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DESIGN REVIEW BASED ON PROCESS MAPPING

Abstract:

The DRBPM system analyzes the standard and non-standard definitions, compares them with available resources and the volume of input and designs the optimum way to perform.

The other known solutions were developed specially for products and are complex in a way that demand specialists to implement and monitor them. DRBPM can be applied to either products or processes effectively in a simplified way and can be managed by anyone involved in the process which avoids long and complex trainings to the personnel.

The other solutions work independently and can help enhance a product/process with some restrictions. DRBPM is a set of known solutions which have been integrated and improved to work as a methodology that can optimize any processes or products thoroughly.

The methodology provides an innovative approach of the Design Review Based on Failure Mode (DRBFM) by shifting from the review of a product, process or goods based on failures analysis, typically performed before the product launch to the mapping of all events inside the organization and defining what is standard and non-standard and then design an optimum process flow and resources application.
A system and a methodology for reviewing the process and optimizing the flow in a better way. The methodology includes the complete analysis of the current process, which will map and define:
The standard processes
The mapping and treatment of failures
Costs and time measurements
Resources mapping and optimization trough the design review.

The system processes the data acquired by the method and, through process simulations, gives us, as a result, the optimum process flow.

Additionally, the system provides a documentation structure for the whole process according to the ISO 9000 standard and an easy way to show and find documents and related instructions

Keywords:

methodology, design, optimization, process, mapping, business, quality, system

JEL Classification: M11

Introduction

A combination of literature review, regarding the methods FMEA, DRBFM, ISO 9001, and DoE, and findings from our focused meetings and trainings were the sources to define the proposed method and to define it in couple words we can say that DRBPM is a combination and transformation of complexes quality methods in a simple way to organize and design the best process flow. The invention relates to a methodology and a system that provides for any organization the optimum way to perform their processes based on a complete process mapping using known quality tools such as the Eight Do`s (8D), Ishikawa (ROSS, 1988), Failure and Mode Effect Analysis (FMEA) and Design of Experiments (DoE) that are simplified and transformed by the Design Review Based on Process Mapping (DRBPM**)** in order to develop a quality method that could be easily applied.

The present invention broadly relates to a method of mapping processes, sub-processes, steps and sub-steps into an organization, defining the standard process and analyzing bottlenecks and failures to execute the exact actions to solve problems.

The Firewall is the method used in order to map processes and failures. It was developed from FMEA (US Patent # US20060149506A1 – DFMEA) and changed and simplified to achieve a practical method to understand and map the mapping and failures. Additionally, Firewall develops a Flexibility Matrix that relates the resources needed that are internal and external service suppliers for each process requirement and provides the Flexibility Matrix fulfillment. The Flexibility Matrix is feed by Firewall which defines the standard processes and data from First Pass Yield that supply with specific requirements and process defects.

The First Pass Yield (FPY) is the method to analyze the failures through 8D tool and Ishikawa and creates a standard way to solve and catalog failures. The new model of Ishikawa guides the FPY to take actions directly inside the system.

1 - Theoretical Basis

It is a reality in growth markets to perform goods and processes already developed and defined by using in the most part of the cases the obsolete resources from major markets. These processes and production resources should be aligned with environment requirements from growth markets and covers it at all (WOMACK, 2007). Additionally (MANDELBAUM,1996) affirms that there is a room for improvements when any non-previously designed changed is applied before the product launch so that changes includes processes transferences (such as location changes). In fact changes always create an increased potential failure in the design (CHAO, 2007). Design changes can be problematic because designers are not always aware of the connectivity between the different parts of a product or process and can inadvertently ignore the incidental effects of change (ECKERT, 2001).

The DRBPM consists in a system and methodology that covers the end to end inside any process, and it is not a lonely product it is a method and system to be applied in unstructured processes or processes by low level of control. This is an optimization processes system that applies a systemic methodology based on the Design for Six Sigma , that has as a focus optimize the initial phases of product development (MADER, 2003) and as a result provides an innovative approach of the DRBFM by shifting from the review of a product, process or goods based on failures analysis, typically performed before the product launch (MANDELBAUM, 1996) to the mapping of all events inside the organization and defining what is standard and non-standard and them designing an optimum process flow and resources application using the FMEA analysis in a simple way (Firewall), system analyzes the standard and non-standard definitions, compares them with available resources and the volume of input and them designs the optimum way to perform.

