

## Chapter 4

# Graphical Techniques and Methods: Validating how they Improve Critical Assets Management

**Adolfo Crespo Márquez**  
*University of Seville, Spain*

**Khairy A. H. Kobbacy**  
*Taibah University, Saudi Arabia*

**Luis Barberá**  
*University of Seville, Spain*

**Samir M. Shariff**  
*Taibah University, Saudi Arabia*

### ABSTRACT

*GAMM (Graphical Analysis for Maintenance Management) is a method that supports decision-making in maintenance management through the visualization and graphical analysis of data. GAMM also allows the identification of anomalous behavior in equipment, derived from its own operations, maintenance activities, improper use of equipment or even as a result of design errors. As a basis for analysis, the GAMM method uses a nonparametric estimator of the reliability function using historical data, sometimes in very limited amounts. However, for successful results, experience and advanced knowledge in maintenance management are strictly necessary. In order to ease the interpretations of the GAMM method results, with the intention that the method becomes really amicable for managers, a set of basic rules have been developed. This set of rules leads to a proper and objective interpretation of GAMM results, improving the decision making.*

DOI: 10.4018/978-1-5225-0651-5.ch004

## **INTRODUCTION**

Maintenance management has grown in the past decade as a result of the continuous advancement of industrial organizations towards more efficient operations and improved productivity (Kobbacy & Jeon, 2001). Maintenance engineering has been fueling this continuous improvement of the maintenance management process by incorporating knowledge, intelligence and analysis (Barberá et al. 2012). Graphical tools supporting decision-making in the area of operational reliability can help to achieve an accurate and efficient management of assets and resources in organizations (Birolini, 2007), even when devices have functional configuration of high complexity. To obtain real applications of analytical models, practical, functional, innovative and simple tools must be generated (Barberá et al. 2013). This will help to make tactical and operational decisions easier. Additionally, the development of simple technical tools to facilitate the exercise of analysis and results outcome (Nelson, 1969) provides a framework for the control and monitoring of action plans implemented in terms of maintenance activities (Surucu1 & Sazak, 2013; Zhou et al., 2014).

The GAMM method (Barberá et al. 2013) is a graphical tool based on collected data related to the sequence of technical equipment revisions. This method of graphic analysis adds variables with useful information that allows the management to visualize support patterns and make decisions in the overall maintenance management, such as: number of technical revisions performed, type (corrective or preventative), duration, operational failure during the routine service, reliability of the equipment before the service, or the variability of equipment failure over a period of time. Moreover, GAMM provides a visual representation from a complete or partial historical record of the maintenance work performed, showing different patterns of analysis providing useful information for decision making and problem solving (Barberá et al. 2013).

After numerous cases where the method was applied, we realized that it was possible to develop a set of simple rules for preventive maintenance program evaluation using GAMM. With these rules, maintenance managers can simply refine their decision-making derived from this method (when generating Graphic 1 & Graphic 2, as we will see).

## **BACKGROUND AND PROBLEM STATEMENT**

The GAMM method (Barberá et al. 2013) is a support tool for operational maintenance management and preventive maintenance program evaluation. The tool provides useful information regarding the reliability and maintainability of systems or equipment for analysis when considering variables such as type of intervention, duration of intervention or the existence of a stop during the intervention of the equipment/system. This broadens the spectrum display for maintenance management, acquiring new evaluation parameters and graphically determining possible areas of improvement.

GAMM is a quantitative and qualitative analysis method that intends to support decision making in maintenance management using the logic of a dispersion diagram which integrates the following variables: type of maintenance task, duration, and state of equipment/system during the maintenance intervention. The combination of these new variables with a graphic display (Graphic 1 and 2, Figure 1 and 2) of the sequence of interventions generates synergies with regard to the information given by the diagram, thus establishing new sources of information that can be analyzed. In addition, GAMM is able to estimate the reliability function, which is calculated using the algorithms on the basis of the

11 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

[www.igi-global.com/chapter/graphical-techniques-and-methods/164047](http://www.igi-global.com/chapter/graphical-techniques-and-methods/164047)

## Related Content

---

### Developing a Method to Valuate the Collection of Big Data

Colleen Carraher Wolverton, Brandi N. Guidry Hollier, Michael W. Totaro and Lise Anne D. Slatten (2019). *International Journal of Strategic Decision Sciences* (pp. 1-9).

[www.irma-international.org/article/developing-a-method-to-valuate-the-collection-of-big-data/219235](http://www.irma-international.org/article/developing-a-method-to-valuate-the-collection-of-big-data/219235)

### New Forms of Work in the Light of Globalization in Software Development

Darja Smite and Juris Borzovs (2010). *Infonomics for Distributed Business and Decision-Making Environments: Creating Information System Ecology* (pp. 277-287).

[www.irma-international.org/chapter/new-forms-work-light-globalization/38428](http://www.irma-international.org/chapter/new-forms-work-light-globalization/38428)

### User Intent-Based Segmentation Analysis for Internet Access Services

Ken Nishimatsu and Akiya Inoue (2023). *International Journal of Strategic Decision Sciences* (pp. 1-21).

[www.irma-international.org/article/user-intent-based-segmentation-analysis-for-internet-access-services/318643](http://www.irma-international.org/article/user-intent-based-segmentation-analysis-for-internet-access-services/318643)

### A Decision Support Tool (DST) for Inventory Management

Okure Udo Obot, Uduak David George and Victoria Sunday Umana (2019). *International Journal of Decision Support System Technology* (pp. 27-47).

[www.irma-international.org/article/a-decision-support-tool-dst-for-inventory-management/223426](http://www.irma-international.org/article/a-decision-support-tool-dst-for-inventory-management/223426)

### Suggestions for Achieving Balance between Corporate Dataveillance and Employee Privacy Concerns

Ordor Ngowari Rosette, Fatemeh Kazemeyni, Shaun Aghili, Sergey Butakov and Ron Ruhl (2017). *Decision Management: Concepts, Methodologies, Tools, and Applications* (pp. 1863-1875).

[www.irma-international.org/chapter/suggestions-for-achieving-balance-between-corporate-dataveillance-and-employee-privacy-concerns/176836](http://www.irma-international.org/chapter/suggestions-for-achieving-balance-between-corporate-dataveillance-and-employee-privacy-concerns/176836)