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Sustainable implementation of network analysis decision-making tools in water utilities

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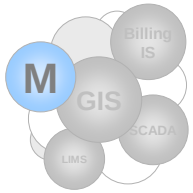


Network analysis models

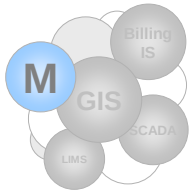
> Water distribution network analysis models are the single most influential tool in understanding existing or projected networks – a precious aid in the assessment of evolution scenarios.

> Modelling affords:

- a sustained approach to problem diagnosis and to the planning of design and operations;
- an integration of a large variety of system and customer data.

> As such, they are at the core of the decision-making process in any short-, medium- or long-term asset management strategy.

> However, they are still less than well-established in many parts of the world, particularly in the operational and technical management environments.



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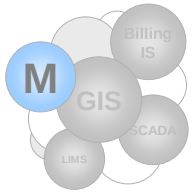
Model development and maintenance

> Experience shows that it is only possible to fully realize the potential of network models in a water utility when there is an internal structure devoted to building, managing and updating them in a sustainable and efficient manner.

> Externally developed models –where often insufficient attention is paid to capability building and organizational issues – have a much greater chance of being abandoned by the utility, after relatively short life spans.



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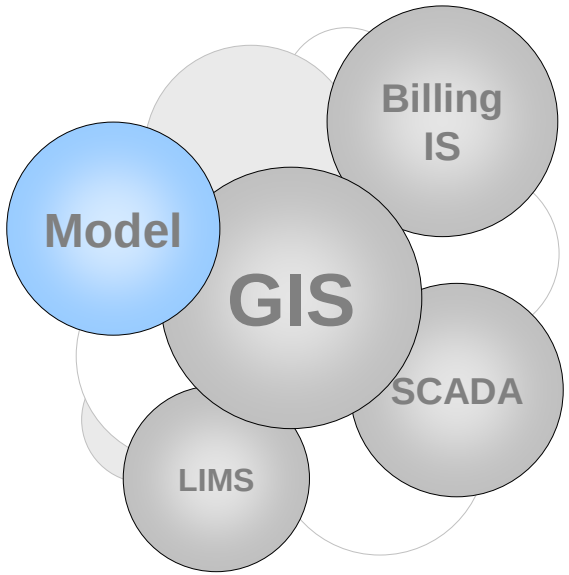
In-house development

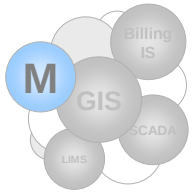
> Conversely:

- the assimilation of model-building knowledge by the utility and
- the establishment of specific internal procedures

… have shown to be a successful formula that spurs a number of parallel innovative advancements in related areas within the utility.

> The internal development of simulation models is a powerful strategic driver for the process of information integration across the various information systems (IS) in the utility.





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Water utility data

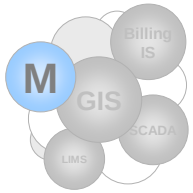
> Water utilities are massive data generators;

> the data is, in turn, a precious but often underexploited asset of the organization.

> Water network models are a prime example of an engineering-oriented application that is very demanding on the quantity, scope and quality of the data it deploys.

> Such information happens to be at the very core of the engineering decision-making process, and beyond.

> The information requirements involved in the well-supported establishment of a network model place demanding questions to the other systems – particularly the GIS, SCADA and billing IS – that inevitably prompt an increase in their quality and depth.



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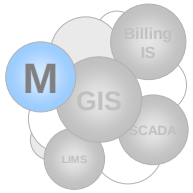
Important issues

> Network models are very demanding in terms of information about the system (engineering data) and its users (customer/ billing data);

> Systematic model development in the operational environment places important questions about:

- The depth and flexibility of the utility's information systems;
- the quality (accuracy and thoroughness) of the data contained therein.



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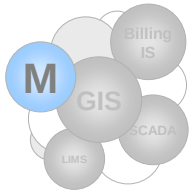
Structured model development

> It makes sense, therefore, that the development of network modeling within a water utility is approached in a structured and systematic way.

> This ensures the highest possible benefit in terms of the effort and resources invested – both in the generation of the initial solutions and in their maintenance and expansion throughout their lifespan.

> The National Initiative for the Development of Simulation Models (INSSAA), a program ran in Portugal between 2003 and 2006 with the objective of promoting the development and use of simulation models by the utilities, is thought to be a valuable example of the above principles.