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2 - Design Review Based on Process Mapping

2.1 Opening term

The Opening Term document has been developed in order to define the main definitions that basis the project planning and execution.

- **Business Application:** Design Review required standardizing and structuring processes.
- **History:** Complex process without standard definition as a result customer has been impacted with delays and failures.
- **Objectives / Goals:** Process cycle time reduction and Process Accuracy Improvement (99.9997 percent error-free performance %).
- **General Benefits:** Process Certified the International Standardization Organization (ISO) 9000 Standard Process Design (Production and Solve Problems); to reduce internal and external complaints invoiced, improve customer satisfaction (internal and external).
- **Restrictions:** Border through actions in External teams, changes in concept process, human resources availability for the project development, new Metrics will be applied.
- **Project Champion:** IBM Innovation Program.

2.1.1 Training

A complete training program has been developed to provide the project team the required knowledge over the quality tools used during DRBPM deployment. That tools has been simplified and transformed by DRBPM concepts and by using the GD³ (G.D Cube) activities that drives to identify the requirements for a “good design” and observing them, holding a “good discussion” with related and right people that

examine the process carefully and them conducting to a “good design review” (KANO, 2004). The training program includes ISO 9000 overview, FPY (First Pass Yield) that covers 8D (Eight “Do`s” method) and Ishikawa, Quality Assurance Matrix called Firewall.

2.2 Scope

2.2.1 Applicability

DRBPM methodology covers every organization that in any way a supplier input data and them the validation and transformation is required through processes and activities to service a customer. Data is well understood as any input tangible or non-tangible that means tangible inputs must be translated to digital information.

2.2.2 Proposal Description

The Project proposal is mapping the key processes and sub-processes and optimizing the process performance through an innovative design review. That design will be a proven concept over the process approach.

2.2.3 SIPOC

The current process mapping using SIPOC (Supplier, Input, Process, Output and Customer) concept allows the brainstorms through GD³ principles that results in planned process mapping which make it simple to understand:

- the suppliers entities (external resources)
- the input

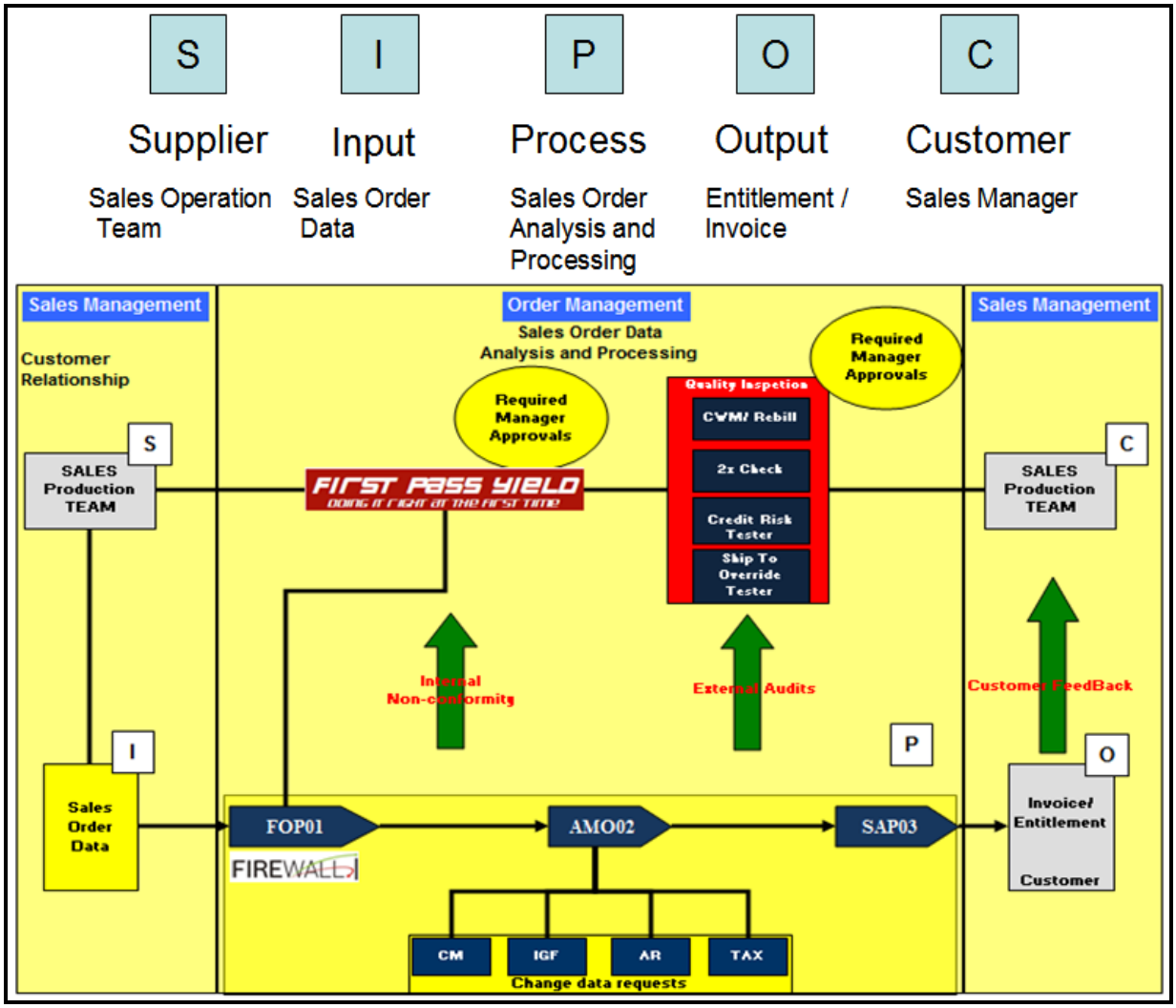
Firewall mapping:

- how to validate the input (standard) and what are the validation failures
- how to transform the input (standard) and what are the transformation failures
- how to release the input (standard) and what are the releasing failures
- what are the resources required to execute the process and related needs
- Time and costs for standard process

First Pass Yield:

- Failure catalog
- In case of non conformity input provide standard way to treat non-conformity by using the 8D (ROSS, P.J. 1988) with suppliers and avoid recurrence using the external resources certification,
- In case of non-conformity performance provide standard way to update the process and avoid recurrence using the internal resource certification.

The Picture 1 is an example of the DRBPM system deployed in a financial process.



