Asset Management in small and medium utilities – AGS' Experience

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Abstract
Asset management is assuming higher relevance in utilities' short and long term management. Governance and policies are playing an important role in the process and, in some countries regulators and governments are assuring that asset management methodologies are properly followed. Utilities and their stakeholders should deal with different 'renewal policies' approaches, towards better planning processes and a more sustainable way of managing capital expenditure in the long term. AGS is a Portuguese private operator with contractual responsibilities in 17 concessions and PPPs. Asset management is an important matter for the entire organisation, as a management process and, since 2009, as a legal obligation. The present paper will describe infrastructure asset management policies in the organisation and the initiative's roadmap in order to present major concerns, tools and methods, its usage, and the results perceived.

Keywords
asset management; knowledge transfer; decision tools; information systems; planning; water and wastewater utilities

INTRODUCTION

Water utilities have a high dependence on long life assets that must be sustained with an adequate service level at an optimal cost (operational costs and rehabilitation investments). Managing these assets must ensure their economic and financial sustainability.

According to a recent Portuguese decree law (Decreto-Lei n.º 194/2009), supported by the National Water and Solid Urban Waste Services Regulator's (Entidade Reguladora dos Serviços de Águas e Resíduos – ERSAR) technical guides (Alegre and Covas, 2010; Almeida and Cardoso, 2010), water and wastewater utilities serving more than 30.000 inhabitants were required to promote the development of asset management plans until the end of 2012. This requirement is an important driver towards a 'new way' of managing water services, where a methodology must be followed in order to provide a proper long term balance between cost, performance and risk at strategic, tactical and operational levels concerning three different perspectives: engineering, information and management (Alegre, 2008).

AGS' PRESENTATION AND PURPOSE

AGS is a Portuguese private operator that manages 14 utilities in Portugal and three in Brazil, in concession and public-private partnership contexts. AGS, due to its contracts' obligations, typically for a 20 to 35 years period, assumes a long term perspective with full responsibility for the entire cycle of water and wastewater systems. Both operation and maintenance activities and investments in new infrastructures must be assured in order to fulfil service level requirements and to generate predicted contractual revenues. This responsibility assures both implicit and explicit concerns for infrastructural investment, either to increase coverage ratios by constructing new systems or to rehabilitate old ones. Regarding these concerns AGS supports different research activities and has

participated in several European projects, such as CARE-W (Computer Aided Rehabilitation of Water Networks) and AWARE-P (Advance Water Asset Rehabilitation - Portugal).
To respond to these management requirements AGS has been developing engineering methods and tools to support all organisations in the group, filling gaps and errors in the process of establishing consistent asset management plans, supported by validated and standardized procedures.
The purpose of this paper is to present AGS' path along the AWARE-P project (www.aware-p.org), the methodology's dissemination to all utilities in the group and, also, the steps forward in order to promote further planning and decision tools.

AGS' AWARE-P PARTICIPATION

AGS' participation in the AWARE-P as a utility project partner with a concession as a case study, promoted the implementation of an asset management policy in AGS group (Feliciano, 2012). The process was very fruitful in a way that many areas were studied and reviewed, such as collecting data processes, re-analysing information systems (IS), linkage between different IS, and acknowledging data and information reliability problems.
Sharing experiences with other national utilities was also very important. It made possible to compare organisations with different dimensions and at different maturity levels; sometimes and in some utilities it was possible to 'look to the past', in other occasions 'it was possible to predict the future'.
Some key steps were identified: the first step was the change in the approach on data and information handling from 'having' data to 'using' data. This change was possible thanks to the asset management planning process requirements, where alignment is needed, and to the acknowledgment of each AGS concession activities. The second step was the customization of existing IS in order to provide information to feed the asset management methodology. The last step consisted in the development of a dynamic platform (waterWISE) (Figure 1) which provides the link between different IS.

