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Challenges of a Service Transition in Multi Domain Environment

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Abstract- Service transition from a development to the full production operations is well defined in best practice documents with a set of steps that must be followed towards the success. Includes a lot of preparations and in advance planning, covering resources, policies, change management, definition of critical success factors and key performance indicators, challenges, risks and many other things.

In multi domain environment, with multiple domains and multi nation teams participating in the creation of the service, in parts of service transition such as service validation and testing as well as service operations, the best practice provides two-edge sword. It can at the same time help in understanding and agreeing in individual steps and present a stumbling-stone if followed blindly and literally.

The paper presents challenges and guidelines for service transition in a multi domain environment.

I. INTRODUCTION

During its lifecycle, a service has several potentially impacting milestones. Challenges follow the service from its development, strategical positioning on the market, including everyday service operations. One important point related to the service launch is when a service transitions from the development into the operations. Service transition includes a number of tests of the validity and sustainability of the service, checking all necessary functionalities and applicability, testing if it is fit for use. At this point, number of issues can arise that can lead to service retreat back into development, to re-assessment of the service readiness for production. Or the service can successfully transition into production and everyday operations.

Multi-domain environment implies existence and relevance of more than one area; it could be area of responsibility, origin, expertise, interest, geographical area, cultural, etc. In the service development and operations, multi-domain aspects can be seen as developers from multiple countries participating in the same team, the team including experts in different areas, coming from more than one organization, the infrastructure used for the service development spread in several countries and/or organisations. Additionally, the service can be aimed for multiple user categories, coming also from different countries and organizations, bringing with them different expectations and potentially various cultural and process requirements.

Each and every point of difference can present a challenge for the service development and take up in each of the service lifecycles as defined by ITIL→ Best Practice [1]. If not handled timely and appropriately, the challenge can become a risk for the service survival.

In this paper, second chapter describes multi-domain environment, third and fourth chapter present service transition from the development into operations in a multi-domain environment and its challenges. Chapter 5 proposes the resolution for those challenges, which are applied on use cases in Chapter 6. Related work is presented in the Chapter 7 and conclusions in Chapter 8.

II. SERVICES IN MULTI-DOMAIN ENVIRONMENT

A "domain" is defined in dictionaries as "an area of knowledge or activity" [2], "a field of action, thought, influence", "the territory" as well as a group of computers and devices on a network "governed by a single ruler or government" [3]. Multi-domain environment brings more than one area of responsibility, interest, expertise, multiple organizations with different visions, strategies, values, governance, processes, target market, and many more differences. Domains can be based on geographically different and distant locations.

Still, multiple domains can come together when they have a common goal and can work together towards the goal, dealing on the way with all the differences in the service of the achievement of the wanted goal. The goal can be to provide one or more services to customers. successful merge of one or more companies, to gain material or non-material benefits of any kind.

In such situations, the differences can become advantage, bridge the gaps that a single domain might have, but can as well bring a lot of challenges and risks.

For a service offering, multi-domain can mean that service developers and operators are coming from different countries bringing with them human capital, the expertise as well as some of the hardware and/or software resources. The joint can be based on a project participation, joint venture, acquisitions, merge, or any other formal and legislative way.

Examples of multi-domain environment can be found in international projects such as those funded by European Commission [4].

III. SERVICE TRANSITION

Service transition is a process a service follows on its way from development to operations. According to ITIL→ Best Practice of Service Transition, the "purpose of the service transition stage of the service lifecycle is to ensure that new, modified or retired services meet the expectations of the business as documented in the service strategy and service design stages of the lifecycle" [5].

The authors participated in and analysed transition of services in the following scenarios:

- service transition from development to production in multi-domain environment of a pan-European project GÉANT [6] and
- transition of ICT infrastructure and services of Ministry of Social Politics and Youth [7], Croatian pension insurance institute [8], Ministry of Environmental and Nature Protection [9] and five Croatian institutes under the Ministry of Health to CARNet infrastructure [10].

Each of those transitions started from the stable starting point, solid and justified reason for change and gaps between the existing and the final wanted state.

Service transition has its organizational, technical, administrative and strategic part. Organizational part includes planning and managing of all changes related to the service and risk management. Technical part includes preparation of the needed infrastructure; testing infrastructure is needed for validation and testing phase where all relevant parts of the service will be examined to check if the service is fit for use, if the service provides all functionalities as expected, if the performance is of acceptable quality. Production infrastructure is needed in addition to the testing one, as it includes all the necessary hardware and software that presents the last resort for this service release that the users will use in the everyday operations. Technical part includes execution of the validation and testing process, successful deployment of the service instance on the production infrastructure, as well as comprehensive performance and sustainability testing. Establishment of the service desk and service support processes, establishment of the processes for knowledge database maintenance and development falls into the administrative part of the transition. Strategic part includes the check that during the transition, and once when the transition is completed, the service still remains fit for purpose.