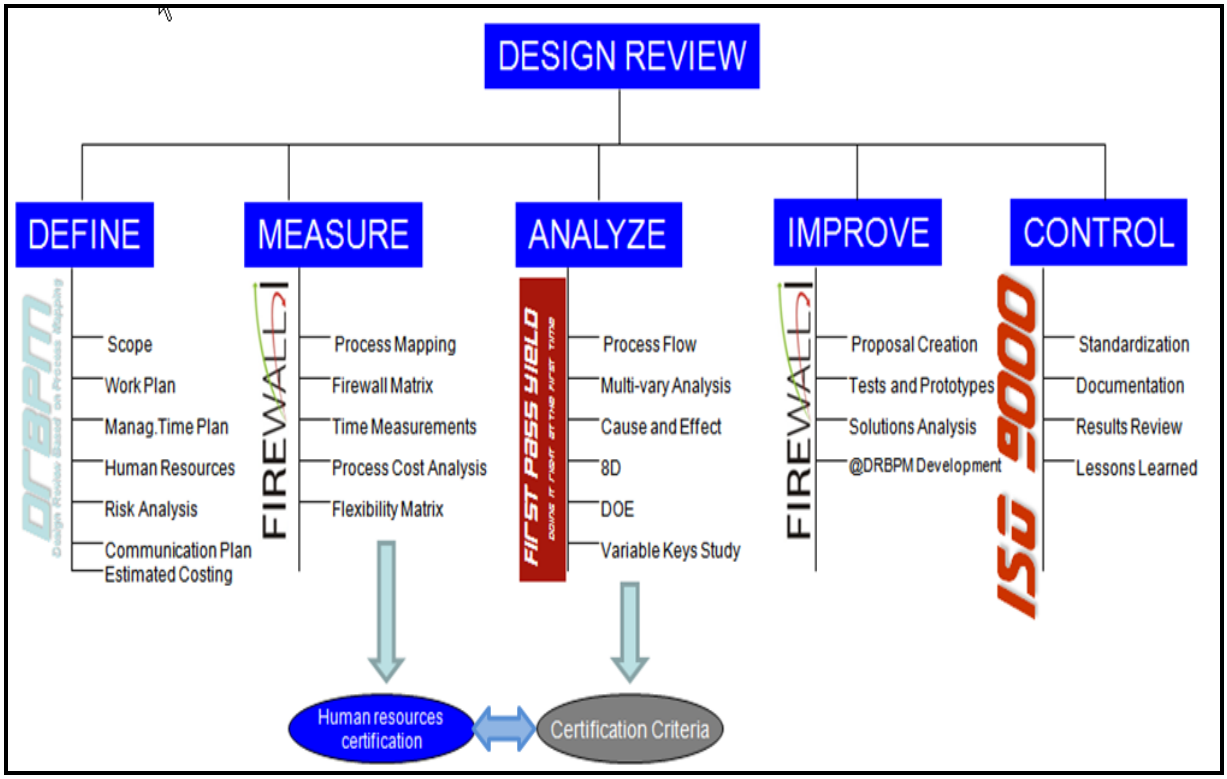
Picture 1 - DRBPM Deployment Example (created by the author)

2.3 Statement of Work (SoW)

When a product or a process is not in existence but needs to be developed, the approach of Define-Measure-Analyze-Design-Verify, or DMADV methodology is used. Except for the first three letters in the acronyms, DMADV and DMAIC have different aims. DMAIC is used to react to or fix unwanted situations, while DMADV is

used to prevent problems by building quality during the design process, getting it "right at the first time". DMADV is also known as Design for Six Sigma (DFSS) because its objective is to design a product or process that is Six Sigma able (HAHN, 2000). So the DRBPM project is shared in five main steps according to the DMAIC (US Patent # US006253115B1 – System for implementing a DFSS process).

The Picture 2 is a flowchart of the DRBPM process. The Overall DRBPM process designed on the Picture 2 is shared into five sub-processes labeled as Define, Measure, Analyze, Improve and Control. Each sub-process includes sub-steps. The DRBPM process is useful for improving a process which has already been implemented and is working. The invention can also be applied in any organization that receives an input and realize the input transformation into an output



Picture 2 – Analytical Structure (created by the author)

2.3.1 Define

To define and communicate the DRBPM targets and definitions to the team:

1) Why we are searching for changes.

2) How we know if the changes are improvements.

At the end of define phase we will have developed:

- The project scope plan (team contract) including a high level process map (SIPOC) and the customer voice translated in solutions.
- Work Plan including the structure and the project work deployment.
- Management time plan including the timetable.
- Human resources plan, including the human resources and responsibilities.
- Risk Analysis and Agent analysis.
- Communication Plan.
- Estimated Costing.

2.3.2 Measure

To know the process performance and behavior in order to adjust the project focus, at the end of measure phase we will have developed:

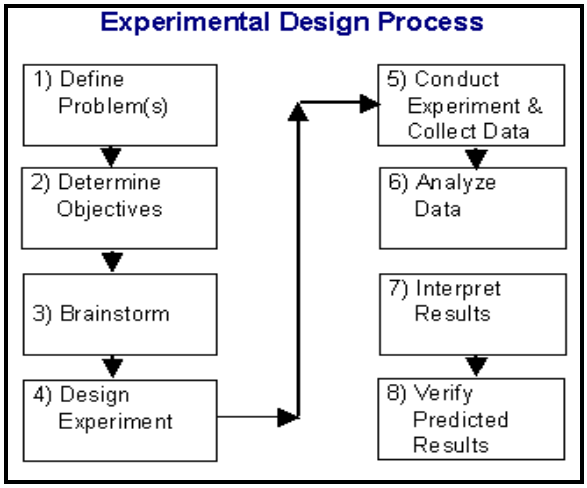
- The process mapping and performance
- Quantify and map the exactly problems points.
- The human resources skills requirements
- The cost of process and delays

