order to be applicable across different domains. This in turn necessitates a certain adaptation of the model when applied in the specific domain. Such is the case with QoS catalog, defined within OMG QFTP specification [8]. QoS cata-

log aims to provide concepts for the qualification of services that are common to various domains and projects. Defined general QoS categories include: *Performance, Dependability* (comprising reliability, availability, safety and integrity), *Security*, *Integrity*, and *Coherence* (details on characteristics defined within these categories can be found in [8]). These QoS categories should be extended or specialized for the specific domain, so as to reflect its relevant non-functional requirements. Therefore each domain/project would have its own specific QoS catalog. Within QFTP specification, OMG's QoS catalog is specialized for the real-time and high-confidence systems.

Business-related quality aspects are not always left out of the service quality models: current draft version (v2.0) of OASIS's Web services Quality Model (WSQM) [9], which discusses the quality of Web services in use, addresses the business value perceived by the user while using Web Services as one of the important quality factors. WSQM in fact considers three layers of Web Service quality in use, namely *business*, *service* and *system level layer*. Different dimensions of quality are defined for each of these layers. *Business level layer* corresponds to the user's view, and in that context business value quality is detailed through the attributes such as business suitability, business effect and business recognition. *Business value* is seen as dependent on all other quality elements of the model, as well as on the type of business and its characteristics. The service and system level layers address primarily technical aspects of service quality: while the former groups quality attributes related to the measurable *performance quality* of Web Services perceived by the user (*stability*, *efficiency*, and *scalability*), the latter deals with *interoperability*, *security* and *manageability* aspects of Web Service quality.

Amongst all the initiatives situated at more technical level, the Quality Reference Model (QRM) [11] defined by Software Services and Systems Network (http://www.s-cube-network.eu/) defines the most comprehensive set of well-defined and relevant quality attributes for service-based applications (SBA). The model aims to cover end-to-end view on service quality (considers attributes relevant for both provider and requestor). QRM defines both domain-independent and domain-specific attributes of quality (e.g. data-related attributes for services that operate/produce data, or quality-of-use context for context-aware adaptive services). Defined quality categories include *performance*, *dependability*, *usability,* c*onfiguration*, *data-related quality*, *network-related quality*, *quality in use*, *security*, and cost. Though comprehensive, this model does not explicitly include service functionality as a quality factor. However, we would expect it to be the case: not only that it is practically always addressed both in software and service quality models, but we believe that without adequate service functionality it can't be stated that minimal QoS has been provided at all.

QRM is also an illustrative of reference quality models incorporating the cost as one of the service quality factors. In our opinion, although cost naturally influences the decision of the consumer, cost itself is not the determinant of the quality as e.g. performance or reliability. The latter two qualities can be considered as the result of the proper design, deployment and configuration of the service, while cost is determined taking into account many different factors (and not only service quality), as for example the political aspects of the business relationship between contractual parties, which don't characterize the service itself.

Out of quality models addressing the quality of conventional service, and hence taking a business perspective, Servqual [12] [13] [14] is the most prominent one to be discussed. The model tackles customer's perception of the quality of the delivered service and therefore represents the basis for expressing customer's quality needs (business-level quality objectives). Servqual enables measuring the perceived service quality over so-called RATER dimensions [14]:

- *Reliability* – regarding consistency in performance and dependability;
- *Assurance* – as the customer's perceived confidence and trust in the employees delivering the service;
- *Tangibles* – concerning the outward, physical evidence of the service;
- *Empathy* – regarding the individual attention given to the customer;
- *Responsiveness* – as the willingness to help customers and to provide prompt service.

For the application in a specific domain, Servqual has to be adapted in order to really be useful, and several attempts of adapting Servqual for assessing e-services quality may be noted in [6] [15] [17]. More precisely, O'Sullivan suggests making use of Servqual as a starting point for electronic services quality model [6] [7]. The Servqual authors proposed as well an adaptation of their original model to assess e-service quality, E-S-Qual [15]. This model measures e-service (i.e. online shops in the study) quality over the following dimensions:

- *Efficiency* – regarding ease and speed of accessing and using the web site
- *Fulfillment* – as the extent to which the site's promises on order delivery and item availability are fulfilled
- *System availability* – regarding the correct technical functioning of the site
- *Privacy* – relating to the degree to which a site is safe and protects customer information.

