A methodological framework for qualifying new thematic services for an implementation into SAFER emergency response and support services

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Abstract:

In the FP-7 GMES SAFER project a pre-operational service for emergency response and emergency support products was implemented to reinforce the European capacity to respond to emergency situations. SAFER was not only focusing on "rapid mapping" and validated products during the crisis phase but also on the enrichment of the service with a wider set of thematic services. For the selection of new thematic services not only a high accuracy of products was of interest. Moreover, e.g. service maturity, user interest and compliance to the SAFER operational model are important issues to guarantee a validated service.

The aim of this contribution is to present a methodological framework that was developed and applied for the evaluation and qualification of selected thematic services into the SAFER portfolio Version 2 (V2). The concept is characterized by strong user involvement including European Civil Protection Organisations and Humanitarian Aid Organisations. The framework consists of several steps comprising – among others – the definition of assessment criteria (here termed as Service Evolution Criteria), the Service Maturity Analysis (SMA), a ranking of interest/relevance by involved users and an operational performance check (operational check = OC). In total 19 Service Evolution Criteria were defined in collaboration with the users and were applied for both, the SMA and the OC. The criteria cover aspects of software and data sustainability, service producing time, user support and user availability, service transferability, metadata compliance and the reliability of the map contents. The SMA was designed to assess whether the services are mature and sustainable whereas during the OC the services were tested under operational conditions. The OC was conducted in collaboration with

several project partners, e.g., the JRC conducting a scientific and technical validation of the delivered products.

The qualification process led to a substantiated suggestion of thematic services to be implemented into SAFER V2 and thus served as an important decision support for the project stakeholders. Finally, with the selected approach it was ensured that the thematic variety of the existing "rapid mapping" services have been substantially increased.

1. Introduction

With the aim to strengthen the European capacity to respond to emergency situations, a pre-operational service for emergency response and emergency support products was implemented in the FP-7 GMES SAFER project. Two major aims of SAFER are (a) the improvement, consolidation and validation of information services focussing on rapid mapping during the response phase and (b) the enrichment of existing pre-operational services with a wider set of information products covering more widely the response cycle, from the prevention phase to the post-crisis phase. This second priority implies a longer-term qualification process which has started in the beginning of the project on 1 January 2009 and finished in July 2011 and is termed in the following as Service Evolution.

The focus of this contribution is to present the methodological framework that was designed and developed within the context of Service Evolution of SAFER. Furthermore, as the framework was already successfully applied and implemented within SAFER, the developed methodology is not only of theoretical but also of great practical value.

A crucial element of the multi-stage concept includes a strong involvement of European users, such as European Civil Protection Organisations and Humanitarian Aid Organisations represented by the UN. Their main role in the framework encompasses particularly the identification of qualification criteria (Service Evolution Criteria) and their contribution to the evaluation of the added-value of the new services in comparison to the existing Emergency response and support services (Core Services = CS).

In general the framework was developed to evaluate the maturity, operability of the new thematic services as well as their added-value in relation to the CS. In addition to the user community, the Service Evolution process was supported by the JRC, CNES, e-GEOS, Infoterra (UK and Germany) and EUSC.

The following chapter 2.1 provides a comprehensive overview of all steps of the qualification framework, whereas chapters 2.2 – 2.5 will pick up some of these steps in more detail.

2. Methodological framework

2.1. General approach

As illustrated on figure 1, the Service Evolution describes the process of qualifying new thematic services for an implementation into the existing pre-operational model of the SAFER project. Service Evolution explicitly focuses on the evaluation and qualification of the services themselves, rather than on an in-depth analysis and validation of the provided products. The latter was conducted by JRC in parallel and includes a technical and scientifically validation where also external experts from different research domains were involved. As indicated by the red dashed frames on fig. 1, the involvement of users played a fundamental role throughout the qualification process. In the first step, the identification of Service Evolution Criteria, users (i.e. the Italian Civil Protection Authority, DPC), service providers (i.e. DLR, EUSC, ITUK) and other project partners agreed on the definition of 19 Service Evolution Criteria to be used for further qualification steps, in particular the Service Maturity Analysis (SMA). During the SMA, all thematic service providers gave a detailed inventory of the maturity of their services.

