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Integration of Holistic Non-Conformities Management and Axiomatic Design: a case study in Italian Income Tax Returns Management

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Abstract

In the last few years, the Italian Welfare State has suffered from the effects of the serious economic crisis. The crisis has hastened the need to cut down the public expenditures. The current study focuses on the improvement of the effectiveness, the efficiency and the inexpensiveness of those processes related to the management of the tax services provided by medium/large withholding agents. The proposed method aims to improve handling Non-Conformities in a process, by introducing a project plan based on the Axiomatic Design methodology. This method aids in producing a set of robust planning solutions for a wide range of issues. Starting from the reported issues emailed to the Customer Support Service of the process, it is possible to catalogue the encountered issues through an Holistic Non Conformity Reduction approach, so that introduces such a level of abstraction necessary to define Non-Conformities of process in a basic and logical way. Then, we turn to the Axiomatic Design methodology in an iterative way and we find the set of planning solutions, which are more logically suitable to the operating context. In practice, this allows innovative and sustainable clustering approaches, making the development of proactive lessons learned possible. These can be used both in the development and in debugging of the information systems supporting the process management, ensuring an enhanced robustness against the frequent changes related to legislative measures and the forecasts adopted.

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1. Introduction

Over these years, the public administration sector has been hit by drastic cuts in available staffing due to various and successive spending review policies. It has often dealt with linear cuts that have indiscriminately affected all sectors, without the real issues being confronted, so that a proposal for innovative solutions. From one side, these allow to cut business costs and on the other side to increase the effectiveness and the efficacy of the public action. Thus, the most important challenge faced by the Italian Welfare State is to provide benefits with the service levels expected by the citizens and guaranteed by the Italian Constitution and at the same time substantially lower the cost of the public expenditures, above all in the lower-value sectors for the citizen. The adoption of new organizational approaches demonstrates that the abovementioned challenge may be possible. This article suggests an innovative approach aimed

at the Non-Conformities management optimization in order to produce the end-of-year income certifications (so called CU). All the withholding agents have the obligation to provide their taxpayers (employees, contractors, insured persons) an end-of-year single certification (CU), attesting amounts granted, deductions and all the other fiscal and personal information required by law. It is a declarative instrument of considerable importance for citizens since it is at the root of the fiscal audits made by the Revenue Agency itself. The Non-Conformities reduction related to this process therefore means to provide citizens with flawlessly income certifications, with no risk of future assessments and with tax deducted in a balanced way throughout the year. This will avoid that the citizens get final burdensome balances. To the withholding agents it means reducing the re-working and Customer Support costs in order to correct defective certifications, while to the Revenue Agency that means avoiding the issue of notices of payment to citizens and the 730 pre-compiled

forms, according to the recent tax reform [1]. The 730 pre-compiled is the Italian income tax returns, which is pre-compiled by the Revenue Agency on the basis of income certifications CU. The withholding agents must submit the CU certifications no later than February 28. The taxpayers are obliged to check their 730-precompiled. In case of lack of certain income information the taxpayers must adjust the 730 pre-compiled available on the website of the Revenue Agency, so that the statement is complete. Therefore, the tax law sanctions the withholding agents, which are defaulters [1]. In fact, the withholding agents must avoid from incurring a 100 euros sanction for each single CU certification submitted after February 28 or notified with mistakes compromising the correctness of the following 730 pre-compiled form. Therefore, it is essential to reduce the non-conformities process. So, the following paragraphs offer an innovative organizational approach that significantly reduces the number of non-conformity.

2. Planning ahead from Present

This article focuses on the management of Non-Conformities (NC) resulting from the issue of the CU income certifications reported by users. The first stage of the process is cataloguing those issues, usually reported by users' notices. For what concern medium and large-sized enterprises, the relationship with the customers is delegated to peripheral agencies, receiving complaints from customers, making first interventions and email the helpdesk the different issues. At this point, two objectives need to be pursued:

- 1) Promptly solve the reported problem;
- 2) Prevent that same problem will occur again in the future.

