M2M – DEVELOPING AND IMPLEMENTING A TECHNICAL ASSET MANAGEMENT SYSTEM IN EDP DISTRIBUIÇÃO (PORTUGAL)

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ABSTRACT

EDP Distribuição, the Portuguese Energy Distribution Utility has set in motion since the beginning of 2008 a set of projects under a three-year program called “Programa Distribuição 2010”, aiming to complete in the end of 2010 the plan of modernization of the company which began some years ago.

The main goals of this program are to assure the full alignment of the organization with the company’s business values, to improve general and individual competences, to optimize operations, to improve management procedures and techniques, to assure the adoption of the adequate control measures and therefore and at the end to increase customer’s satisfaction and perception of the company.

One of the projects of this program is M2M, a project that aspires to optimize operations and improve management practises by developing and implementing a technical asset management system.

PROJECT M2M – GENERAL DESCRIPTION

The M2M Project has been divided in the 7 sub-projects, assigned to 7 individual teams, each one occupying itself with relevant matters concerning the main goal of optimizing operations and improve management practises.

Sub-Project 1 – Technical Asset Management

The team of Sub-project 1 aimed to prepare the development and implementation of a technical asset management based on a well structured asset database, on a well structured asset condition management and on a well structured asset risk management.

The detailed description of the initiatives associated with this sub-project is done in the next chapter.

Sub-Project 2 – Asset Performance Indicators

The team of Sub-Project 2 aimed to determine the key performance indicators (KPI) that will better monitor the performance of assets.

To assure the feasibility of the determination of the KPI, the team evaluated if the needed data available in the corporative systems and the best way to assure an automatic calculation of the KPI.

The next step was to establish, in accordance with the Board, the goals that ensure the alignment with the company’s business plan.

Since it was identified that the detailed description of the root cause of failures was not systemized, the team applied the Failure Mode and Effect Analysis (FMEA) to the most relevant assets.

Sub-Project 3 – Improving and Developing Maintenance Outsourcing

The team of Sub-Project 3 aimed to implement the measures that will promote the technical and organizational improvement and/or development of maintenance external service providers aiming a better performance.

The perspective that the level of outsourcing could become higher lead the team to sense the need to determine the control tools that would assured that the supervision over the outsourced activities could be strengthened.

The upgrade of the technical work instructions, complementary to the furnisher’s maintenance instructions, was one of the important tasks that was carried out.

Sub-Project 4 – Commissioning of New Assets

The team of Sub-Project 4 aimed to determine and prepare the implementation of the procedures that will promote the maintenance departments to play a decisive role in guaranteeing the quality of new assets.

The team also determined and promoted the procedures to better manage and have the usufruct of the warranty periods associated to construction enterprises and to the supply of equipments.

Sub-Project 5 – Asset Refurbishment or Renewal

For assets which the condition became deficient or was extrapolated to become deficient in a near future, the team of Sub-Project 5 aimed to determine the criteria that would permit to evaluate, regarding both technical and economical aspects, the trade-off between refurbishment or renewal (replacement) of the asset.

After the determination of these criteria, the team customized a tool that could be used systematically.
Sub-Project 6 – Preventive or Corrective Maintenance

The team of Sub-Project 6 aimed to evaluate the trade-off between preventive and corrective maintenance activities and also determine which type of maintenance tasks better adapt to the policy and/or strategy of maintenance selected for each type of asset.
Afterwards and based on the asset condition database and on the asset risk database elaborated, the team reevaluated the maintenance criteria.

Sub-Project 7 – Optimization of Spare Parts Management

The team of Sub-Project 7 aimed to determine the adequate quantity of spare parts for each type of equipment model, considering the fact that EDP Distribuição was recently reorganized in national maintenance departments and therefore enabling the optimization of spare parts.

The team also established the procedures and the asset condition reference values that should validate the decision to reutilize an asset that is taken out of service or alienate it.

TECHNICAL ASSET MANAGEMENT

Main Motivation and Expected Benefits

The main motivation was to enable the company to achieve a significant and sustainable improvement in the area of technical asset management and meanwhile work towards a PAS-55 certification.