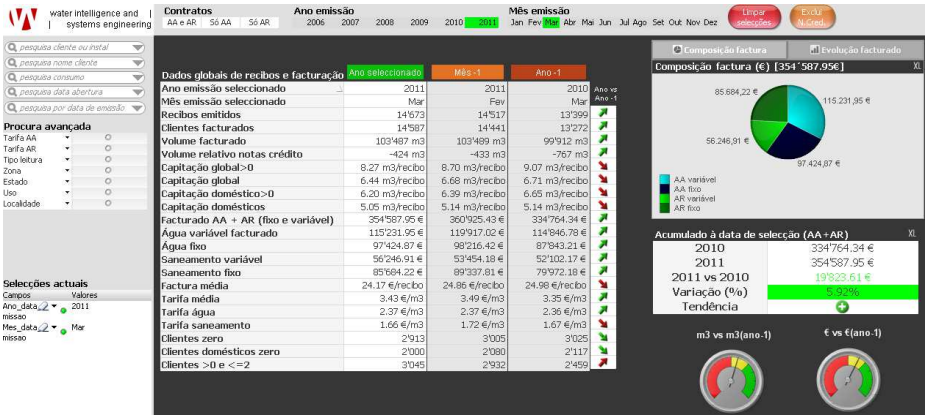


Figure 1. waterWISE example dashboard.

Once the methodology and supporting tools were created there was the human factor to consider, namely the ability for long term planning, to perform in different decision making processes and balancing properly costs and performance at a given risk.
Managing 14 utilities in Portugal and three in Brazil obliged AGS to define a strategy in order to manage them in an aligned way. In this diversity it is natural to identify cultural differences, different general manager's academic background, different contractual contexts and different staff's technical consistency. In the last seven years most of the methodologies, tools and reports were standardized, even though general management maintains some asymmetries. Regarding what was mentioned before a change was needed, promoting the internal development of a new tool (Waterchallenge) and the acknowledgment of 'knowledge transfer' processes from the holding company to its utilities.

The participation in the AWARE-P drove AGS to another kind of concerns, such as, data and information collection, quality, reliability and opportunity. All the processes were re-visited in order to provide a proper answer to all the infrastructural asset management (IAM) needs. Other of the major issues was the knowledge transfer; how could knowledge be transferred and/or spread in order to have an efficient and rigourous implementation of an aligned IAM policy in all group's utilities.

ASSET MANAGEMENT POLICY IN A MULTI-UTILITY GROUP

Concepts as IAM as described in ERSAR's technical guides (Alegre and Covas, 2010; Almeida and Cardoso, 2010) are relatively new in Portugal. New concepts are neither easily spread nor assimilated. To answer these concerns Laboratório Nacional de Engenharia Civil (LNEC) promoted a national asset management collaborative project that was followed by AGS in a parallel initiative under LNEC's authorization.

AGS in its initiative studied the knowledge transfer approaches due to its concerns related to the IAM methods' standardization in all utilities. Nonaka and Takeuchi (1995) approaches were followed; tacit and explicit knowledge exist in all organisations, saying, as an example, that methods imported from the AWARE-P and ERSAR's technical guides (Alegre and Covas, 2010; Almeida and Cardoso, 2010) to the AGS holding's engineering team are a form of explicit knowledge and the teams utilities' operational experience are a form of tacit knowledge. The initiative must interact with both knowledge forms and grow spirally (Nonaka and Takeuchi, 1995) (Figure 2).