The provided information was then checked against the predefined criteria. A further qualification stage includes a ranking of interests of involved users. In total 13 National civil protection organisations and five humanitarian aid organisations were asked to rank those thematic services that passes the SMA to a level of interest or relevance. In the operational check (OC) a realistic test scenario was created, where the service providers had to show the operational performance of their services.

A prioritisation of the thematic services was made on the basis of the SMA, the ranking statistics as well as the OC. In addition, the required amount of budget and separation from the CS were additionally taken into account during this pre-selection. This prioritisation served as an essential basis for the final decision on the qualification of the services which was taken by the SAFER executive committee (EXCOM). It needs to be emphasized that the users were also involved in the decision phase of the framework and where represented in the committee by the Project User Board (PUB). The qualification process leads over to the implementation phase where the existing product portfolio versions 0 and 1 and also many other elements of the pre-operational model of SAFER had to be updated.

The following sections give a more comprehensive overview of the four major qualification steps, the criteria selection, the SMA, user ranking and the OC.
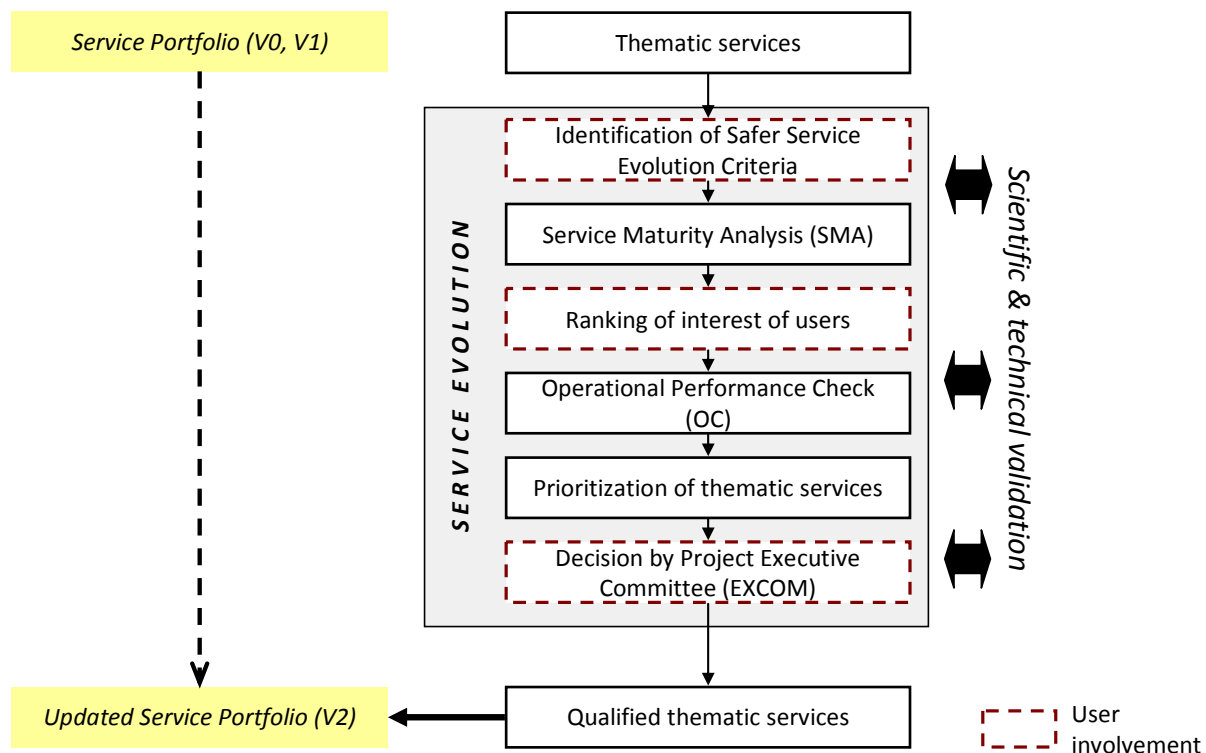

Figure 1. The concept and workflow of Service Evolution.

