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# Improvement of the diagram reasons - result at the examination in the unsatisfactory quality of the products and the machines of production technique

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*During the working process there is a systematic development and improvement of the methodology for search of sources for technical faults, low quality, bad outlook and other unsatisfactory results received at different stages of the life circle of one product or production means. The basis for it is the famous principle - SM, which is used in the diagram "reasons - result"*

*The new instrument for analyses which is abbreviated into 12M Can be used at some very important processes of products, for example the phases of the marketing and management of the firms, the constructive and the technological preparation, management of the products quality etc*

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***Felix qui potuit rerum cognoscere causas.***
***Happy is the one who can guess the reasons for things/Vergilii/***

In the literature, for example {1,2,3} it is shown that when there are some possible reasons for technical faults, low quality, unsatisfactory results etc., that are later on called **unwanted results** (UR), it can be also used successfully the methodology 5M. It points five basic resources (which start in English with M): **manual craft, materials, means, methods and surrounding environment.** The analyses and the concrete situations show that a number of reasons remain either unnoticed or are directed to unsuitable source. From now on there can be a number of failures at the further examination of the basic reasons. On the other hand this will also cause some difficulties for the teams that are working to remove them. Teams formed by managers, economists, engineers, highly qualified workers etc. The analyses of the unwanted results has main meaning for the successful realization of the so called **parallel engineering.** One of the most perspective strategies for fast and effective creation of highly qualified and expensive products, production technique and means {4}.

The aim of the work is to separate into groups the similar sources of unwanted results. The more precise examination of the different reasons shows that twelve basic sources must be separated. For the convenience later on is used the appropriate terminology, which is applicable for the one who speak English as well as for the one who speak French.

**12M - MULTITUDE OF SOURCES OF INSATISFACTORY RESULTATS OF THE PRODUCTS**

**12M - MATRICULE DES SOURCES DE RESULTATS INSATISFAISANTS DES PRODUITS**

**M1 M**etrology & **M**easurement - **M**ethods & **M**eans.

**M**ethods of the expert evaluation, examination & experimentation. Quality estimation.

**M**etrologie et **M**esurement - **M**ethodes et **M**oyens.

**M**ethodiques de l'evaluation d'experts, d'expertises et d' experimentation. Estimation de la qualite.

The metrology reasons are connected with the ways, the methods and the means for the realization of the control, the punctuality of the measurements, the subjectivity of the evaluations, the difference in the criterion for pointing the importance of the different reasons for UR and etc.

**M2 Machines**, instruments, articles connected with the projecting and the manufacturing and the exploitation of the product, as well as their maintenance for the moment (condition for the moment).

**M**achinery (**m**achines of **m**anufacturing) & **m**aintenance in the **m**oment.

**M**ateriel (**m**oyens de production) et **m**aintenance au **m**oment.

Reasons coming out from the production technique - on one hand it is connected with the manufacturing of the product, and on the other hand with the maintenance, functioning or reliability on the means for production. Here must be pointed the reasons caused UR because of the unsatisfactory quality of the material of the details or at the surface of the manufacturing machines (for example not enough strength), the presence of exploitation faults of the details (wearing out, rough surface, wrong size etc.), false functioning of the technique as a whole, that is connected with the mentioned reasons.

**M3. Materials and modules**, that are building the product, the quality of its elements at a certain moment of its exploitation . **The momentarily** condition of the product, the quality and the level of its maintenance etc.

**M**ateriaux des pieces et **M**odules, qualite des elements du produit et **m**aintenance au **m**oment.

Here we have to point the reasons that have caused UR because of the material of the details or the surface of the products, the presence of exploitation faults of the details (wearing out, roughness, wrong size etc.) incorrect functioning of the technique as a whole, that is connected with the reasons mentioned above.

**M4 Materials**, energy and information, that is acquired for the treatment for the examined product, for example matter and material resource (raw material) for the product.

Matiere d`oeuvre (materiaux) - Matieres premieres pour le produit.

Raw materials, ready modules, purchased products, oils - type, prices, quantity, quality; aesthetic, functional and other markers, along with their certificates, standard etc. We also have to pay attention to the bad quality of the materials in that group does not have to be mixed with the low quality of the material of the details, the

punctuality and the roughness of the surface of the products that were previously discussed.

**M5 Methods** and technologies, that are used in the frame of the operation or the function that is performed by the project.

Methods and technology in the march of operation.

Methodes and technologies (marche d`operation).

Problems in the frame of the operation or in the process of the activity, which is performed by the product, unsatisfactory information for the principle of action and the processes or lack of actual information about them.

**M6 Morphological** principles, that are connected with the structure of the product, like the excellence of the construction, technological ability, simplicity etc.

Morphological causes

Morphologiques

Here are included the mistakes during the construction , production, low quality or false connection of the separate elements or modules, for example those which are connected with untraditionality and/or complexness, old technologies, means for optimization and software products.

**M7 Men and women** that are involved in the production of the product and its exploitation. **Masters production**.

Man (members of a group connected directly to the production: discipline, qualification,…)

Main d`oeuvre (members d`equipe:discipline, qualification…)

**M8 Manipulation, maintenance**, transport, storing and packing of the product. Methods and means.

Manipulations, maintenance, transport, stockage et emballage - Methodes et Moyens

All supporting processes and manipulations like transport for example, stock, actions that are connected with the pack, the stay, the expenses, the place etc which reasons can be pointed toward false way of realization or their direct unhealthy influence.

**M9. Methodological and methodical** causes in the march of production.

Methodologiques et Methodiques causes (marche de production).

Here we have to point out reasons that are connected with the process, for which is the product or the stage of excellence of the methodology that is chosen for its functioning, for example the steps of the performed actions, the compromises that are allowed, the lack of information for the recent level of the technological processes, that are used by the leading companies and the methodological mistakes, for example the accepted differences with the theoretical

markers.