2.3.3 Analyze

To enhance the understanding and knowledge about the cause system of the process and develop problem resolution tool, at the end of analysis phase we will have developed:

- A design over the causes system proven through the 8D data which will be basis to changes.

- A Problems resolution methodology in order to “Do the process right at the first time”
- Internal and external certification criteria with focus on avoiding defects and recurrences.
- Variable Keys Analysis (define required approvals for each exceptional process).
- DOE Analysis – Picture 3



Picture 3 – Experimental Design Process (ANDERSON, 2000)

2.3.4 Improve

To execute a changes proposal, testing and prototypes, at the end of improve phase we will have developed:

- Changes Proposal Execution = Execute the firewall changes according to DOE results
- Tests and Prototypes = execute changes tests and prototypes
- Solution Analysis = Through time measures
- @DRBPM Development = The interface with On Demand Workplace (Documentation, actions, goal charts)

2.3.5 Control

To Standardize the knowledge learned according to ISO 9000 – Quality Management System development, at the end of control phase we will have developed:

- Standardization = Quality Manual creation
- Documentation = Procedures and Instructions creation
- Results Review = Critical Analysis of the Quality Management System (QMS).

3 - DRBPM System

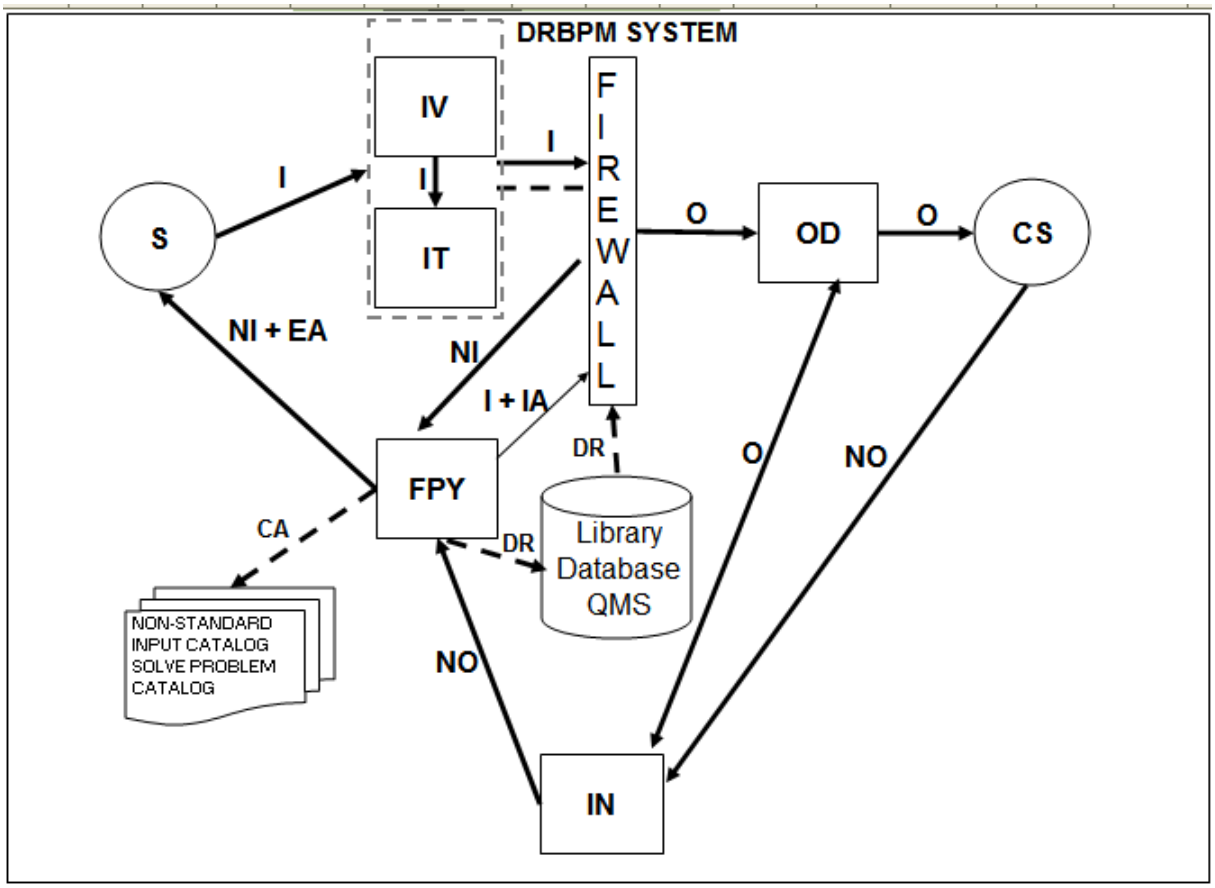
Design Principle. A principle is a generalized, accepted industry practice. In other words, it's something others are doing or promoting in association with a common objective. You can compare a principle with a practice in that both propose a means of accomplishing something based on past experience or industry-wide acceptance. When it comes to building solutions, a design principle represents a highly recommended guideline for shaping solution logic in a certain way and with certain goals in mind. These goals are usually associated with establishing one or more specific design characteristics (as a result of applying the principle) (THOMAS ERL, 2007**).**