2.2. Selection of Service Evolution Criteria

As illustrated on fig. 1, the Safer Service Evolution Criteria were firstly defined in a collaborative work during a workshop on 9 June 2009 in cooperation with the user forum, represented by the Italian Civil Protection Authority (DPC), the rapid mapping service provider community (DLR, ITUK) and other project partner organisations that are responsible for the product dissemination and geo-data infrastructure (e-GEOS), the product validation (JRC) and the quality control (CNES).

In a first step all contributing partners have defined their own Service Evolution Criteria from their point of view and expertises. The second step included the synthesis of these criteria which was done by DLR. At this stage, the consortium agreed on the definition of 19 Service Evolution Criteria to be used for the further service qualification process. The criteria can in general be divided into the following four criteria groups: *Service performance, Product quality, Dissemination and Usability/Additional value.*
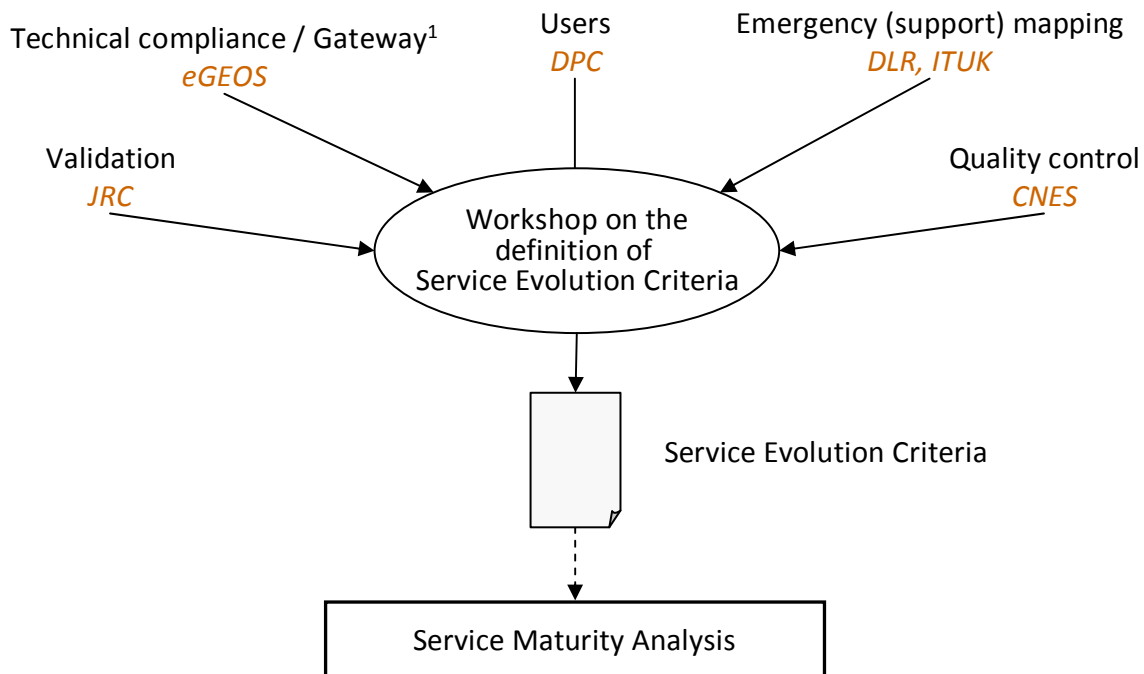
Service performance criteria were mainly defined by the well established service providers and the user community. A major criterion here is the sustainability with regard to the required EO and non-EO data sources and the support of additional software/tools used for the product generation. Furthermore, service performance refers to the time requirements for different activation modes, the 24 hours / 7 day availability in case of Emergency Response services, the required costs and the technical support provided for the users.

Even though a scientific and technical validation of the products was carried out by JRC on a sample basis, each new service provider should be familiar with the validation scheme. *Product quality* criteria include map and layout criteria, such as consistency between map and legend symbols, compatibility between geographic projections of the different entities or geographic information layers included in the same product.