The transition usually introduces changes, and changes can affect some of the following categories:

1. the infrastructure - when the infrastructure used during the development is not the same as the one that will be used for a production service; infrastructure includes all the hardware and software needed for the service candidate release;
2. the service itself - if during the validation and testing phase it turns out that current version of the service should be changed in some way;
3. people - when persons from the development team will not be involved with the service when the service goes into production and/or when

additional people should be introduced in the service-related tasks;

4. procedures - if procedures used during the development phase are no longer applicable and/or used in the operations phase and when operations phase brings new or changed procedures that needs to be followed.
5. multi-domain aspects - resources provided by one domain could be replaced by or amended with resources from another domain (resource can be for example a person, hardware or software), tasks performed by one domain is being transferred to another domain.

Any of those changes should be analysed, evaluated and managed.

Starting situation, as well as any of the aforementioned changes can impose challenges and/or risks to the service offering.

IV. CHALLENGES AND RISKS

Each and every service lifecycle phase brings some challenges and with it associated risks to its stakeholders.

Challenges and risks recognized from the analysed cases, extended with other that changes in a service transition can bring and observed from the same five categories are:

1. the infrastructure - existing infrastructure not available for use in the production, new infrastructure resources not (yet) available, available resource not sufficient, possible delay for the infrastructure preparation that can impact the service launch, the service requires specific software that is not available (including potential issues with licences and licencing), ...;
2. the service itself - the service is not fit for purpose or not fit for use, the services require bigger changes which means that it is not ready for production, the service does not satisfy needed requirements or does not pass validity tests, ...;
3. people - lack of needed expertise or experience, insufficient number of team members, changes in the team (e.g. caused by individuals leaving to other teams/companies or handover from one team to another), not enough motivation, ...
4. procedures - existing procedures not applicable, procedures too complicated, additional procedures not coordinated with existing procedures, too many procedures, slow support caused by inappropriate procedures, old teams face difficulties accepting new procedures (relates also to the #3 - people), ...
5. multi-domain aspects - resources provided by one domain should/should not/should but cannot be replaced by or amended with resources from another domain (resource can be for example a person, hardware or software), tasks performed by one domain are in some part overlapping with another domain, a domain not aware of their area of responsibility, ...

For each risk it should be defined what is the possibility that this risk will happen, what could be the impact and what are the possible options to mitigate the risk. For each of the option, additional analysis should be performed to define the optimal solution at the time of the analysis.

V. CHALLENGES RESOLUTION

The potential risks cannot completely be eliminated. Necessary prevention can help to decrease the possibility of the appearance of a risk and/or to lower down the potential impact, but some risk will always be present.

However, the challenges can be minimized and mitigated with the implementation of the following methods and techniques, gathered in the five letter word - DARCS:

D - Description of work should be clear for each and every participant of the team, disregarding the role the person takes. From the service perspective - this should provide basic definitions for the service.

Work description influences each human-related service aspect. Therefore, if a challenge is related to the participation of one or more persons, D should be checked and acknowledged.

A - Assignment or job assignment should be clear for each and every person at each and every point in time related to the service.

Each person gets its own assignments within the team that together brings the whole puzzle together. A challenge may arise if the assignment is not well understood and by each person matched to exact set of steps to its resolution. Thus, together with the broader scope of D, A should be checked for all team members in each service aspect.

R - RACI (Responsible, Accountable, Consulted, Informed) matrix [11] of roles important for the service should be clear to all participants for all important situations.

R is implemented each time when there are more actors involved, in order to define relationships between them. If the associations are not defined or not well defined, risks and challenges may arise, e.g. in the form of overlapping tasks, unrecognized gaps, delays.

C - Communication is the most important glue that can keep everything together; exchange of data and information horizontally and vertically is even more important in the multi-domain environment and in the phase of service transition which is expected to be the most dynamic, the fastest and the shortest comparing to other service lifecycle phases.

C should be checked each time when a challenge is recognized, hopefully before it becomes a risk, in human interactions, as well as in protocols and procedures.

S - SMART goals - last but not least, all goals related to the service transition and offering should follow the SMART principle [12] and be defined to be very **specific**, **measurable**, **achievable** (agreed upon), **realistic** (with reasonable resources) and **time-based**.

SMART approach should be checked every time when the infrastructure is involved. Right measure, resources, timing, specific requirements are extremely important, and if omitted - raises risk possibility. SMART should also be checked against procedures, processes and multi-domain aspects. With regard to people, SMART can help to determine exact goals of the participation and expectations and therefore should not be ignored.

Proper combination of the techniques enables managers and team members to address every challenge and minimize the more or less expected risk, as can be seen in the following Chapter.

VI. DARCS IN ACTION

Following Tables match challenges from Chapter 4 with the proposed DARCS principle described in Chapter 5, and lists one or more techniques that can help mitigate individual challenges.

Challenge - Infrastructure	DARCS
existing infrastructure not available for production	RCS
new infrastructure resources not (yet) available	RCS
available resource not sufficient,	RCS
delay for the infrastructure preparation	RCS
software dependencies not resolved	RCS
...	?