The DRBPM System applies over the current process principle a new concept design by using known quality methods and tools in a simplified way:

- The data generated that describes the standard process through Firewall and the error catalog by the First Pass Yield is used to simulate different flow ways.
- The Design of Experiments (DoE) is applied to develop a Process Design Review Proposal that is tested and prototyped.
- The optimum process prototype is analyzed and an optimum proven concept is defined.
- The new process is published in the DRBPM system and is documented according ISO 9000.

DRBPM System (Picture 4) is an automated and standard method which relates a process data in a standard way that maps and defines: the Input Suppliers (S), the Types of Input (I) - both from External Organizations, the Standard Processes (FIREWALL), Input Validation (IV), Input Transformation (IT), Non-standard input (NI), Analysis (FPY), Library Database according to ISO 9000 – the Quality Management System (QMS), Non-Standard Input Catalog, Input and Output Inspection (IN) , Output (O) and the Output Delivery (OD).

The types of input (I) are placed by the Suppliers (S) into the DRBPM System through the Input Control Tool (IC) – Tools that are used by the Organization to manage and store data. The Input Control Tool (IC) submits the input for the first process – the Input Validation (IV). The Input Validation (IV) process compares automatically or manually the Firewall Standard (FIREWALL) against the Input (I) searching for matches. The Input Transformation (IT) aggregates value to the Input (I) according to Firewall Standard (FIREWALL) that is supported by the Library Database - Quality Management System (QMS).



Picture 4 – DRBPM System (created by the author)

Input Validation (IV) and Input Transformation (IT) transform the Input (I) into an Output (O) if the input is performed without any non-conformity. If (IV) or (IT) processes identify or perform a Non-Standard Input (NI) the NI will be assigned to First Pass Yield (FPY) that analyzes the Non-Conformity.

The FPY analysis could result in one of the following actions:

- Identify the NI as a Standard Input (I) and send it back to FIREWALL performing an Internal Action (IA) to the Firewall resources to make sure that this process disturb will not reoccur or a Design Review on the Library Documentation (DR), and then the DR is applied in FIREWALL altering the Standard.
- Identify the NI as a Non-Standard Input and send it back to the Supplier (S) with an External Action (EA) that will assure the Input (I) will be placed as a Standard Input (I), tag the Non-Standard Input (NI) and the Solve Problem process through the Catalog Action (CA).