The criteria dealing with the product dissemination cover the type of delivered data sets, the metadata compliance to ISO 19115 standards and, in case of data publication as remote services, the compliance to OGC reference standards (WMS, WFS etc.).

The Usability/Additional value refers to the innovative and additional value of the service compared to existing European services and the CS as well as to the service transferability. The latter targets on the question whether the service is limited and applicable to specific areas/regions or whether there are dependencies on specific data availabilities. A further criterion is the User feedback from previous GMES projects.

The selected Service Evolution Criteria were only slightly modified and updated after the first workshop and played a fundamental role for the next qualification, the SMA that is presented in the next chapter 2.3.

Technical compliance / Gateway[1]
eGEOS

Users
DPC

Emergency (support) mapping
DLR, ITUK

Validation
JRC

Quality control
CNES

Workshop on the
definition of
Service Evolution Criteria

Service Evolution Criteria

Service Maturity Analysis

[1] The Safer Gateway is a web application sustaining the GMES Emergency Response Service and providing several interfaces according to the user profile.

Figure 2. Safer service criteria identification.

2.3. Service Maturity Analysis

During the Service Maturity Analysis (SMA) all thematic SP gave a detailed inventory of the maturity of their services by filling in a dedicated Service Maturity Questionnaire (SMQ). In the SMQ the questions were closely oriented to the predefined Service Evolution Criteria as described in section 2.2.

Regarding the evaluation of the SMQ, two of the questions in the SMQ were considered as mandatory criteria: firstly the thematic SP had to state if their product/service can be considered as being mature and that the SP wants to have it implemented in the next SAFER version. Secondly, the SP must guarantee that a sustainable supply of EO and non-EO data can be assured. Only if these criteria were fulfilled, the service/product was checked against the other remaining questions. A quantitative evaluation scheme comprising three different levels of importance respectively weighting factors was applied for the other questions. For example, the knowledge and usage of the SAFER template was considered less important than the general transferability of the product to other areas or a support that can be provided in English language. In order to achieve a maximum of transparency in the evaluation, each SP was provided with an evaluation sheet in addition to the SMQ. This contains the information on the evaluation points and the weighting factors assigned to each question, respectively those questions considered as mandatory criteria.

The number of evaluation points (respectively the percentage values) achieved by each SP served as an important quantitative basis in the Service Evolution in general. Furthermore, the results were related to the quantitative results derived from the ranking of interest of involved users (cp. section 2.4).
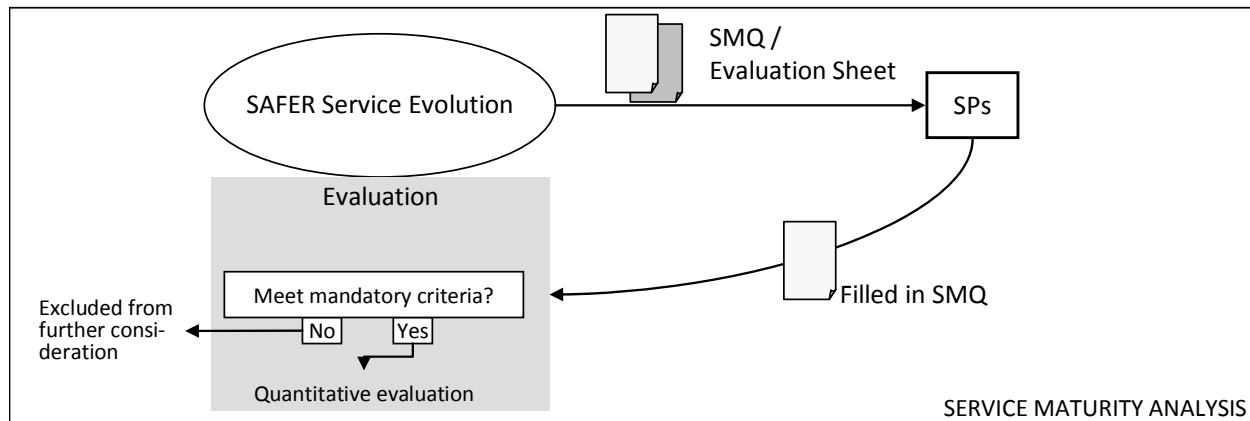
Figure 3. The Service Maturity Analaysis (SMA).