The taxation has an annual characterization.

About the second object the proactivity means that it is necessary to start planning that now for proactive measures that have to take into consideration what caused the different problems and the possible legislative changes that may arise in the meantime. Keep tracking of these problems let us formulate the functional requirements necessary to start up the campaign to produce the CU certifications for the following year. Therefore, in this article there is a dual approach based on the combination of an Holistic Non Conformity Reduction approach (HNCR) [2,3], in order to gain, catalogue and register Non-Conformities and Axiomatic Design (AD) for producing a set of robust planning solutions. Such approach allows defining a level of a sufficient abstraction so to identify non-conform clusters solvable by a single intervention. Moreover, taxation has an annual characterization. Every annuity has its specific version of non conformity. HNCR solves the non conformities related to different tax years. In fact, the Root Cause Analysis (RCA) solves the non conformities of a specific annuity. RCA does not provide any tools to solve non conformities for successive versions of the same problem. While, HNCR allows us to find solutions for different annuity. This means planning for proactive measures that have to take into consideration what

caused the different problems and the possible legislative changes that may arise in the meantime. Keep tracking of these problems let us formulate the functional requirements necessary to start up the campaign to produce the CU certifications for the following year. The second part of the article, however, focuses on the selection of the most appropriate corrective actions to resolve such problems in the future. For this use is made of a decision-making mechanism based on the logical principles of the AD. This approach allows to find the more robust solution. AD suggests that the best design solution achieves [4]:

- Maintain the independence of the functional requirements of design;
- Reduce the additional information required to make the system function designed.

2.1. Customer Users Support

The Customer Support to the End-users of the system is the main point of this dual mechanism. It deals with a real litmus test used to monitor the trend of the entire process. It is made up of two parts, the Front End, dealing with the activities run by the helpdesk agents on the applications troubleshooting and a Back Office, held in the Functional Assistance area. Notices are almost exclusively reported by email and not necessarily are about Non-Conformities of the process. They can be about simple information or ask for support in the use of the applications. All the reported notices are often in the business repositories, where they are classified by subject, status (open or closed), requesting user, resolving time and specific request. The body of the email is not a structured template but is a free text. The subject of the same email is not always mentioned so that the Front Office agents must read it carefully and they reply only in case of immediate resolution. Concerning particularly complex issues or when a new case occurs, the email is forwarded to the Back Office, taking care of troubleshooting it. In this case, the analysts follow an RCA (Root Cause Analysis) methodology pointing to the resolution of the reported problem. Notices can also be forwarded to other areas, in case of out of scope or if it is necessary you may ask for other areas cooperation. Also in this case, the Non-Conformity solution always follows an RCA approach. Finally, both categories of intervention are solved with a more structured approach for those representing a "weight" in terms of more relevant numbers of events and impact on citizen. The less impacting problems are faced when the event occurs or they are not resolved at all if the resolving cost is much higher than the expected benefit. Figure 1 illustrates the functioning of the assistance service. It also should be noted that the notices Repository is an electronic registry for tracking simple calls and emails, both requests and replies. It is not created to elaborate complex information to be used for a radical analysis of the Non-Conformities.