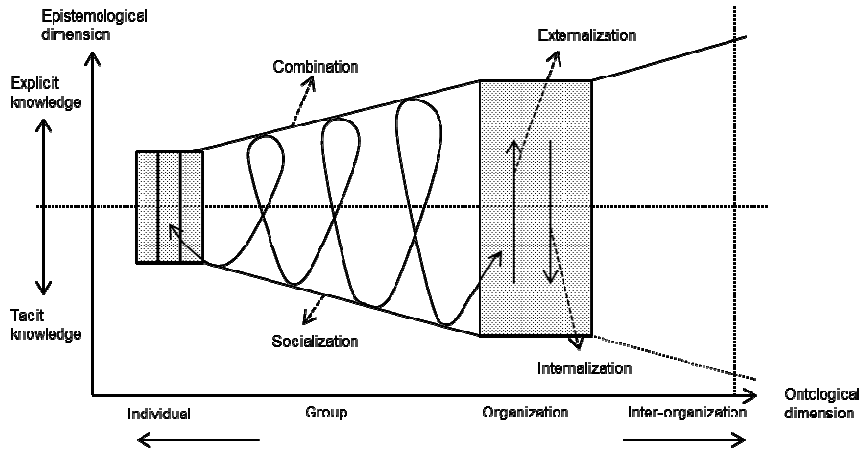


Figure 2. Spiral of organisational knowledge transfer (Nonaka and Takeuchi, 1995).

In order to provide some answers to our concerns about knowledge transfer even taken into account the participation in an initiative where all the utilities were present we felt the transfer process was not so effective.

There is a kind of cognitive dissonance in transferring methods from an expert's community, in an explicit form, to a technical community that normally deals with tacital knowledge. And even if we can solve this problem easily, the communication is being done from an external community (the engineering support team) to the utilities' middle management that, afterwards, must be responsible for the internal transfer process in a 'middle-up' and 'middle-down' ways, inside their organisations.

To find a way, in order to have a 'tool' that could be used as a bridge between tacit and explicit knowledge, Waterchallenge has been developed.

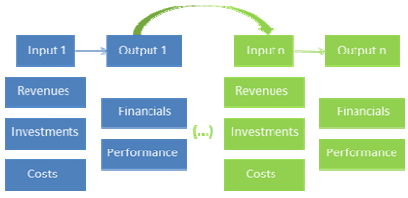
A BRIDGE TO FULFIL THE GAP BETWEEN TACIT AND EXPLICIT KNOWLEDGE - WATERCHALLENGE

Waterchallenge has been developed in the scope of a research program, having different objectives

at different stages in an asset management methodology: it is a) an assessment tool to understand decision behaviour's trends and patterns between different users b) a pedagogical tool regarding the utility's own use c) part of a national initiative, where different utilities can be challenged to be the best 'team' in financial and performance terms, starting from the same given initial scenario.
A different issue was the way of dissimenate a 'new asset management method'. Innovate ideas, methods and tools are difficult to spread in an organisation, where people have a mix of tacit and explicit knowledge. This concern droves us to the need of understanding the method beneath the colaborative initiative in order to have a more eficient knowledge transfer approach, as referred before.
Direct and indirect results of the participation in the AWARE-P will be shown and further steps will be described: a) tools developed, including a standardized dynamic data and information analysis platform, waterWISE; b) the collaborative project 'AGS asset management initiative', regarding a standardized asset management policy for the 17 group's utilities; c) a long term decision simulation model, Waterchallenge, towards a comprehensive analysis of decision trends and patterns, in different utilities, considering different users in different cultures.
The Waterchallenge is able to assess different management profiles by having on its basis an economical and financial model with a capability to compute each year several key performance indicators (kpi), from the International Water Association (IWA) and ERSAR publications (Cabrera, 2011; ERSAR, 2011).
The model's goal was the evaluation of the management ability and, also, the trends and/or patterns in the decision process of each managing and/or technical staff per utility typology. Targeting these goals, this model was translated into a 'game', where users could experience the general management, in its financial and performance perspectives, from a given initial scenario during a 21 years modelling horizon.
This means each user can interact with the model, in 7 rounds, each one corresponding to a 3 years period. In each round, users will be asked to input several variables in three different perspectives: costs, performance and risk. Users will be challenged, every round, with their own results concerning service level and financial performance attained in their previous play.
Figure 3 shows the three main parts of the game: part 1 – users or players profile, part 2 model input and output, representing the 7 plays and part 3, the result analyses and conclusions.

1. Profiling users

2. Plays: Input and Output



3. Result analysis

Figure 3. Waterchallenge structure.

