APPLICATION OF CBR IN PUBLIC ADMINISTRATION

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Abstract: *European Union (EU) member countries are expected to have acquis communautaire public administration and to fulfil all criteria adopted by European Council in Copenhagen, Madrid and Luxembourg. There are different tools and frameworks to help states achieve these criteria, such as Reference Framework for European Sustainable Cities (RFSC) and Quality of Public Administration: A Toolbox for Practitioners. Most of these frameworks and tools provide a guideline for countries to public administration and other purposes. Even though most cities of the EU member countries have different capacities, different cities could face the same problem at the same or different point in time. What is proposed in this paper is the use of case-based reasoning (CBR) to share experience among cities in solving a specific public administration problem; that is solving a problem of one city based on past experience of other cities. To identify the best solution in the case base similar to a problem at hand text parser and fuzzy aggregation method, Choquet fuzzy integral method, was used.*

Keywords: *Acquis Communautaire, Case-Based Reasoning, Choquet Fuzzy Integral, Multiple Criteria Decision Making, Strategic Planning.*

JEL Classification: *D70, D83, H83.*

Introduction

The lack of general European Commission legislation applicable in the domains of public administration and administrative law poses a problem for European Union candidate countries. Candidate countries are required to have administrative systems and public administration institutions capable of transposing, implementing and enforcing the acquis communautaire, EU legislation, according to the principle of "obligatory results" ("obligation de résultat"). Candidate countries have to meet the criteria required for EU Membership as adopted by the European Council in Copenhagen, Madrid and Luxembourg. In addition, candidate countries' progress will be measured against those criteria, i.e. in the wording of the European Commission's Regular Reports, in terms of their "administrative and judicial capacity to apply the acquis", which signifies implicitly that their progress will be assessed against European administrative standards [16]. Therefore, it is essential for the EU member states to use strategic planning to achieve the expected progress.

Strategic planning… is based on the premise that leaders and managers of public and nonprofit organizations must be effective strategists if their organizations are to fulfill their missions, meet their mandates, and satisfy constituents in the years ahead [2].

The framework, used by many authors in developing strategic plan is data collection, surveys, researches and thematic analyses – SWOT (strength, weakness, opportunity and threat) analyses (analytical part); vision – goals, aims, (strategic part); actions and activities (action part) and a part of implementation, management,

measurement and evaluation [17]. As long as measurement and evaluation is involved a strategic planning process is on-going where organizations evaluate their improvement, identify their weakness propose a solution to overcome their weakness implement it and back to evaluating improvement.

1 Problem statement

Even though EU member cities have their differences in many ways, most cities suffer from the same problem at one point or another. 'Our cities possess unique cultural and architectural qualities, strong forces of social inclusion and exceptional possibilities for economic development. They are centers of knowledge and sources of growth and innovation. At the same time, however, they suffer from demographic problems, social inequality, social exclusion of specific population groups, a lack of affordable and suitable housing, and environmental problems' [11]. For instance based on studies conducted independently for the city of Vienna and Prague although presented in different categories and different words both countries face the following weaknesses:

- Poor coordination between public and private sector
- Low interaction between companies, authorities and education
- Relatively low outcome in research and development

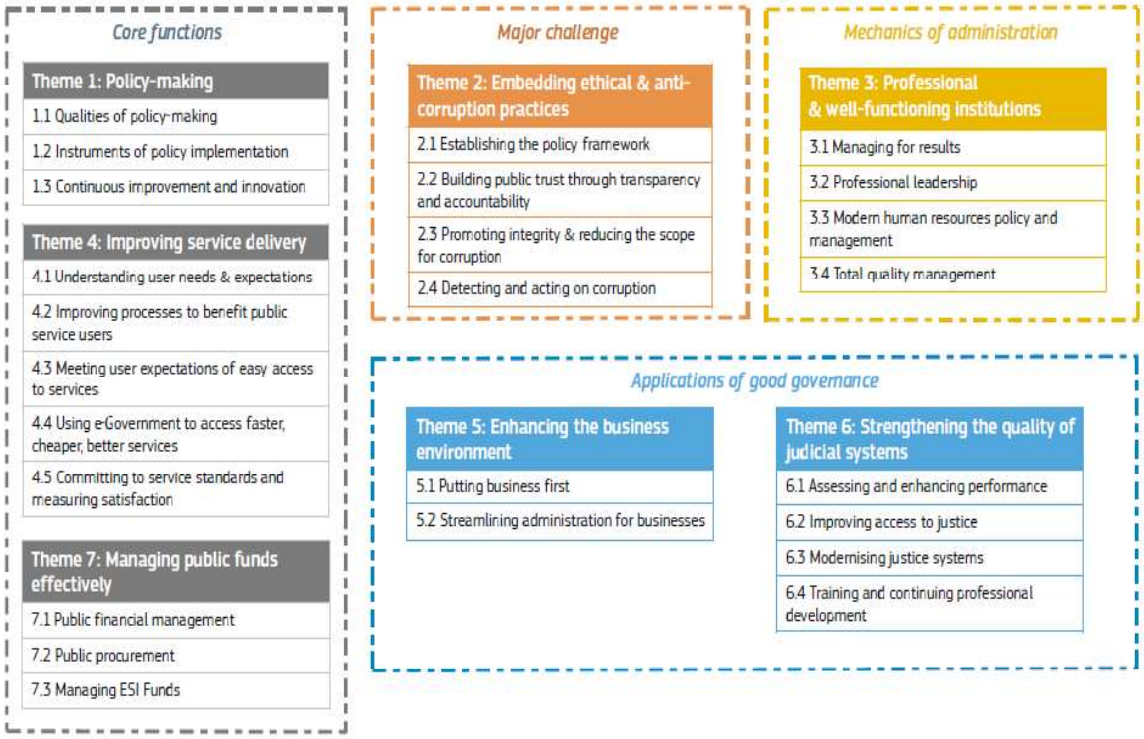
Over the years may frameworks and tools have been developed where EU member countries would exchange experience and refer guidelines in order to improve their countries and to create similar situation through the member countries. Among those are RFSC and Quality of Public Administration: A Toolbox for Practitioners.