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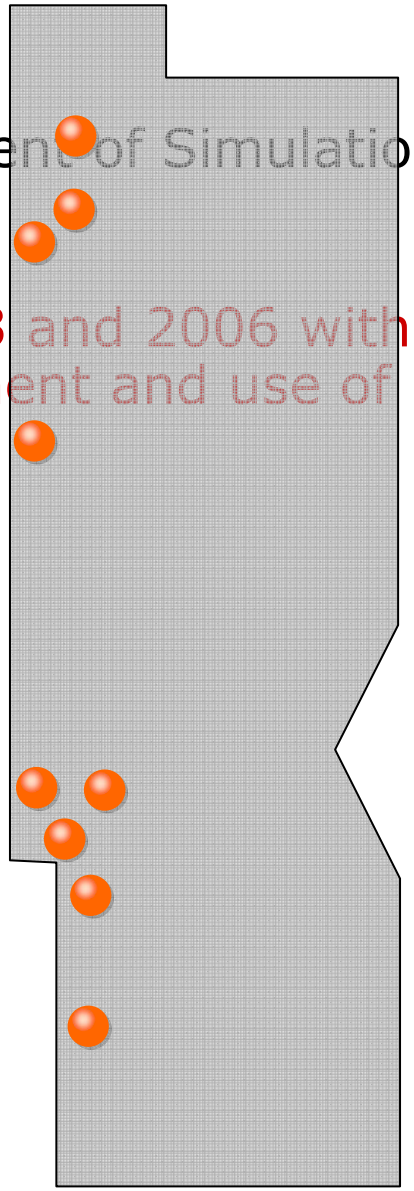

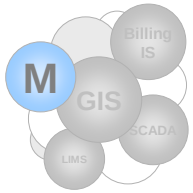

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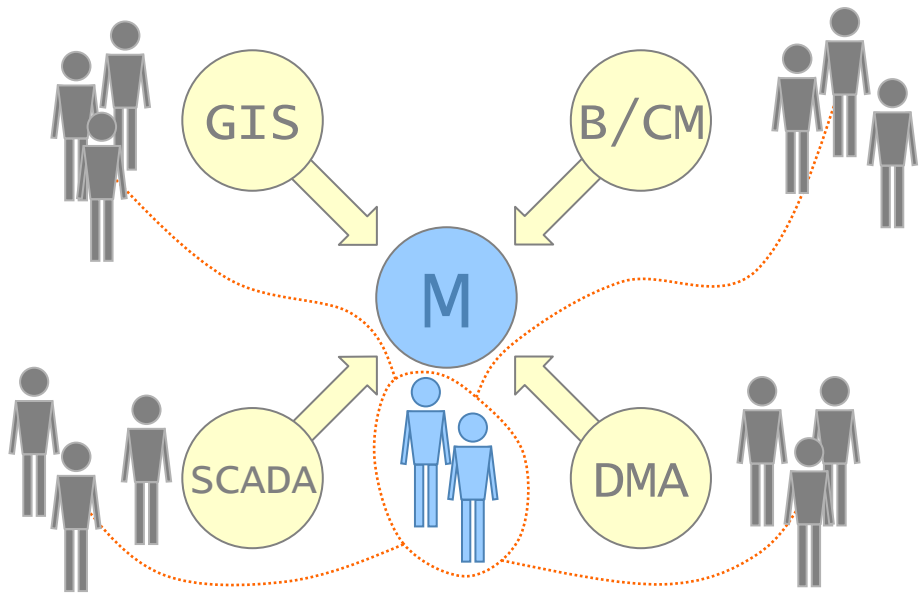
> Key focus areas:

- Human resources – model team set-up; mission definition and organizational fit; training in model development, use and maintenance.
- Planning, development, and operational implementation, by the utility teams themselves, of fully functional, calibrated models of selected network sectors, within a strategy for full territorial coverage.
- Set-up of data and organizational procedures for the integration of the developed tool, for its efficient management and its integration with the other IS across the utility.

Information and human resources



M	Model
SIG	Geographical Information System
B/CM	Billing / Customer Management IS
SCADA	SCADA System
DMA	DMA Metering System

INSSAA: Methodology and planning

> Each par[illegible]-3), led by a designated Model Manager;

> Each utility was responsible for full development of their models, i[illegible] necessary information and data;

> LNEC provided general project supervision, through:

- A specif[illegible]
- 7 specialized training courses;
- A dedic[illegible]courses, data an[illegible]
- Periodical progress meetings and general meetings;
- Perman[illegible]

Stage A – Model planning

Stage B – Model building : physical infrastructure

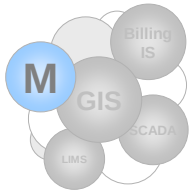
Stage C – Model building : demands

Stage D – Model building : operational control

Stage E – Implementation of base-solution

Stage F – Model calibration

Stage G – Model management, maintenance and planning



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INSSAA: direct benefits

> Models built and calibrated for strategic operational scenarios;

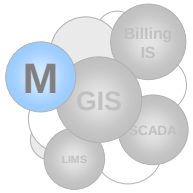
> Model-building and -maintenance procedures implemented;

> Internal information/data channels structured and formalised;

> Extensively trained, experienced model teams;

> Significant improvements on the knowledge about the systems and their behaviour;

> Wide range of modelling applications fulfilled or under exploration.