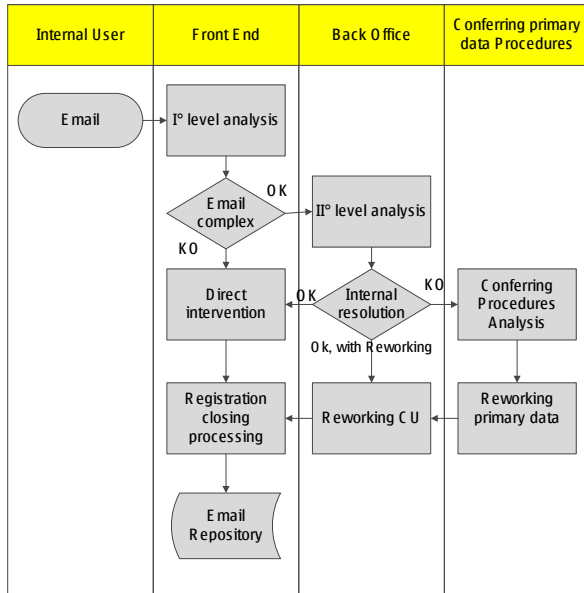


Fig. 1 Process Assistance Users with RCA approach

2.2. Implementation of the Non-Conformities management system with holistic approach

The tracking of the incidents carried out over time can be used to implement a more structured database that may detect in a more detailed way the Non-Conformities available from users' notices. In this case, the assistance service becomes then a detector of all the issues raised. Thanks to an activity of analysis and cataloguing, you may re-articulate the same Non-Conformities in a multiple-levels structure, containing unique and structured elementary data. This allows analytically deepening with an impact on more NCs at a time, by avoiding the expensive activity to solve them one by one. It is about to valorize the experience acquired all over the years with a lesson learned useful to solve problems in an overall way, looking at the deeper root. [3].

The Non-Conformities are mapped in six levels:

- First Level: NC Category. It is the higher subject of the non conformity;
- Second Level: Description of the Non-Conformities type. It is about the general subject of the problem;
- Third Level: NC Subject. It individuates the specific subject of the problem.
- Fourth Level: Competency Sector Category. It individuates the system or systems generated the problem.
- Fifth Level: Risk Category for the citizen. It indicates the consequences that the NC may have on citizens. Specifically, the following consequences may occur:
 - Assessment. In this case the NC can produce the issue of an assessment notice by the Revenue Agency for citizen;
 - Loss of tax credit. In this case, the issued income tax return does not allow the correct setting up of the 730

form. There is no assessment risk, but the problem is the missing credit amounts belonging to the citizen.

- Information. The issued income return is formally correct. Descriptive information that underline the compiling of the income tax return to the citizen is missing.
- Income Certification. The income certification is formally issued but the citizen has to re-issue an income tax return so to offset the taxes the withholding agent could not set because of inadequacy or uncertainty of some information.
- Sixth Level: Problem Category. It identifies the type of the specific problem generating the mentioned NC. At this level two particular associated attributes can be assigned to the NC:
 - Corrective actions necessary to solve the problem;
 - Classification of the same NC according to the traditional classification in Personnel, Machines, Environment, Methods, Material, Measurement [2].

2.3. Application methodology

For example, here is the report of a NC registration in the DataBase concerning the following email received (Figure 2). This message relates to the fiscal assistance 2014. CUD is the version of the income certification of the year 2014, relative to the income paid in 2013. CUD certification was replaced in 2015 by the certification CU due to the legislative decree 21 November 2014 , n. 175.

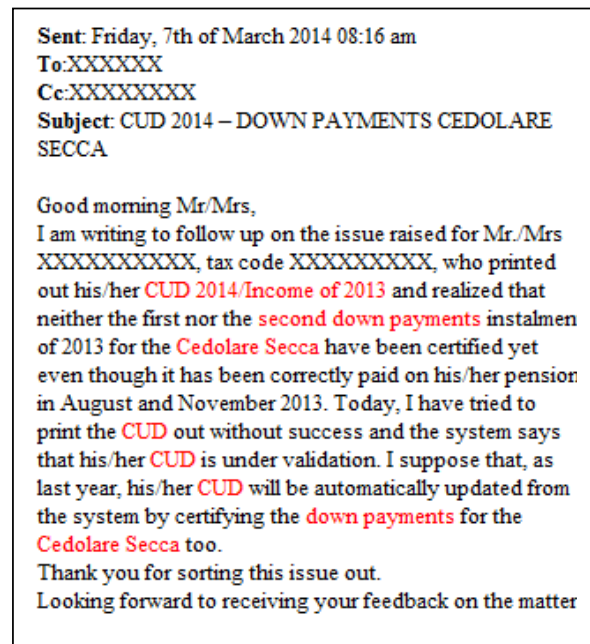


Fig. 2 Example of Assistance request email

Concerning this email, we might say that it is part of the same NC category as the Annotations. In particular, it deals with the relevant annotation about the down payments of the