2.4. Ranking of interest of users

Generally, the user community in SAFER is represented by the Project User Board (PUB). In order to get a wider feedback than from the five PUB members only, the members of the External User Advisory Committee (EUAC) were addressed during an EUAC conference. The participants comprised the five humanitarian aid organisations WFP, UNOSAT, UNHCR, UNICEF and IFFRC as well as 13 National Focal Points from Germany, UK, Hungary, Austria, Bulgaria, the Netherlands, Portugal, Croatia, France, Bosnia & Herzegovina, Italy, Greece and Sweden. They were asked to rank the thematic services which passed the Service Maturity Analyses for SAFER version 1 and 2 according to a level of importance or interest. The ranking scheme applied ranges from 1 for very low interest, to 5 for very high interest (2=low interest, 3=medium interest and 4 high interest, respectively).

Since the SAFER project is a strongly user-driven project, the user ranking was a major component of the general qualification process of the thematic services. In order to account for unequal interest and impact of the different disaster types (e.g. flood is of much more interest that earthquake for European users), the user interest was categorized for each disaster type, because the aim of SAFER was to enrich the Service with a wide variety of thematic services, and not only flood services, for example.

2.5. Operational performance check

The operational performance check (OC) is a key step of the Service Evolution process. It aims at assessing whether the new thematic services can be offered under operational conditions. Similar to the SMQ, the assessment criteria were closely related to the predefined evolution criteria (cp. section 2.2). In contrast to the SMA, the focus was on those criteria that were related to the operational

performance, in particular the user support, time requirements, service transferability, technical compliance and service sustainability. Thus, the OC comprises different sub-exercises for the respective criteria group that were carried out in collaboration with other project partner organisations, such as eGEOS, ITUK, EUSC and the JRC (cp. fig 4). As already mentioned in section 2.1, the product validation was indeed carried out in parallel to the Service evolution process, respectively to the OC, but was not a component of the Service Evolution in a narrower sense.

At the beginning of the exercise a time window during which the OC had to be carried out was given to each SP to have them on alert. During the first week of this period, each SP was provided with the Service Request Form (SRF) which contains general information about the test scenario, such as the area of interest (AOI), the deadline for product delivery and the information required for product dissemination. The SRF represents the official SAFER document used to specify and standardise the service request of the user. Figure 4 illustrates that most of the sub-exercises were carried out after the product generation; however some tests were also carried out right after triggering of the service.
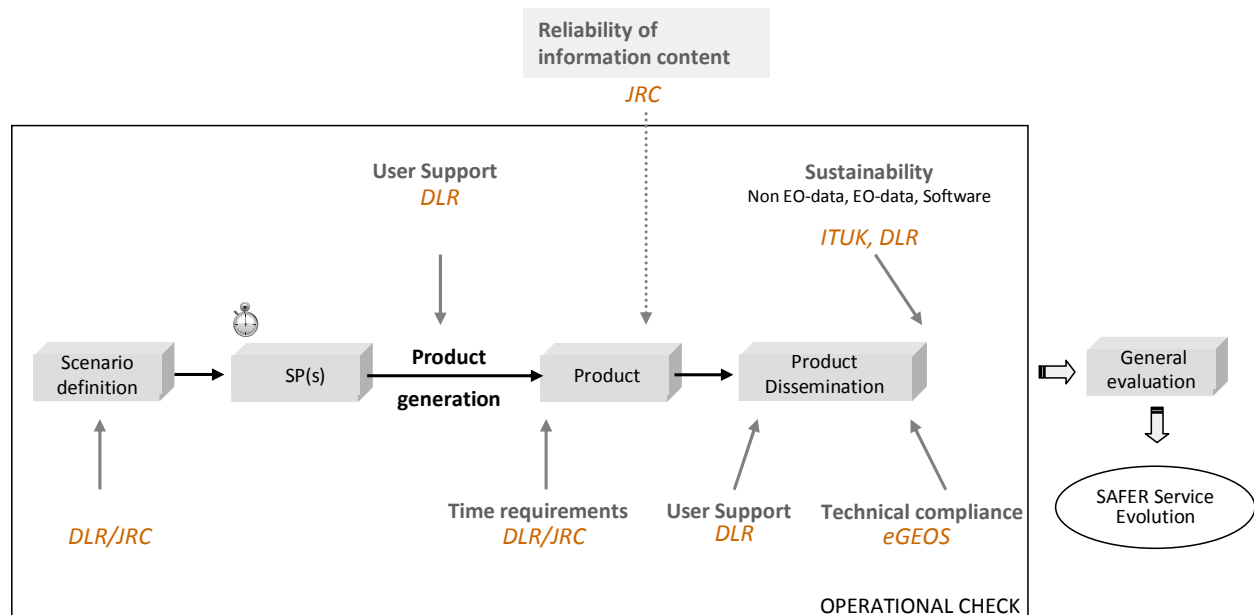
Figure 4. The operational performance check (OC).