The evidences of excellence in organization, management and performance would facilitate the company’s interaction with business stakeholders, with the regulator and with the insurance companies.

The direct benefits of these evidences, along with the benefits expected to result from the gradual implementation of smart grids, could lead, in as other countries it has occurred, to a release of the regulator’s pressure on EDP Distribuição as a grid operator.

Evaluating the Positioning in Asset Management

The first step of all was to consult the best international practices in asset management.

The conclusion of this consult lead to the decision to assess the positioning of the company in terms of technical asset management according to the requirements set by PAS-55 by an external consultant, KEMA from the Netherlands.

The main gaps that where identified were related to the fields of strategy and policy, objectives and targets, risk assessment and management, operational and managerial loop and coherence and governance of activities.

KEMA explained that this positioning was typical of grid operators with great focus on technical issues, with emphasis on outage reduction and with pressure to optimize performance and costs.

IT Support Systems

A major concern of M2M was to assure that whatever new IT support systems or software tools could be identified by the teams would integrate and interface with the existing corporative systems, assuring therefore consistency between IT support systems.

The existing corporative systems related to technical assets were the following:
- a GIS system (SIT) for assuring the geographical referenced representation of the electrical grid (all type of assets, lines and electrical plants, for all voltage levels) and for charging all the technical characteristics of these assets;
- a SAP system (SAP/PM) for registering all the work orders and all the notes referring needs of refurbishment or corrective interventions and automatically guarantee the accounting the related costs (the assets in SAP/PM are automatically created by means of an interface system with SIT);
- a SCADA system (GENESYS) for the dispatch to conduct remotely the grid (the assets in GENESYS are automatically created by means of an interface system with SIT);
- a system (POWERON) on the same basis as SIT (POWERON) for the dispatch to manage and classify all failures (the assets in POWERON are the assets from SIT; POWERON can send, by means of an interface system with SAP/PM, notes referring needs of corrective interventions in consequence of failures);
- a system (DPLAN) for supporting all the planning activities related to grid development (the assets in DPLAN are automatically created by means of an interface system with SIT).

Involvement of the Organization

In every important step of the accomplishment of the main tasks, the team of Sub-Project 1 organized conferences, workshops and meetings in order to share this new way of managing technical assets throughout the organization.

All this communication activities were sensed to be fundamental to be done during the process of development of the technical asset management system and to be critical to assure that the system is successfully set in operation.

Asset Condition Management

In the beginning, the team determined a first version of the
set of technical assets that the company needed to manage in order to improve the performance.

The criteria for the asset selection, which was intended to be pragmatic, was that the impact of the failure of the asset should be significant, that the parameters to be monitored will be able to real characterize the condition of the asset and, last but not least, that the company had the sufficient means to monitor all the assets of this type.

The final decision of the assets for which asset condition management would be implemented was done by extended teams including the best maintenance technicians for each type of asset.

This option of including the maintenance technicians aspired to incorporate their knowledge and experience in an intended “Bottom Up” approach and ensured the important benefit that the technicians considered this project as their property.

These same extended teams, including the technicians, determined then for the chosen assets the parameters that would be monitored.

Quantifiable parameters were privileged, but also qualitative parameters were allowed for some assets. In those cases, the qualitative parameters had to be graduated in quantities.

For each quantifiable parameter which was determined, the correspondent reference value for each model of each type of asset had to be determined.

These tasks of determination of the parameters and the applicable reference values were accompanied by the consultation of international databases in order to always confront the team’s conclusions with best practices.

The team specified the requirements for an asset condition management system:

- well structured database, assuring the complete and comprehensive register of asset condition parameters data;
- assure the register of the reference values for each model;
- guarantee the establishment of logic conditions that would compare the values collected in the field (remotely or during diagnostic maintenance tasks) with the reference values and, if applicable, automatically creating notes expressing needs of refurbishment of the asset.

The fact that with the help of this system a lot of tasks associated to asset condition management began to be automatic, allowed the technician service provider managers and the asset managers to spend more time in tasks with recognized added value.

Since these tasks were associated with incorporating people’s knowledge and experience in corporative systems, the decision of the company was to apply these tasks simultaneously for all chosen type of assets on a national scale.