taxing assistance (Annotation BA CUD 2014) [5]. Such annotation certifies the IRPEF accounts (Italian Income Tax Down Payments) and from Cedolare Secca (Italian Rentals Tax Down Payments), for Declarant and Spouse, retained by the withholding agent with the taxing assistance of the previous year. Thus, the single NC can be split into four sub-conformities that may vary with the wrong component (Object). Further fractionations can be made in conformity of the procedure generated the anomaly (Sector). Consequences for citizen can be various. Each category of Risk introduces on a following NC re-articulation. At the same time, the Problem type may be a criteria of the NC following partition.

Table 1 Graphical Representation of level from 1st to 4rd.

1 st level NC Category	2 nd level: Description of the Non-Conformities type	3 rd level NC Subject	4 th level NC Sector
Annotation (FR ₁)	Unavailable 730 Annotation (FR ₁₁)	Down Payment of Irpef 730 (FR ₁₁₁)	NI
		Down Payment Cedolare Secca 730 (rentals) (FR ₁₁₂)	NI

Table 2 Graphical Representation of 3th , 4th , 5th , 6th Level

3 rd level NC Subject	4 th level NC Area	5 th level Risk for the citizen	6 th level Problem	Corrective Actions	Non-conformities type
Down Payments Irpef 730 (FR ₁₁₁)	NI	Loss of tax credit	Absent	Acceptance Test with provided data	Personnel
Down Payments Cedolare Secca 730 (FR ₁₁₂)	NI	Loss of tax credit	Absent	Acceptance Test with provided data	Personnel

Tables 1 and 2 provide the representation of the case analysis with the six levels used. They allow us to skip from a generic description of a Non-Conformity to the abstraction of the same in terms of structured attributes, memorized in a relational database.

2.4. Re-organization of the information flow

The adoption of a holistic approach to the management of Non-Conformities leads to a re-organization of the information flow of the Customer Service. Against the current situation, where the requests for assistance are simply traced in a low-structured electronic archiving system, consisting of a simple Email Repository with forms registering the resolving times of the problem. Through a setting of a HNCR approach the same reported issues will have to be registered in of a multilevel network DataBase allowing us to have a well-structured and relational handling of the information in it. This solution permits to :

- Perform multilevel cross correlation analysis among the categories;
- Obtain a synthesis of the multilevel network information through graphics, report and data file. These tools should be tailorable to underline trend or detect critical level;
- Identify in automatic mode the holistic critical issues of Non Conformity Management (cluster of Non Conformity);
- The cluster abstraction allows to define the non-conformities to a higher conceptual level. Thus, the critical issues no longer depend on the particular annual version of the problem. But, the remedial action can be calibrated for subsequent years, even in the presence of a strong variability of the legislative environment.

This DataBase will also have a sub-system that memorizes the history of the Non-Conformities and those that will occur through the time. This way, the Back Office Analysts will give the proper support to assign a category to the different issues by tracking them into the system, following the tracking record previously retrieved. The Front End Agents will have to assign an id number/code to the specific registered Non-Conformity for each single Non-Conformity request for support. The previous report presents a very interesting situation. The NC refers to the previous version of the tax return CUD 2014. With the CU 2015 certification Annotation concerning Down Payment 730 has been eliminated [6]. The information of the Down Payment 730 paid are as specific fields in the same statement. The classification of NC detected in 2014 on multiple levels allows us to identify the levels of non-conformity that are still valid for the version of non-conformity 2015. In this case, to be changed is only the first level. The anomaly is no longer associated with the category Remarks. But, other levels of analysis remain unchanged, as well as corrective actions. The whole system is shown schematically in Figure 3