The users must fill-in a form containing a professional background survey and a Hofstede (1991) based questionnaire. The form and decision's trends cross-analysis can help to perceive cultural context patterns influence in the decision making process.
According to Hofstede (1991) people have 'mental programs' that are developed and reinforced through their experience. In these 'mental programs' there is a component of national culture that can be explained in five dimensions: 1) power distance; 2) uncertainty avoidance; 3) individualism and collectivism; 4) masculinity and femininity; 5) Long term orientation. These five dimensions symbolize the basic elements of common structure in the cultural systems of the countries.
Therefore, these analyses can be an important framework to study national culture, and also to understand the effects of cultural differences in management decisions.

Waterchallenge – Users' profile
The Waterchallenge first initiative started with 34 participants working in different departments of water utilities.
The first step, after fulfilling the survey, was collect and analyse data from "players" in terms of their own profile. Two major guidelines are included in the survey: the utility or the organisation context and the personal background context, adapted from Hofstede.
Regarding the organisation there are four main topics analysed: 1) Players' Academic Profile; 2) Players' Demographics; 3) Players' Professional Track and 4) Employing Entity. In terms of Hofstede´s methodology the five dimensions are calculated according to the survey output.
Figure 4 represents players' general profile of the first edition: 1) the academic profile, showing that 60% of the players are engineers with Master of Science degree (MSc); 2) professional track of the players, represented in majority by technical staff; 3) Background experience and 4) the player's age, divided in male and female, showing that 60% of the players are in 30 – 40 years old range.

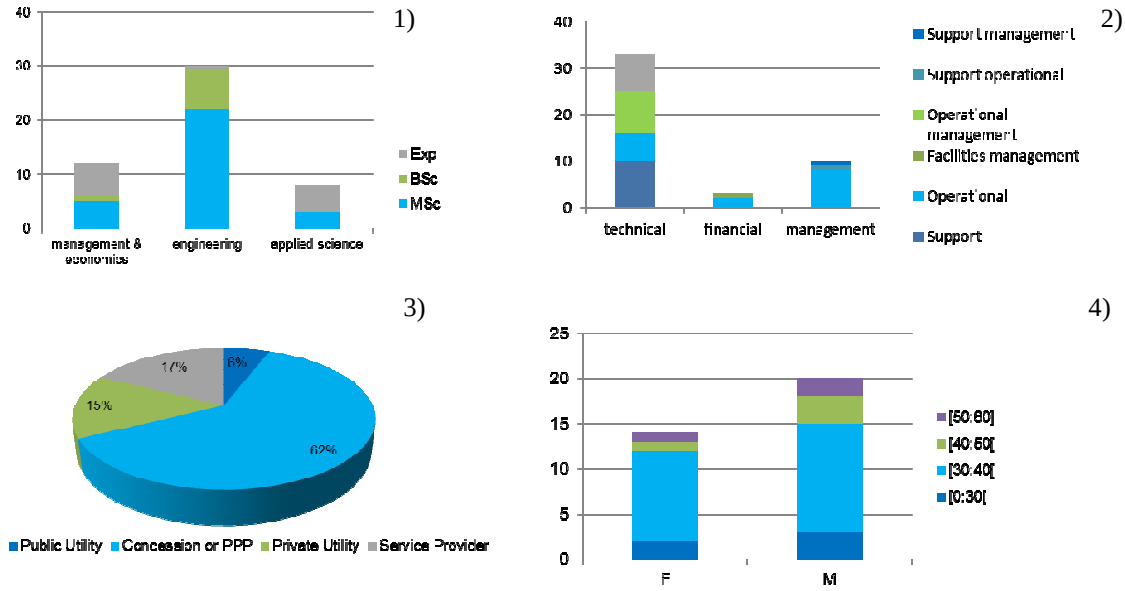


Figure 4. General profile 1) Players' academic profile; 2) Players' professional track; 3) Background experience; 4) Players' age.