Table 1: Challenges - Infrastructure

As it can be seen, all listed infrastructure challenges (except for the last) are related to the fact that the resources are not made available, which is included in the letter R of the SMART goal definition principle. SMART goal requires that the needed resources are known and made available, so if the SMART approach is taken, with the analysis of the resources it will be known what should be ensured before the transition can take place. If the resources are recognized in advance, then the transition can start only when the resources are ready, otherwise it can be delayed or cancelled. There is a possibility that the needs of the service were not communicated well and/or in advance to the resource owner/stakeholder, and that it caused the challenge to appear. If so, then the communication channels and messages should be checked to ensure that all relevant parties are appropriately involved. If there are more parties involved,

the need for RACI should be checked and introduced if needed.

The last option enables the possibility that not all challenges are listed. There is no ultimate solution for an un-known problem, therefore the question-mark in the field. The same is applicable for all the following tables and will therefore be omitted.

Table 2 lists challenges related to the service itself:

Challenge - Service	DARCS
not fit for purpose	DACS
not fit for use	DACS
not ready for production	DACS
does not pass validity tests	DACS

Table 2: Challenges - Service

All listed challenges can appear as a result of the execution of service validation and testing process during the service transition. One of the first things that should be checked next is - is the overall work defined well enough, and then secondarily - was is clear to all involved (including their assignments). In addition, if the testing process provided bad results, it should be clearly communicated to all involved. In order to prevent this, D and A should be checked, as well as goals re-assessed across the SMART principle.

Table 3 lists challenges related to the people involved in the service:

Challenges - People	DARCS
lack of expertize	DACS
lack of experience	DACS
insufficient number of team members	CS
changes in the team	CS
lack of motivation	CSA

Table 3: Challenges - People

Lack of the right combination and number of people that should be engaged with the service signals that it should be re-checked if all involved know their exact work and roles and to match it with existing expertize and engagement. If the challenge still exists, then it means that resources (from S) should be re-checked. Communication is here of vital importance, to help recognize that there is a gap, and to help prevent a situation that because of continuous lack of resources existing people burn out (faster spending of existing resources).

Table 4 contains a list of challenges related to procedures. Since the service operational procedures deal with different roles and responsibilities, it is not strange that R has important role in this area. Procedures non-existing, not applicable, too complicated or overlapping, point to the need to define and/or redefine the roles (R) and existing resources (people) (S) and to communicate

(C) necessary changes and procedures to all involved. In addition, it is important to check if all know their assignments (A), to avoid misunderstandings.

Challenges - Procedures	DARCS
existing procedures not applicable in production	CRS
procedures too complicated	CS
additional procedures not coordinated with existing procedures	CR
too many procedures	SR
slow support caused by inappropriate procedures	ARC
old teams face difficulties accepting new procedures	ARC

Table 4: Challenges - Procedures

Challenges that might appear in the area of multi-domain service support are listed in the Table 5.

Challenges - Multi-domain	DARCS
resource provisioning is changing from one domain to another	ARCS
tasks performed by one domain are overlapping with another domain	DARC
a domain not aware of area of responsibility	DARC

Table 5: Challenges - Multi-domain

Three selected challenges require strong communication between domains. It has to include discussions about the exact area of work (D), exact assignments (A), the matrix of responsibility (R) that should be synchronous on both sides (or all sides if more of two domains are involved). The first example is directly related to the available resources and how they are determined. The last two can have any of the S aspects as a secondary after thought, after the DARC is analysed and resolved.

It can be seen that some of the techniques are better for some area of challenge sources, and some for the others. Some techniques such as Communication and SMART are applicable very often, especially in the phase of service transition. RACI should be engaged when there are more parties involved, D and A when one or more persons are included.

Additionally, even if some of the letters are not mentioned in the table, the resolution of one challenge might introduce the need to use other techniques, that were not used at the beginning.

For more complex and important services and systems DARCS can be applied in circles and each of the techniques re-assessed each time when the challenges and/or risks are recognized.

VII. RELATED WORK

In [13], Cusick explains production readiness reviews that are added to the architecture review in the transition phase.

Wolski et al. [14] presented a Service and Validation Process that includes a set of tests that are performed on a service candidate before the service goes into production. Only successful execution of all defined tests ensures that the service will transition directly. Partial success means that the service will stay with the developers until the minor or major are corrected.

Bovend'Eerd et al. define in [15] a novel approach to set SMART goals by “using up to four parts: the target activity, the support needed, quantification of performance and the time period to achieve the desired state”. In this paper, SMART goal setting is seen as a useful tool that enables all participants from multiple domains to share the same view on the goals of every process and every task related to the service operations.

VIII. CONCLUSION

This paper examines service offering from the perspective of the time when the service goes from the development in the production, and when there are multiple area of knowledge or influence. Service transition and especially service transition in a multi-domain environment can be very challenging. Five categories of challenge sources are recognized for a service transition in a multi-domain environment, and for each of them a few potential challenges and risks have been listed.

Based on the multiple sources of best practices, a set of five existing techniques is proposed to help avoid most of

the challenges and mitigate their potential impact. However, none of it can help to eliminate the existence or appearance of any risk in the system.

Proposed approach has been applied on a listed example of challenges (and risks) with a proposal of the techniques that can help in a particular situation.

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