The service transferability was assessed by choosing test scenarios outside of the SP's working area and was carried out by JRC and DLR. User support was evaluated via phone interviews in order to check the SP's availability, its ability to provide user support in English language and its flexibility to deal with potential user requirements, such as to make small adjustments to their product (e.g. change the projection from UTM to a local projection) even after product finalisation. The time requirement was checked by comparing the deadlines for the product delivery as indicated in the SRF, with the actual time of product delivery (upload of the data). The time-requirements are closely oriented to the time requirements that apply to the CS and are related to the respective activation mode (rush mode or emergency support mode). The technical compliance check was conducted after product dissemination

in order to evaluate the metadata quality, i.e., the conformity to ISO19115/19139 and INSPIRE standards. The service sustainability check encompass the check of the sustainability of software applied (e.g., technical support, license model) and the EO- and non EO-data sets that were either required for processing or for product improvement (i.e., data sources, time required for data acquisition, etc.).

As the OC was the only practical test within the Service Evolution process the results served as an essential basis for the general evaluation of the service performance. The products that were delivered in the frame of the OC exercise provided a good basis for the users to assess what they can expect from the thematic services under operational conditions.

3. Concluding remarks and outlook

The objective of this contribution was to present a methodological framework that has already demonstrated its practical value within the GMES Safer project. In summary, the framework holds two major strengths: a) the close cooperation with involved users throughout the evaluation process and 2) the integration and consideration of many different assessment criteria within the evaluation process which was realized by close cooperation with different partner organisations and experts. Therefore, it can be concluded, that the selected framework provided a comprehensive and reliable basis for a fair and transparent qualification process of the thematic services that were implemented into the SAFER operational model. Based on the practical experiences with the application of the framework, it can be assumed that the general structure of the methodology is also transferable and useful in comparable application cases.

Even though the independent scientific product validation was carried out in parallel to the Service Evolution, the authors agree that a closer link between both parts would have simplified the qualification process in general. However, the absolute certainty on how the users will benefit from the new thematic services will turn out in the future. Here the most important indicators are the number of user requests per time period (activations) and the degree of user satisfaction in case of an activation of a new thematic service.

References

GAEHLER, M.; FOERSTER, A.; ZOSSEDER, K.; ZWENZNER, H. (2010): Report of defining the selection criteria for transfer of thematic services to the pre-operational emergency response services. *Project report* **SAFER-D21000.1-SDD-DLR-01.03**, 32p.

ROEMER, H.; ZWENZNER, H. (2011): Service Maturity Analysis (V2). *Project report* **SAFER-D21000.4-SDD-DLR-01.00**, 310p.

ROEMER, H.; ZWENZNER, H. (2011): Portfolio of thematic and technologic innovation services within the project and impact on operational architecture - Version 2. *Project report* **SAFER-D21000.5-SDD-DLR-01.00**, 171p.