Finally, Zarvić and Wieringa [16] rely on Servqual and O'Sullivan's work to define their own reference model, where service quality is discussed from the point of view of business value. The proposed service quality attributes are:

- *Reliability* – involving consistency in performance and dependability,
- *Responsiveness* – concerns the willingness or readiness to provide services,
- *Access* – involves ease of contact,
- *Communication* – means keeping customers informed in language they can understand,
- *Credibility* – involves trustworthiness, believability and honesty,
- *Security*,

- *Understandability* – involves making the efforts to understand client's needs,
- *Availability* – concerns times when and place where service is available,
- *Trust* – deals with trusting the competence and intentions of a service provider.

The authors define the initial mapping of service quality attributes to the quality attributes of the realizing information system (those of ISO/IEC 9126-1:2001). It is stated that hypotheses of the impact of service quality attributes on software quality attributes, based on which the mapping is established have yet to be validated.

IV. Business-Level Service Quality Model – A Proposition

A. Motivation

We have already discussed the need to clearly separate business and technical viewpoints on services, and thus on their non-functional aspects. Business view of non-functional aspects should provide the first version of what level of quality is expected, while the technical view should provide more details on QoS, according to the chosen solution. The attributes of service quality at technical level are thoroughly discussed in many different works and more or less well established (in our work, we intend to rely on S-Cube QRM for identifying important attributes for technical description of service quality). However, defining the model for business-level description of service quality (expressing both requirements and qualifying services) represents the real challenge, and the state-of-the-art work showed that there are very few works addressing this topic.

It is evident that the quality of a business service is influenced by that of technical services enabling business activities. Nevertheless, what characterizes business service quality is the adequacy of the service for users and activities it is aimed to support, e.g. in terms of relying on domain-specific vocabulary, alignment with domain activities, support of the existing regulation and standards relative to the domain etc.

The following paragraphs present our initial proposition of a model for expressing service quality requirements from a business perspective, which is adapted to highly-collaborative construction projects (and within Dest2Co project). The model aims to provide business experts with a way to discuss service quality with terms and concepts they are used to, i.e. level of confidentiality of data exchanged in a project, adequation to collective practices of actors etc.

We first discuss the method used to develop this model, and then proceed with detailed presentation of the current proposition.

B. Research method

The approach adopted for developing the model seems more like a bottom-up approach. Although quality aspects covered by the model were chosen from relevant literature review, their sense is expressed in the framework of the given business context (i.e. service design and innovation in construction collaborative projects) and this has been done by involving domain experts. Furthermore, in each stage of model development, the attention has been put on gathering and formalizing only what appears to be the relevant quality requirement for the service in this concrete domain, rather than covering all possible quality aspects discussed in theory. At last, it may be worthwhile underlining the iterative nature of the approach, although the way it is presented below may suggest to the reader it is a waterfall-like approach.

The approach used to develop the proposed model comprises the following steps:

1. *Objectives definition:* As already discussed, our goal is to define the service quality model enabling the qualification of services from early stages of service development, and thus approaching quality concern from the business perspective. The model should at the first stage be adapted to construction projects, since our experience in developing services in this domain drives the definition of this quality model. In the end, this quality model should enable business experts to express the quality requirements for services in terms and concepts they are used to.
2. *State-of-the-art review*: Relevant quality models have been selected (cf. Related work on service quality modeling) and their applicability in the highly-collaborative context has been analyzed. We specifically focused on Servqual and e-S-Qual, since they enable categorizing user's business-level expectations in a way which seems to be consistent regardless of the services' domain. The WSQM's concept of business level layer quality was also taken into account for it as well corresponds to the user's view on service quality. Our approach was to try to integrate most of the quality aspects discussed in above-mentioned models in the developing proposition, not being too extensive, but rather focusing on the usability of the model.
3. *Selection of high-level quality categories*: Relying on the selected models, a set of relevant quality categories is proposed (cf. Table I), to structure the developing model.
4. *Validation of initial set of categories with domain experts*: These initial quality categories have been validated against a number of already achieved and ongoing projects in the construction sector: e.g. CRTI-weB services developed and now transferred to construction sector, and innovative services regarding mobile computing for construction site (ongoing project). Domain experts involved in these projects validated that service quality aspects discussed and pointed out by business actors could mostly be covered with the initial categories set.
5. *Identification of relevant quality attributes*: As concrete quality characteristics should reflect the specific non-functional aspects of the domain, we aimed to identify them relying on the experience in developing IT-supported services. This was done by reviewing the quality requirements elicitated in mentioned projects for the construction sector with involved domain experts. The current proposition of the model is presented in detail later in this section.
6. *Validation:* Two perspectives for validating he model have been identified. Firstly, service design experts

would assess the applicability of the model for qualifying services already developed and used (i.e. case study approach). In the second place, the validation with business actors would consist in assessing the appropriateness of the model for specifying quality requirements in experimental phases of innovative services design. This paper later elaborates on the first validation perspective, that is, it presents the application scenario (cf. Application scenario section) to which the initial model proposition is confronted.

Several difficulties we came upon when identifying quality attributes of the model require further discussion. Firstly, the level of detail with which we were able to define quality attributes (reflecting business concerns) differs from one category to the other. This may be due to the type of experience our experts had, and/or to the difference in relative importance of a certain quality category in different project types. So, our initial proposition may be regarded as "unbalanced". Nonetheless, we assume that with the following application scenarios it will be possible to deflect this. Secondly, we were faced to a problem when identifying important aspects of performance and security from the business viewpoint, since it appeared that those would be expressed in all those well-known attributes used at qualifying these categories in technical terms.

Table I.
Quality categories

Quality categories	Quality categories definitions
Business suitability	Business suitability refers to the suitability of the service for conducting the activities in the given business domain (e.g. highly-collaborative context).
Stability (Dependability)	Stability refers the ability of the service to be available, reliable and accurate.
Performance	Performance refers to the efficiency of support the service provides for the business activities.
Security	Security refers to the degree of information protection so that unauthorized persons or systems can't read or modify them and authorized persons or systems are not denied access to them.
Usability	Usability refers to the degree to which the service is easily understood, learned, and used.
Regulatory and interoperability	This category refers to whether the services is able of supporting the existing regulations and to which extent the service is able interoperating with other services that are defined within the same context.

This may be due to these two quality aspects gaining recently so much on importance for the business, that business actors are in general quite familiar with the corresponding technical terminology and very often express the requirements that are and technical in nature. In the context of Dest2Co method, it may as well mean that business experts' viewpoint (BRV) overlaps with the one of service technical experts (TSV), especially regarding the requirements on performance, security, usability of the service (interface), and that it is difficult to make a clear distinction between these different viewpoints on quality. As there is no doubt of the importance of security and performance for the business, these are kept within the model, despite being defined with a very general set of attributes. Further experimentation would allow us to validate our hypotheses and to complete the model.

Regardless of discussed difficulties and the fact that this proposal has still to mature, we believe the added value of the proposed model is two-fold: First, it allows business actors to define non-functional aspects of business services, and consequently to assess the quality (and other) aspects of service compositions proposed as support of given collective business practices. Such an approach is really important in the design of services at the beginning of a construction project. Furthermore, the model makes possible expressing non-functional requirements for services from high-level standpoint, and may ultimately lead to better understanding and precisely defining requirements for related technical services.

C. Initial model proposition

In this section, we present quality categories and their belonging quality attributes, which constitute an initial service quality model (from the business perspective).