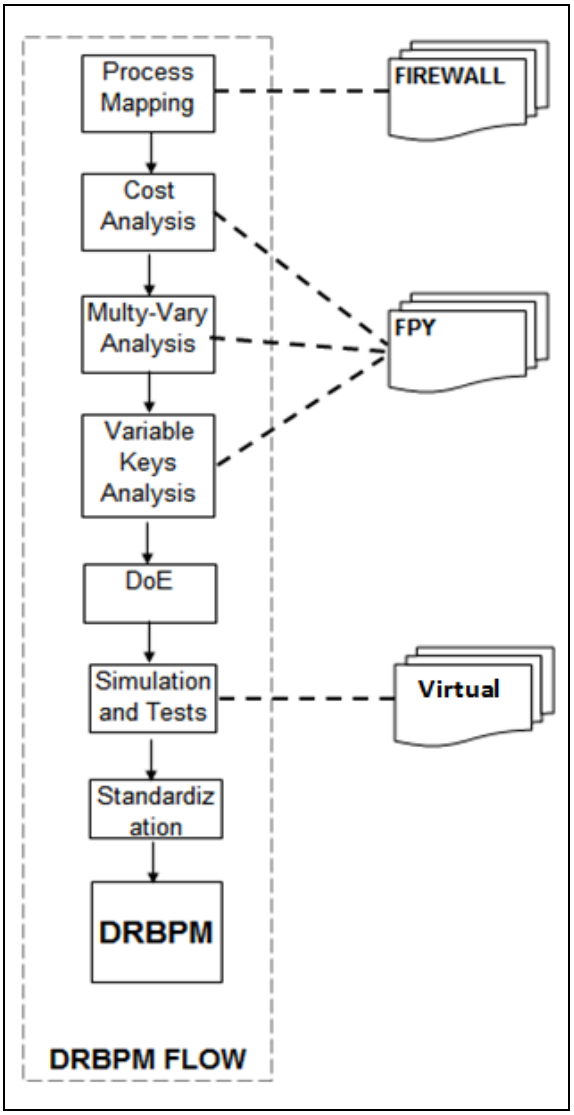
The Input (I) that was validated and transformed according to FIREWALL now flows to the Output (O). On the Output Delivery (OD) process, the Output (O) is submitted to Inspections (IN) when necessary. The inspection results could be:

- Identification of the Output as Non-Standard Output (NO) and send it back to First Pass Yield (FPY) analysis.
- Identification of the Output as Standard Output (O) and send it back to Output Delivery (OD) process. Output Delivery (OD) process releases the Output (O) and delivers it to the Customer (CS)

After the output reached Customer (CS), he can identify the Output (O) as Non-Standard Output (NO). This will flow to the Inspection (IN), who will send it back to the First Pass Yield (FPY) analysis, that will take the actions on Supplier and

Customer, tag the Non-Standard Output (NO) and the Solve Problem process through the Catalog Action (CA).

The DRBPM Flow (picture 5) can be considered as the way to mapping process by using Firewall concepts (Quality Assurance Matrix and FMEA) and analyzing non standard data by understanding the costs and the keys variables with the FPY that uses 8D and Ishikawa concepts. With the data from FPY the DoE is built and the right modifications are prototyped and tested giving us as a result an improved design that must be standardized according ISO 9001.



Picture 5 – DRBPM flow (created by the author)

4 – Final Remarks

The DRBPM Final Project report describes the fundamentals and allows the identification of the methodology and system for to structure and collect right data to optimize processes by using the DoE. Therefore, DRBPM must be deployed into organizations that recognize the need for changes and that are able to create a proper environment within leadership, team work and shift the traditional process model to a new concept.

The most important to the organization that wants to deploy the DRBPM is to shift the culture of doing the processes as they come and been doing to engineering and proven concepts processes. In summary the proposed method is to meet the current necessity of companies that has transferred processes abroad and/or companies that has a low level of control and standardization and simplification

As a proposal for keep researching on design review methods based on process mapping the recommendation is to analyze the integration of the DRBPM with the Aligning Business Process Management, Service-Oriented Architecture, and Lean Six Sigma for Real Business Results in order to achieve a continual and sustainable process optimization.

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