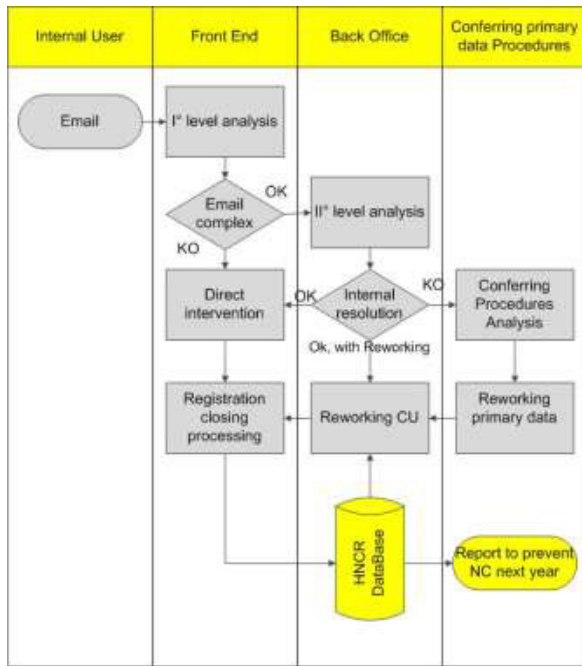


Fig. 3 Users Assistance Process with HNCR approach

3. Set of robust interventions through Axiomatic Design

The aim of this part of the Non-Conformities Management Process is the design of a set of robust corrective actions. Indeed, after having identified the Non-Conformities occurred during a certain annuality, we can actually go to the next stage of planning interventions that have to be adopted for the following annuality to improve the system performances. In this case, we adopt an AD-based planning approach [4]. The Figure 4 shows the whole process to identify some available solution clusters that could be adopted that is a fit of the traditional model of axiomatic planning in this framework . We have introduced in the classic AD model, between Customer Domain and Functional Domain, the cataloguing system anomalies with HNCR approach. This system represents the cataloguing mechanism of the reported Non-Conformities, that allows us underlining homogenous clusters anomalies. Each cluster of Non-Conformities corresponds to a specific functional requirement of the Functional Domain. The Physical Domain contains, however, the corresponding corrective actions to specific NC. While, the Process Domain is the domain of the instruments of implementation for this corrective actions. This mechanism design allows us to design for specific clusters of NC the most appropriate set of corrective actions. Moreover, such corrective actions are evaluated, also, for the degree of actual realization. This mechanism also allows to accumulate knowledge on the working process and to spread easily to the various sectors. These are the following definitions:

- Anomalies’ notices sent to the Customer User Support by the peripheral agencies’ operators, represent the {CA_i} of the Customer domain. They are non-structured notices that should be analyzed and catalogued;

- HNCR DB & Interface instead, represents the cataloguing mechanism of the reported Non-Conformities, that allows us underlining homogenous clusters anomalies, as stated in the previous paragraph;
- {FR_i} are homogenous clusters of Non-Conformities after having applied for the holistic mechanism of reclassification. They are the functional requirements of the process;
- {DP_i} are corrective actions to implement in order to satisfy the corresponding functional requirements. In other words, they are the actions to be implemented so to solve the reclassified Non-Conformities;
- {PV_i} are effective realized interventions to be implemented in order to activate corrective actions.

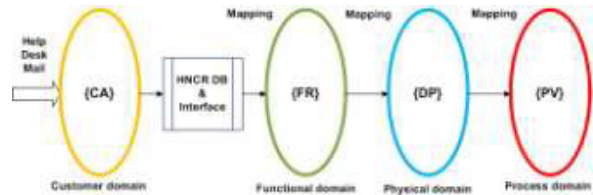


Fig. 4 Users Assistance Process with HNCR approach

3.1. Mapping from Customer to Functional Domain

Mapping between {CA_i} and {FR_i} corresponds to the analysis and cataloguing process of Non-Conformities received in a non-structured way via noticed reported to the Assistance Service. In order to make the mapping more robust form a logical point of view {FR_i} should be reviewed on the basis of the following process stages, because the first formulation could not be that strict. This activity corresponds to Non-Conformities normalization so that the independence axiom is fulfilled. Therefore, each single functional requirement should be the expression of conceptually autonomous Non-Conformities. It can be that (FR_i) and (FR_j) are not independent user requirements, but one of the two includes partially or entirely the other one. In this case, {FR_i} has to be modified into the Non-Conformities reclassification so to obtain homogenous cluster from a conceptual point of view.