RFSC is a web tool designed to help cities and urban territories promote and improve their integrated urban development actions [13], [15]. Where "respect" means the RFSC values the diversity of European cities, respecting differences in local priorities and institutions. There is no one-size-fits-all solution for integrated urban development, no universal recipe for success. It is the shared vision that matters, the time frames, targets and themes should be decided locally. RFSC enables cities to move at their own pace and choose the scope of their involvement. It offers a set of tools for evaluating and monitoring public policies, and an online space for cities to share their experiences. The RFSC rethinks the basis for sustainable development of cities by proposing a grid of 25 common questions formulated based on the following four dimensions: enhance the economic efficiency of territories, foster social cohesion in conurbations, improve the environmental quality of cities, and develop integrated governance practices. It means that RFSC analyzes four areas simultaneously: economy, social, environment and governance. The RFSC is a vibrant community of cities that learn from each other, share experience and discuss common challenges. By joining the RFSC community, cities get access to different forms of exchange and support, including dedicated training sessions, peer learning and coaching from urban governance experts. Finally, for "cooperation", not competition, which is at the heart of the RFSC. Developed for cities and with cities, RFSC is a meeting place that aims to bring together various actors within one city, hundreds of cities and local authorities from across Europe and finally all those at the national and European level who believe that sustainable cities are the future [14],

[15]. The RFSC is used in countries such as Czech Republic, France, Italy, Netherlands, Poland, Portugal, Spain and Sweden [15].

Quality of Public Administration: A Toolbox for Practitioners was conceived as a helpful and practical guide for civil and judicial administrations to the challenges of good governance in a constantly changing environment. It examines the key elements of good governance and highlights positive real-world responses in Member States to dilemmas in administration, signposting the way that others may also wish to follow. The Toolbox concentrates solely on the administration of public policy and services, including both civil and judicial systems. It is about governance as a process. It does not cover the specifics of individual policies or services - for example regarding education, taxation, health, customs, competition, training, etc [12]. The figure below (Fig. 1) shows the toolbox.

Fig. 1: Toolbox overview by theme and topic



Source: [12]

What is proposed in this paper is a reasoning system that could be used by EU member countries to solve specific city problems or make decision based on the experiences of other member cities. By solving problems in the same or similar way as other EU cities quality of public administration of cities could get closer to unanimity. What makes the proposed method different from the RFSC discussed in the above section is that the proposed method does most work while the decision belongs to the city council. The city council provide the system with desired criteria and the system presents the council with top solution based on the criteria set by them. The system focuses on cities since cities play a key role in the social and economic development of all European territories and provides home for the majority of population [6]. Different cities have different capacity but by using CBR system cities could be able to share their experience in solving a specific problem.

2 Case-Based Reasoning

The idea behind CBR terminology is to solve a problem by using previous experience. While solving a problem we refer to a similar problem that has already been solved and if the perfect solution is found it will be used. Otherwise, a solution with more similarity values will be modified to suit the current problem and the new solution will be stored in the case library for future reference. In CBR terminology, a case usually denotes a problem situation previously experienced which has been captured and learned in a way that it could be reused in the solving of future problems. In general, a case is composed of problem description, problem solution, and outcome [1], [10]. The problem description essentially contains as much data about the problem and its context as necessary for an efficient and accurate case retrieval. Problem solution or outcome states the derived solution to that problem. CBR has the two main processes: storing and organizing cases in the case library and retrieving the solution that best suits current problem [9].