Business suitability

Business domain adequacy refers to how well the service corresponds to the defined problematic of the domain, in terms of the domain coverage (*applicable area of services*), and *flexibility to major changes* that may occur in the collaborative context.

Effect on collaborative practices refers to which extent the collaborative practices (for which the service provides support) are supported and to which extent they would have to be aligned if the service would be used.

Reputation within the sector refers to how well the service is perceived by others business actors inside the sector or within relevant communities.

Stability

Reliability refers to whether the service can function in a predictable way and be trustworthy, i.e. whether service produces correct information and does not impede the performance of users in achieving their goals.

Availability refers to whether the service is in a state to perform its required function.

Accuracy refers to whether the information provided by the service has the needed degree of precision.

Performance

Time behavior refers to the response and processing times and throughput rates of the service when performing its function, under stated conditions.

Resource utilization refers the amounts and types of resources used when the service performs its function under stated condition

Security

Confidentiality is the degree of protection from unauthorized disclosure of data or information, whether deliberate or accidental.

Integrity is the degree to which a system (service) prevents unauthorized access to, or modification of, computer programs or data.

Non-repudiation is the degree to which actions or events can be proven to have taken place, so that the events or actions cannot be repudiated later.

Accountability is the degree to which the actions of an entity can be traced uniquely to the entity.

Authenticity is the degree to which the identity of a subject or resource can be proved to be the one claimed.

Usability

Understandability refers to whether the information on the service is provided so that users can recognize the appropriateness of the service for their needs. This can include demonstrations, tutorials, documentation etc.

Learnability is the degree to which the service enables users to easily learn how the service operates, i.e. whether the service is intuitive enough to be learnt easily.

Ease of use refers to the degree to which the service has attributes that make it easy to operate and control.

User error protection refers to the degree to which the service protects users against making errors.

Regulatory and interoperability

Supported standards addresses the issue of to which extent the service takes into account or can support the existing relevant regulations (defined for and) applied in the domain. It also refers to whether the service is open (or flexible with regards) to supporting other regulations that may be relevant within the domain.

Interoperability tackles the question of whether the service is capable of interoperating with the existing services defined/used. This is assessed based on the *interoperability of the organizational roles and responsibilities* (e.g. Does the service rely on the same definition of roles, or if not, is it possible to establish the finite, precise and bidirectional mapping between the set of roles for each service?), and the *interoperability in terms of the information structure* (e.g. Do services rely on the same information structure, or if not, is it possible to establish the finite, precise and bidirectional mapping between the two structures (for each service)?).

V. Application Scenario

The proposed model has firstly been validated through the application to a scenario observed in a real project, with the aim of assessing its coverage and applicability. In this scenario, the initial quality model is used for qualifying services at the design stage and from the business point of view.

The scenario addresses collaborative practices related to the collaborative thermal assessment of an architectural project, and its services support, designed with the Dest2Co method. We present one of the services and focus on its non-functional aspect description using the proposed quality model.

A. Collaborative context of the scenario

The situation regarding the assessment of environmental quality of building project is challenging nowadays, since even higher energy efficiency is sought for, and the related certification of the building projects have to be obtained. Depending on the project nature (e.g. wood or concrete-based construction) the assessment can be performed at different times in the project (both in the design and during construction), and also may be done by various experts.

For the given context of the application scenario, the following collaborative practice has been identified: *the energy efficiency assessment of the design project is required by the architect at the end of the early design stage and it is performed by an independent expert. Results of the assessment are transmitted both to the architect and eventually to the building owner.* This collaborative practice involves the project's architect, thermal expert(s) and possibly the building owner.

B. Service design: functional and nonfunctional description[1]

To support the presented collaborative practice, a business service has been designed: *Thermal assessment of the project based on design document requested by the architect (and performed by external expert).*

The functional description of the service is given as follows (in accordance with concepts of Dest2Co BSV metamodel): The *goal* of the service is to allow the expert's performing of thermal assessment of the design project as well as reporting to the architect. Its *input* is a project design description (both graphical and textual representations) and its *output* is a written thermal assessment of the project. *Preconditions* applying to this business service are 1) that the design project is enough advanced (designed) to be assessed, 2) that design documents are complete enough to enable assessment and 3) that criteria for the assessment are known or defined (usually based on standards and regulations applicable to thermal norms). The expected *effect* is that the design project is assessed with respect to thermal aspects, and that in case of negative assessment (low energy efficiency) the redesign/modifications may be suggested.