3.2. Mapping from Functional to Physical Domain

Mapping between {FR_i} and {DP_i} corresponds to associate the relevant corrective action to the each single Non-Conformity to be implemented in order to avoid that the problem will occur again. The Figure 5 provides such mapping through a correlation. As it is possible to notice, the mapping is multi-phase, corresponding to the levels of reclassification of the users’ notices. In the example, we have considered three levels of significance:

- Level 1 which identifies the generic NC (Annotation);
- Level 2 which identifies the specific NC (lack down payments 730);
- Level 3 which identifies two NC categories that might arise:

- o Lack of down payments IRPEF 730;
- o Lack of down payments Cedolare Secca 730.

This framework, through AD, includes the simultaneous valuation of the Independence and Information Axioms. The Independence Axiom guarantees that the set of corrective actions are a patchwork of logical solutions. The whole project is represented by a matrix of diagonal or triangular correlation. The Information Axiom allows, instead, selecting from more set of corrective actions that is more likely to be realized.

	Corrective Actions	Test	Acceptance Test Down Payments 730	Verification of Down Payments Irpef 730	Verification of Down Payments Cedolare Secca 730
Non-Conformities		DP ₁	DP ₁₁	DP ₁₁₁	DP ₁₁₂
Annotation	FR ₁	X ← Level 1			
Lack 730 Annotation	FR ₁₁		X ← Level 2		
Lack Down Payments Irpef 730	FR ₁₁₁			X ← Level 3	
Lack Down Payments Cedolare Secca 730	FR ₁₁₂				X

Fig. 5 Mapping from Functional to Physical Domain

3.1. Mapping Functional domain to Physical domain

Mapping between {DP_i} and {PV_i} corresponds to associate the specific implementation interventions to each single corrective action (Figure 6).

	Implementation interventions	Commission Test	Acceptance Test Commission	Set of tests on Down Payments Irpef 730	Set of tests on Down Payments Cedolare Secca 730
Corrective Action		PV ₁	PV ₁₁	PV ₁₁₁	PV ₁₁₂
Test	DP ₁	X ← Level 1			
Down Payments 730 Acceptance Test	DP ₁₁		X ← Level 2		
Verification of down payments Irpef 730	DP ₁₁₁			X ← Level 3	
Verification of down payments Cedolare Secca 730	DP ₁₁₂				X

Fig. 6 Mapping from Physical to Process Domain

The purpose at this stage of the process is to verify the feasibility of the corrective action previously identified. The associated matrix correlation, for which there is an example against the case previously stated, will have to respect the Independence and Information axioms of the AD. When the axioms are not fulfilled, it needs to go back to the previous stage to select a further set of actions. The entire process flow can be summarized by Figure 7.

4. Conclusions

The re-styling of the Customer Users Support through a dual approach allows monitoring the whole process management of income tax returns. Thus, from one side the re-classification of each single Non-Conformity in a multi-level scheme allows us to use a relational DataBase with simple and well-structured data in it. Through these data, it is possible to easily implement the preventive policies to resolve anomalies of entire clusters. On the other side, the introduction of project plan techniques based on the AD allows us to find, among the possible solutions, the more robust ones, above all in a framework of extreme organizational complexity and legislative variation. This approach leads to the reduction of costs related to individual solutions made in an offhand way. Moreover, the seasonality of the taxing deadlines allow the smart planning for interventions, by proposing, in cooperation with the areas giving the primary data areas, preventive policies with a dual result:

- Avoid NC entire clusters will occur again;
- Facilitate the identification and sharing of more robust solutions;
- Allow the dynamic cataloguing and archiving of corrective actions refreshed compared with the complexity and mutability of the legislative and social context;
- Improve the performances of the procedures transferring themselves into the provision of benefits to citizens;
- Improve knowledge management of work processes, encoding problems, solutions and best practices and facilitating the transfer of knowledge business