The existence of an asset condition database, accessible to all the interested departments within the organization, enhanced the prioritization of the different type of assets in terms of their real condition in order to support decision making.

**Risk Asset Management**

The benchmarking initiatives with other utilities of other countries allowed the team to conclude that two different risk assessment approaches were possible:

- the first approach would do risk assessment for a number of standardized events and then, for each asset that would be analyzed in terms of risk, the most proximate standardized event would be chosen and applied.
- the second approach would do risk assessment for the individual assets, enabling therefore and at the end the prioritization of the different type of assets in terms of risk.

Although the second approach would represent a more difficult and a longer task than the first approach, but since the second’s appliance would be less subjective and more systematic than the first’s approach, the company chose the second approach.

Like in the case of asset condition assessment, also in the case of asset risk assessment, the team first began by determining the assets for those the company really needs to determine and monitor risk in order to minimize operational risk and in order to adjust maintenance policies or strategies.

The company’s risk matrix was evaluated and constructed according to the following expression:

\[ \text{risk} = (\text{failure consequence}) \times (\text{failure probability}) \]

Concerning the failure consequence, the following tasks were set in motion:

- the gradation of the severity of the failure consequence was determined (for example, “catastrophic”, “critical”, “negligible”, …);
- the company’s business values were selected [for instance, “reputation”, based on legislative and regulatory compliance and on sustainability (health, safety and environment), “quality of supply”, “performance indicators”, “financial impact”, …];
- for each business value and according to the level of failure consequence, the contents of the
different graduation was determined.

The company considered the risk matrix as a mean to assure that business values, strategy and targets can be clearer and better understood throughout the organization.

The identification of the business values to consider in the risk matrix and the completeness of the correspondent business goals was a very important step and had the strong participation of the Board, performing in this way his prominent role as Asset Owner.

The graduation of failure probability was determined by means of the expected frequency (for example, “permanent”, “monthly”, “regular”, “nearly impossible”...).

Finally and concerning the core of risk matrix, the different quadrants within the matrix were labeled with the level of risk acceptance, divided in 3 groups (“unacceptable”, “medium acceptable” and “acceptable”).

The Sub-Project 1 team conceived the risk assessment of each asset done by regional pluri-disciplinary teams, integrated by local people with a very accurate and profound knowledge of the assets.

This risk assessment would be concluded with the selection of the adequate level of risk acceptance for each asset.

In order to support this risk assessment the team:

- determined the procedures and data sources needed to calculate the probability of failure and the consequence of failure;
- created a discussion guide regarding aspects related to failure consequence and to failure probability.

Since this kind of risk assessment was a new methodology and in order to train the procedures and experience the difficulties that would have to be faced, it was decided to create regional transversal pilots (transversal to all type of assets at each voltage level).

The resultant global scenario of the asset’s level of acceptance for each region would then be evaluated and validated by the top management, aligned with the Board.

The team specified the requirements for an asset risk management system:

- permitting the register of the level of risk acceptance for each asset;
- well structured database, permitting to register all data and conclusions of the risk assessment of each asset.

The existence of an asset risk database, accessible to all the interested departments within the organization, enhanced the prioritization of the different type of assets in terms of their risk in order to support decision making.

**Operational and Managerial Loops**

The team identified standardized risk mitigation measures in terms of investment (such as refurbishment with added lifetime, renewal or creation of redundancies) and in terms of maintenance (such as adjusting the maintenance policies or maintenance criteria).

The team prepared the procedures to be followed when implementing the circles “Plan-Do-Check-Act” in order to assure continual improvement.

**Evaluation of Adjustment in the Organization**

In the end, the team evaluated what desired repercussion in the company’s organization the implementation of the technical asset management should have.

This evaluation based itself on the different roles of asset management:

- **Asset Owner**: responsible for business values, for the strategic direction of the network company and for the overall financing of investments and policy;
- **Asset Manager**: responsible for network and asset strategy and for asset lifecycle management, producing risk based decisions in terms of procedures and plans;
- **Service Provider**: responsible for implementing and executing plans.

The technical asset management documentation was also gathered and organized.

**REFERENCES**