The non-functional aspects of the designed service are expressed relying on the model proposed in this article. Since the qualification of services is taking place at the design stage, it is not really possible to precisely characterize those quality aspects related to run-time (i.e. performance).

Business suitability

Business service designed is adapted to AEC domain projects (*business domain adequacy*). It supports a typical collaborative practice that can be found in all project types in the domain, but remains very dependent on the organizational context, because it's fixed that the architect-designer is the one who asks the evaluation of the design project (*flexibility*). As it supports a typical collaborative practice, using this service wouldn't have a side-effect on other practices applied

[1] The transactional aspect of the service, which is the third aspect covered by Dest2Co method, representing the information flow between service activities is detailed in [5].

in the same situation. In the scope of this application scenario, we were not able to qualify the *reputation* of the service.

Stability

Since current design of the service doesn't completely take into account all possible alternative scenarios, we may say that *reliability* of the service is not excellent: all related business rules are not systematically being specified in present design descriptions.

Performance

Except for assuming that the performance of the related technical service is not going to be influenced negatively by the business logic it will implement, since not much alternative scenarios are managed by the service, we couldn't provide more details on this aspect.

Security

The alignment between the rights assigned to participants of this service and the responsibilities assigned to their corresponding organizational roles defined in the domain affects the security. The security is enhanced if this alignment is done adequately. However, it needs to be verified how the responsibilities of organizational roles are assigned, in order to be sure that general security recommendations are respected.

VI. Conclusion

This article presents an initial proposition of a service quality model, aiming to support qualifying services from a business viewpoint. This model is primarily aimed at being used in the design of services for the construction projects, but eventually, could in the future be used for qualifying services in other highly-collaborative projects. The method we relied on when developing this model combines top-down and bottom-up approach, i.e. the proposition is elaborated relying both on relevant literature review and the input from domain experts.

Utility of such a model is justified firstly in the context of (existing) service design and composition for a given collaborative project: business-technical service alignment is enhanced if business actors are able to clearly understand non-functional properties of business services, beyond more usual functional descriptions. Secondly, such a model is highly applicable in the context of innovation through service design, where defining non-functional characteristics of a business service can help in defining requirements for software services.

Indeed, our initial application scenario, presented in the article, showed that the model was useful, as it forced to make quality concerns explicit early at the design stage and from high-level (i.e. business) point of view. This helps not only to consider business and technical concerns of services separately so as to enhance the alignment of services to the business, but it enables business actors to clearly understand the capacities and constraints of designed services, before they are finalized and delivered.

Going further, and in the context of service-based sectorial innovation, we consider that innovative business services can only be demonstrated to business actors through prototypes of future technical services. Enhancing these prototypes with quality description of future real services to be developed can ensure the understanding of their characteristics very early in innovation projects, and provide clear technical requirements for their development.

When elaborating this proposition, we experienced several difficulties. Namely, we noticed that business and technical viewpoint on service quality may overlap, notably with regards to expressing performance and security requirements. In addition, because the model is in its initial stage and because it's driven by our previous experience, some dimensions of quality are more "developed" than others are. Nevertheless, we believe that by experimenting with the model in real-world projects, we may arrive to a mature and ready-to-use service quality model.

The prospects related to this ongoing work are now to validate and possibly improve the model through the confrontation with business experts, as well as in the framework of other innovation projects (e.g. the experimentation with business users of prototyped mobile services). Applications to other collaborative domains could also be relevant in order to assess the genericity and applicability of the proposed quality concepts. Furthermore, once the model has reached a sufficient maturity, we plan to elaborate on the quantification scales for the adopted quality attributes.

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