Regarding Hofstede methodology the five dimensions were calculated with data survey. The first dimension, 1) power distance expresses the degree to which the less powerful members of a society accept and expect that power is distributed unequally. The dimension 2) uncertainty avoidance is the extent to which members of an organisational society feel threatened by and try to avoid future

uncertainty or ambiguous situations. The dimension 3) individualism and collectivism describes the relationship between the individual and the community that is reflected in the way people live together. The dimension 4) masculinity and femininity explain the extent of roles division between gender to which people in a society put different emphasis on work goals and assertiveness as opposed to personal goals and nurturance. Finally the dimension 5) Long term orientation can be interpreted as dealing with society's search for virtue. Societies with a short-term orientation generally have a strong concern with establishing the absolute truth. In societies with a long-term orientation, people believe that truth depends very much on situation, context and time.
The Waterchallenge profile's result, according to Hofstede is shown in the figure below (Figure 5).

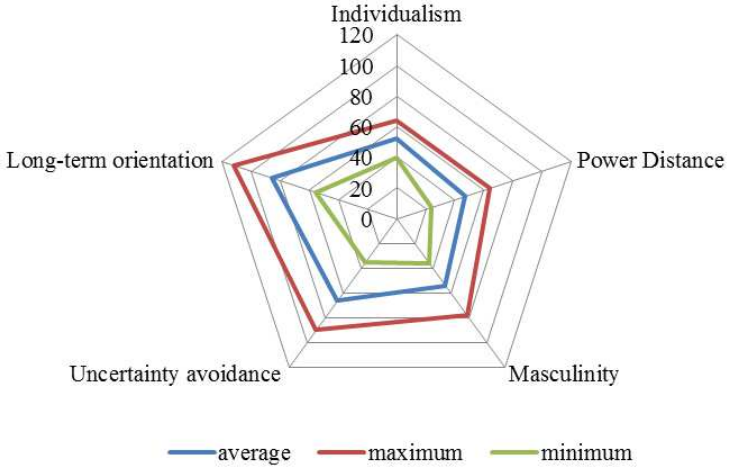


Figure 5. Waterchallenge profile.

With this sample we can perceive a strong trend to long time orientation. The maximum and minimum value can diverge in 120 and 24, and the sample represents long time orientation average of 86, with a maximum and minimum value of 112 and 56, respectively. These dimensions show an ability to adapt traditions to changed conditions, a strong propensity to save and invest with prudence, and perseverance in achieving results.

Waterchallenge – First play
After fulfilling the survey players started the game, playing the first of seven rounds.
In this round players were confronted with the first step of a utility management, where revenues don't cover costs and a technical unbalanced situation is the *status quo*.
The first challenge was to study the present conditions (financial and technical) and to promote several basic investments in operational issues.
In the first round users could interact with three different dimensions:
- **Revenues** (establishing different variations in the tariff's values and structure);
- **Costs** (labour costs, organisational structure and general costs) and;
- **Investments** (general operational expenditures, 'opex').

Players' decision, in terms of revenues, costs, and the performance results are presented in the next figures.
In terms of revenues all players decide to increase tariffs; Figure 6 represents the tariff increase of each player and the maximum and medium decision in terms of average tariff.

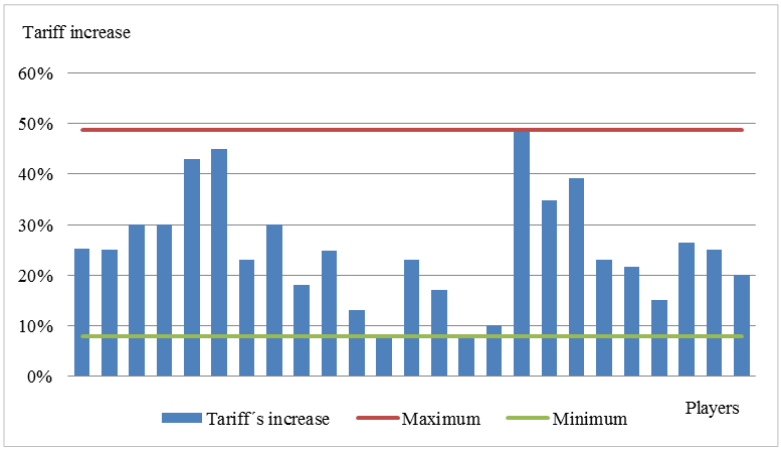


Figure 6. Tariff´s increase – 1º play.