In order to solve problems using previously solved cases, there has to be an initial case memory that stores successful cases in an indexed and organized way, to make access efficient. CBR scholars have proposed several guidelines on indexing; Indexes should be: predictive of the case relevance, recognizable in the sense that it should be understandable why they are used, abstract enough to allow for widening the future use of the case base and discrete enough to facilitate efficient and accurate retrieval. Methodologies for choosing indexing could be manual and automated methods. when cases are complex and the knowledge needed to understand cases well enough to choose indexes accurately is not concretely available, hand indexing is needed otherwise automated indexing could be used. Another important factor is case organization; the case base should be organized into a manageable structure that supports efficient and accurate search and retrieval methods. Accurate retrieval guarantees the retrieval of best matching case, and efficient retrieval guarantees fast retrieval of cases for acceptable system response times [9].

The retrieve solution task starts with a (partial) problem description, and ends when best matching previous case has been found. The subtasks of retrieve process are referred as identify features, initially match, search, and select, executed in that order. The identification task comes up with a set of relevant problem descriptors. The goal of the matching task is to return a set of cases that are sufficiently similar to the new case given a similarity threshold of some kind. The selection task works on these set of cases and chooses the best match (or at least a first case to try out) [1]. In this step, a new case is entered into the system by the user; the system recalls cases that have relatively high similarity values, i.e., previous cases with similar indexes are retrieved. This process is called interpretation. When problem situations are interpreted, they are compared and contrasted to old problem situations. Different methods can be used to search cases [9].

CBR has been applied by researchers since the 90's for different fields recent applications include business failure prediction [7], eco-innovation product design [3] medical domains [5], [8].

In this paper instead of the traditional retrieving methods, such as inductive retrieval, Choquet Fuzzy Integral was applied, that is to use specific characteristics and compare cases based on these characteristics to find the best solution that satisfy

the cities' requirement. Once a similar case is retrieved the next step is to adopt the solution to meet the demands of the new case and to store the new solution to the case base for future reference.

3 Discussion

As mentioned in the introduction strategic planning is on-going process and needs a constant monitoring and fix to improve success. What is proposed here is CBR system that records all the problems or weaknesses faced by EU member cities and their solution so that solutions could be adopted by other cities in the future. This will create relation among cities in sharing experience, avoids redundancy and saves costs.

While solving any problem cities consider solutions that are implementable on their capacity and structure. Capacity includes fund, human resource, time limit, the city the problem was solved in, and so on, which are considered as case attributes. Therefore, in case representation each case contains these attributes, problem statement, and solution. The advantages of the proposed method over existing tools include:

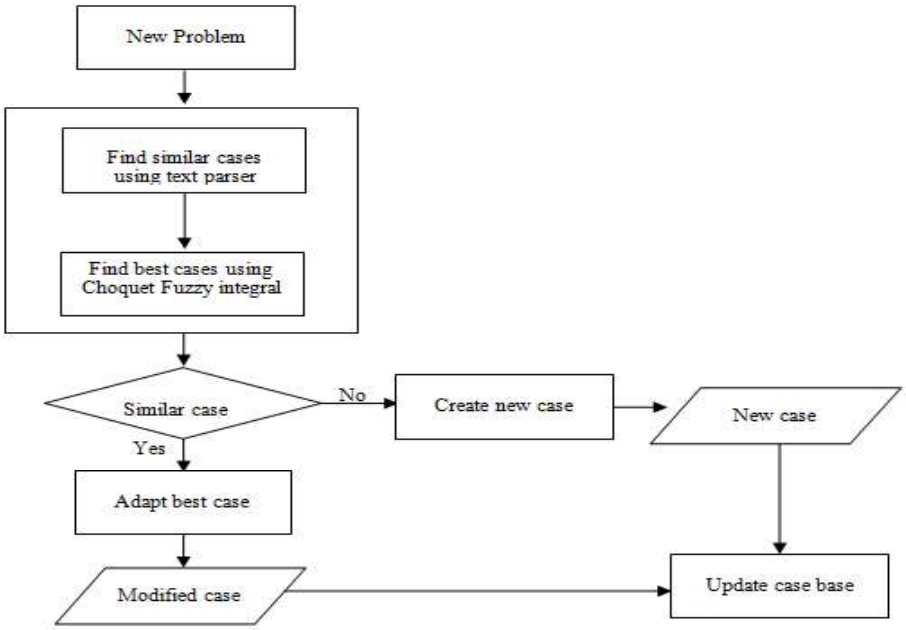
- Providing a way to adapt solution for a specific problem instead of a strategy, based on the criteria set by city council;
- The method is also cost and time effective since the system does most of the heavy lifting, by avoiding the process of proposing alternate solutions;
- Solving these specific problems improve the overall success of a strategy;
- The system provides cities with options and freedom to choose a detailed solution for a specific problem based on their capacity without going through strategies of other cities.