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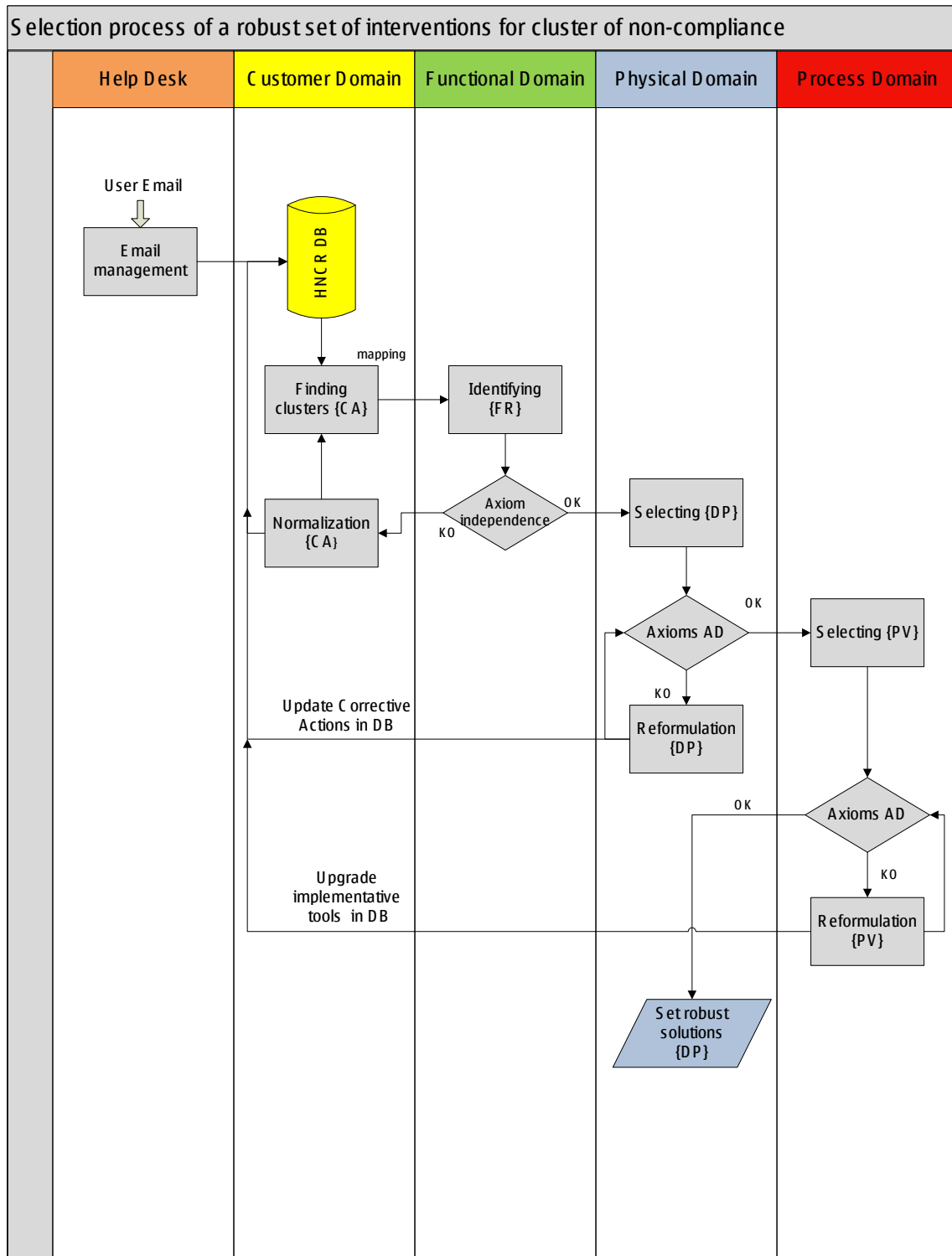


Fig. 7 Selection process of a robust set of corrective actions