In terms of costs, the most important decision was around labour costs (number of employees) decided by the players.
Figure 7, shows the percentage of players that decided to increase, maintain or decrease the number of employees of the utility. In the first round the 72% of the players decided to decrease the number of employees.

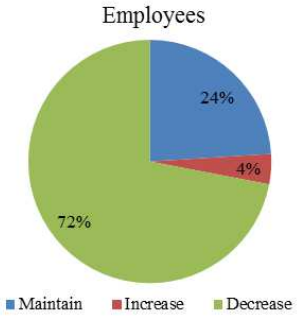


Figure 7. Employee's variation (percentage).

The results of each round are divided in two dimensions financial and service level. The first dimension is represented by the utilities financial statement and the service level is represented by the computed performance indicators.
Figure 8 shows the first play output including global performance results and operating income.

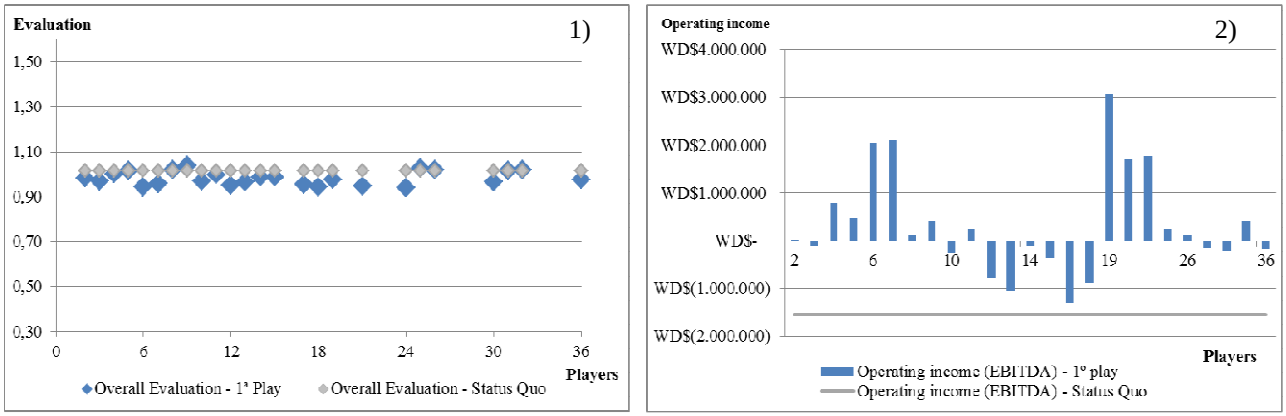


Figure 8. 1) Global performance results and 2) financial statements.

The global performance results represented in Figure 8.1) shows that all players decrease the

service level but on the other hand increase the financial result 2) of their utility.
The first round main goal was to do a first approach in balancing the *Wisewater* utility, and most of the players understood this objective. In the next rounds players will be challenged to decide other kind of issues concerning water utility's management.

CONCLUSIONS

In summary, direct and indirect results of the AWARE-P participation were shown and further steps were described, namely: a) tools developed, including a standardized dynamic data and information analysis platform, waterWISE; b) the collaborative project 'AGS asset management initiative', regarding a standardized asset management policy for the 17 group's utilities; c) a long term decision simulation model, Waterchallenge, towards a comprehensive analysis of decision trends and patterns, in different utilities, considering different users in different cultures.
In this initial stage players' profile were analysed regarding Hofstede´s methodology and a long term orientation were identified in the group. Output from first play show that players´ understood well the first round main goal, to balance financially water utility initial stage.
Further steps will reveal the assertiveness of a method where knowledge transfer can be more efficient with the use of tools such as Waterchallenge.
The interaction of the middle management in a way where a long-term tool can be used and where financial and service level performance indicators can be crossed should provide an environment where knowledge, in this case IAM methodologies and related concerns, can flow in an easiest way in the organisations.

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