Generally, the method provides a bottom up approach where cities can solve their weakness and improve the success of their strategic planning.

In this paper, a two-step retrieval method is proposed. The first step is to use text parser to find similar cases. Once these cases with similar problem statement are found Choquet fuzzy integral method will be used to choose the best-suited case for the current problem based on the comparison of case attributes.

In the first step of the case retrieval process, the problem statement of the new case is compared with cases and the cases that match the new case are chosen. These will limit the number of candidate cases. To further eliminate candidate cases Choquet fuzzy integral method will be used to find the best matching solution based on criteria set by city council. For instance, cities with smaller population would prefer solutions generated in cities with similar population size, similar culture, and growth rate based on the type of problem the city is facing. Furthermore, the solution has to be implementable with resources affordable by the city. These criteria could be implemented using multiple criteria decision-making methods such as analytic hierarchy process. For this paper, Choquet fuzzy integral method is chosen to avoid dependency issues among characteristics [4]. The following figure (Fig. 2) shows the two step case retrieval process.

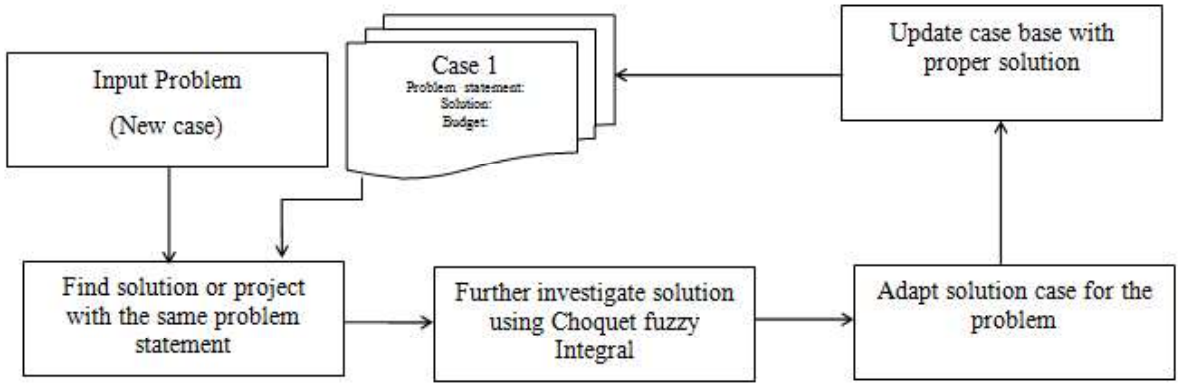
Fig. 2: Case retrival process



Source: Authors

If a case that satisfies the given characteristics is found then the solution will be adapted and implemented by the city. The adaption process highly depends on knowledge and experience of experts the city has. After the adaption and implementation process the new solution will be stored in the case library for future reference. If there is no such case that satisfies the given criteria a solution for the new case will be created, implemented by the city and stored in the case library. The following figure (Fig. 3) shows the process flow while accessing a solution from a case base using the proposed method.

Fig. 3: Process flow for the proposed model CBR



Source: Authors

For instance in section 1, the common weaknesses of the cities of Prague and Vienna was discussed. If one of these cities were to solve those problems, using the proposed method, the city specifies the problem, and the characteristics the expected solution has to fulfill. Since it is unlikely to find a case that fulfill all required characteristics the characteristics has to be assigned priorities. Then the case library will be searched for proper solution, if a solution is found it will be adopted, implemented, and the new solution will be properly indexed and uploaded to the case

library. If the problem has not been solved by another city in the past, a solution will be created, implemented, and uploaded to the case library.

Conclusion

Over the years, different frameworks and tools have been available for EU member countries to assists member countries to have administrative systems and public administration institutions capable of transposing, implementing, and enforcing the acquis according to the principle of "obligatory results". The method discussed in this paper is application of CBR for solving cities' problems based on others experience.

The advantage of the proposed method over existing tools include: the proposed method provides a way to adapt solution for a specific problem instead of a strategy, but still provides countries the final say, like other tools and frameworks. Solving these specific problems improve the overall success of strategic planning. The method also provides cities with options and freedom to choose a detailed solution for a specific problem based on their capacity without going through strategies of other cities. This is a bottom up approach where cities can solve their weakness and improve the success of their strategic planning. For further work case study will be conducted.

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