INSSAA: surrogate benefits (I)

> Significant improvement in quality and detail of GIS information/ extra motivation for partial or complete upgrade;

> Ditto for georeferencing of household connections on GIS;

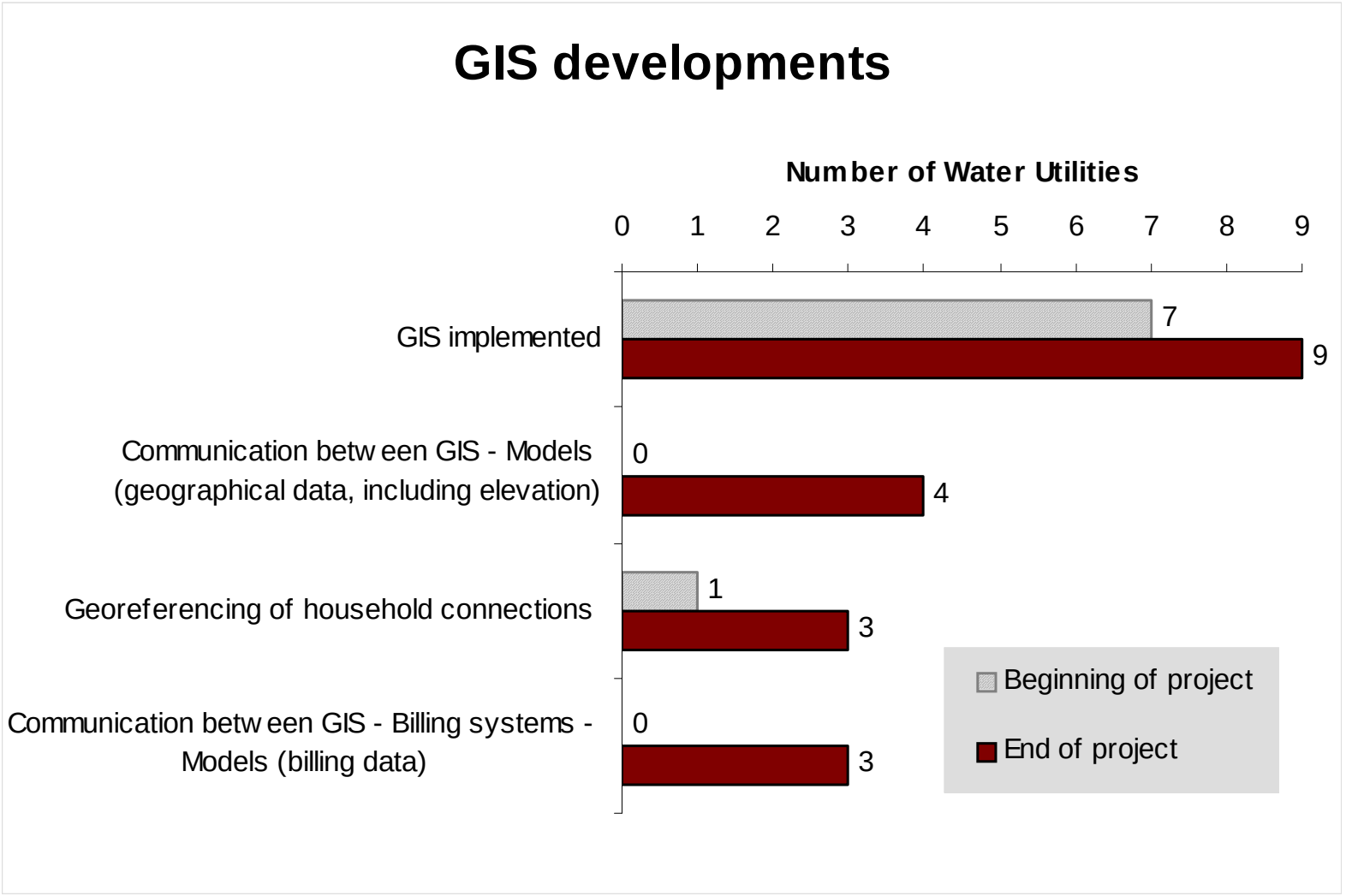
> Development of tools (external/internal) connecting GIS and Billing system, with multiple applications;

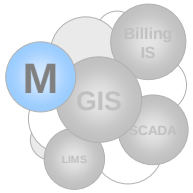
> Revision of billing system capabilities for engineering applications;

> Improvement of flow monitoring practices, supported by updated technology;

> (revision of data produced by SCADA systems).

A few indicators





INSSAA: surrogate benefits (II)

> Flow pattern analysis at DMA level (Profiling consumption);

> More accurate water balances at DMA level;

> Analysis of hydraulic parameters at DMA level;

> Establishment of a valuable network of contacts (inside each water utility and outside, between water utilities)

A few indicators (II)