**M10 Management** and engineering - the faults, that are in the management and in the organization of the manufacturing or the firm activity as a whole.

Management`s errors (menage of enterprise, mode of production)
Management- erreurs (menage d`enterprise, mode de production).
Reasons connected with the entire production process, the chosen type of production, managers` faults, for example incorrect information, bad organization, wrong planning of the work (for example- too heavy regime at certain jobs).

**M11 Many-sidedness** of the environments factors
Milieu environment - multitude de facteurs
The gathering of all external factors with important influence, that are examined at the level of operation, technological or manufacturing process, the financial restrictions, the external conditions of the places that are connected with the specific phase of the living circle, for example wrong connection of the separate components or modules of the product, temperature, wrong impacts, vibrations, noise etc.

**M12 "Manco" -** factors, multitude of the factors that are connected with bad design, attractiveness, minuteness, ergomatic performance etc.
Manque de design, moins d`attraction, mauvaise performances ergonomiques etc.
Here belong other questions that are connected with the technique safety, the ability to self-protect and resistance of the product when it is exposed at unprofessional work, or bad hygiene conditions, danger from fire.
The analyses of the reasons may start from any place, but it is advisable to start systematically to pass from one source of UR to another in the order that is given above. It is advisable to work out the diagram of Ishikava according to the given plan from the first to the last position.

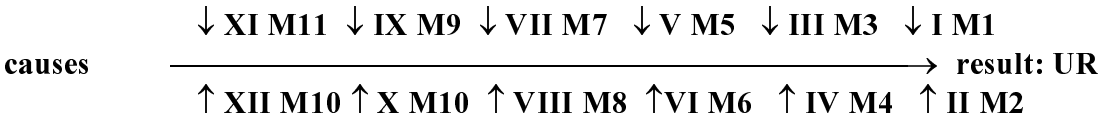


**Fig.1. Order to analyze the reasons**.
Examinations and analyses can be performed for and in free stage of the living circle of the product. In the literature {1,2,3 etc.} the living circle of the products is subdivided into different number of stages and phases. For the needs of that examination we have to divide the circle into ten stages (E)

**E**1.Marketing, conception, and constructive preparation of the product.
**E**2.technological and organizational preparation of the product.
**E**3.Control over the production and inspection on the means for production.
**E**4.Basic production.
**E**5Supporting activities
**E**6.Maintenance and refreshment of the means for production.
**E**7.Packing and expedition of the ready production.
**E**8Trade activities (incl. Transport , stock, distribution, sales).
**E**9.Recicling.

In that case on each stage of **Ei** and in the accepted order we may look for and explore the numbered basic resources of UR. It would be right to have two or three cycles of meetings with the team for pointing out the primary resources.
On the other hand on each one of the basic resources there can appear UR from different sources. Here advice will be given for a search, which will have no demands to be a complete one , but if there is a lack of concrete directions it may turn out useful. The list of concrete reasons for unsuitable decisions (N) it may be continued or reduced in the different specific productions and according to the quality markers of the product.
In the common case we may distinguish ten different types of insufficiencies (Ni):

N1.Lack of some component…
N2Small or not enough quality, lack of knowledge about the components…
N3.Bad functioning, weak spot.
N4Something exhausting, inappropriate, disturbing…
N5Something that is out of its time,
N6.Something that is inconvenient and badly shaped…
N7Extra-sized and disturbing…
N8 Huge quantity, rough, mixed and inappropriate…
N9.There is no presence of synergic effect in the separate decisions…
N10.Other insufficiencies and inappropriate decisions or dissatisfaction from the existing product.

In that way it is possible to explore the reasons like hypothesis and further on in a planned or production experiment and after the statistic preparation of the results that are received, to reject or to accept them. This classification and approach are still available to discussions. They are open to changes and for the moment they are more effective than the other methods for analyses. The practical application of the new approach shows that at a conference it is more advisable to get acquainted in advance with the participants in the experts` group and the leader of the team. Further on it is advisable to precise and estimate the reason that are pointed out (for example through diagram of Pareto, planned experiments etc.)

With this new methodology it is possible to code the reasons. For example M1E2N3 is the reason that is connected with a method or machine for measurements, that is predicted for the stage with the technological preparation of the production, when the reason is the low reliability and functioning of the product.

The appointment of the team in which the reasons appeared as well as the type of the concrete basic reason are a sure and precise pointing toward the way how to remove them.

**Conclusions and advice**

1.Through building improved diagram of Isikava, the new systematic approach gives the opportunity to enlarge and to improve the way for search of the reasons for low quality, high expenses, technical errors, bad outlook of the products, faults and unsatisfactory results in the different branches of manufacture. It becomes possible to code the reasons according the basic types, stages of the living cycle of the article and a kind of the unsatisfactory result.

2.the approach is universal and it can be used successfully by the management of the projects, the engineering, the constructive and the technological preparation of the production, the exploitation etc. The methodology described is suitable for individual as well as for group use, according to the quality. It may be a useful instrument for increasing the competitive power of the enterprises.
3.A certain disadvantage of that methodology is its comparative minuteness. Obviously such approach is more appropriate for more important cases where the questions for management of the quality are actual and/or the products are complex and expensive.
4.In their present shape the approach described is useful for the improvement of some activities in the engineering and the management of the firms and it is convenient for the introduction of education and it may be signed as 12M. It comes as the normal continuation of the famous instrument for analyses 5M and it is an opened system for further improvements and developments of the system. The approach may be used in software products and CADCAM systems, at the working out of the life cycle of the products.
5.The English and French terms given, with didactic purpose contribute to the integration of the education with the European and assist to the international and University collaboration.