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Urban Renewal Project Selection Using the Integration of AHP and PROMETHEE Approaches

Gul Polat[1]*, Atilla Damci[1], Asli Pelin Gurgun[2], Ilayda Demirli[1]

[1] *Istanbul Technical University, Istanbul, 34469, Turkey*
[2] *Yildiz Technical University, Istanbul, 34220, Turkey*

Abstract

Appropriate project selection has a significant impact on construction companies' success. Selecting the appropriate project is complicated due to uncertainties related to many factors that may influence the project selection process. The uncertainties related to a construction project may vary according to the type of the construction project. Therefore, having a project selection tool, which assists construction companies in selecting a particular construction project, can be a significant advantage in achieving success. Urban renewal projects constitute a significant portion of the projects that are carried out by construction companies in Turkey. This study aims to propose an integrated approach for selection of urban renewal projects. The proposed approach combines analytic hierarchy process (AHP) method and PROMETHEE, to help construction companies in selecting the appropriate urban renewal project. AHP and PROMETHEE were used to find the weights of the selection criteria and to rank the alternative projects, respectively. The proposed approach is used to solve a project selection problem of a Turkish construction company, which is mainly specialized in urban renewal projects. In the case study, twelve different projects were ranked according to seventeen evaluation criteria by using the proposed approach. The findings of this study revealed that the proposed approach can be a useful tool for construction companies, which are especially specialized on urban renewal projects.

Keywords: Analytic hierarchy process; case study; project selection, promethee; urban renewal projects

1. Introduction

Turkey is one of the most earthquake-prone countries in the world. Due to having too many buildings (e.g., public buildings, residential buildings, etc.) that are not safe enough to survive during a major earthquake, Istanbul has become a specific focus of many urban renewal projects. In typical urban renewal projects, public authorities purchase properties from many different private owners, renew and resell them to other private owners [1,2]. However, it should be noted that the execution of urban renewal projects is different in Turkey from the execution of typical urban renewal projects due to the regulations established by public authorities. In Turkey, public authorities are not involved in purchasing, renewing and reselling of properties, but establishing the regulations guiding the planning and execution of urban renewal projects. Inhabitants, who are residing in urban renewal districts that are specified by law, hire a contractor to renew their buildings. The contractor agrees to rebuild the building in return for owning a number of units. In order to support the renewal of unsafe buildings, the regulations guiding the planning and execution of urban renewal projects allow the owners to build more square meters when they hire a contractor to renew their building. Contractors are responsible for the cost of the project in return for a number of units to sell.

At this point, selecting appropriate urban renewal project gains importance for contractors as they take more risk than any party involved. Several studies have been conducted on developing a model for project selection over the last years [2-7]. Developing a generic model for selecting the most appropriate project is difficult due to the

* Corresponding author. Tel.: +90 212 285 3737; fax: +90 285 6587.
*E-mail address:*polatgu@itu.edu.tr

fact that factors affecting the selection of a construction project may vary according to the type of the construction project. Therefore, in today's competitive construction environment, construction companies can take advantage of having a tool assisting them in selection of a particular type of the construction project. Since urban renewal projects constitute an important portion of the construction projects that are carried out by construction companies in Turkey, this study aims to propose an integrated approach for selection of urban renewal projects. The proposed approach combines analytic hierarchy process (AHP) method and PROMETHEE, to help construction companies in selecting the most appropriate urban renewal project. In the proposed approach, AHP is used to calculate the weights of the factors and PROMETHEE is used to rank the alternative urban renewal projects. The proposed approach is also applied in a construction company that is mainly specialized in urban renewal projects.

2. Research Methodology

The main objective of this study is to propose an approach for selection of urban renewal projects in Turkey. The proposed approach can be adopted and adjusted by any construction company that is interested in urban renewal projects. The tasks that were performed in this study can be summarized as follows: (1) identifying the factors that affect the selection of appropriate urban renewal projects; (2) integrating AHP and PROMETHEE for selection of urban renewal projects; and (3) applying the proposed approach to solve a project selection problem of a Turkish construction company, which is mainly specialized in urban renewal projects. In the following subsections, a brief review of AHP and PROMETHEE methods are presented.

2.1. *The AHP method*

It is acknowledged by the researchers that AHP is one of the most commonly used techniques for solving multi-criteria-decision-making problems since it was developed by Saaty (1980) [8]. The intention in using AHP is to have manageable and measurable components rather than complex and unstructured components for multi-criteria-decision problems. There are mainly five steps of AHP [8]:

- *Defining the decision problem and determining its goal*.
- *Establishing a decision hierarchy*: The hierarchy is comprised of highest, middle, and lowest levels that represent the goal of a decision problem, multiple criteria, and alternatives, respectively. The relationship between the elements of a level with those of the level immediately below is indicated with this hierarchy.
- *Comparing the elements in the corresponding level in pairs*: This comparison is done in terms of the degrees of influence on the specified element in the higher level of the decision hierarchy. A standardized nine-point scale of measurement, which converts human preferences between available alternatives as equal importance, weak importance, strong importance, very strong importance, and absolute importance, is used for multiple pairwise comparisons.
- *Finding the relative priority for each criterion/alternative through synthesizing all of the pairwise comparison matrices*: In this process, first, the normalized pairwise comparison matrix is found by dividing each element of a pairwise comparison matric by its column total. After establishing the normalized pairwise comparison matrix, the average of its elements in each row is calculated to find the priority vector.
- *Determining the consistency ratio (CR) of the pairwise comparisons*: There are four main steps to calculate the CR. The first step is that the weighted matrices should be established through multiplying pairwise comparison matrices by priority vectors. Computing the eigenvalues by dividing all the elements of the weighted sum matrices by their respective priority vector element is the second step in determining the CR. Third, the average of the eigenvalues is calculated to compute the principal eigenvector. Finally, the principal eigenvector is used to compute consistency index which is necessary to calculate CR. Any CR value that is lower than 0.10 is acceptable, if not then the judgement matrix is considered to be inconsistent. In order to obtain a consistent matrix, the pairwise comparisons should be reviewed and altered.

2.2. *The PROMETHEE method*

PROMETHEE is a family of outranking methods which consists of PROMETHEE I for partial ranking of the alternatives, PROMETHEE II for complete ranking of the alternatives, PROMETHEE III for ranking based on interval, PROMETHEE IV for complete or partial ranking of the alternatives when the set of viable solutions is continuous, PROMETHEE V for problems with segmentation constraints, PROMETHEE VI for the human brain representation, PROMETHEE GDSS for group decision-making, PROMETHEE GAIA (Geometrical Analysis for Interactive Aid) for graphical representation, PROMETHEE TRI for dealing with sorting problems,

PROMETHEE CLUSTER for nominal classification. These methods mainly deal with ranking of a set of alternatives according to multiple conflicting criteria [9-12].

In this study, three PROMETHEE tools were used to analyze the urban renewal project selection problem, namely PROMETHEE I and PROMETHEE II. Even though there are different versions in PROMETHEE family, all of the versions are mainly based on eight steps [11- 13]:

- *Determining the criteria and the set of possible alternatives of a decision problem*.
- *Determining the weights of the criteria*: There are different techniques that can be used to determine the weights of the criteria, such as AHP which is the method preferred in this study. No matter which technique you use, these weights are non-negative numbers and independent from the measurement units of the criteria. The lower the weight, the less important the criterion.
- *Determining the preference function*: There are six different preference functions that are used in PROMETHEE method, namely, 1) usual, 2) U-shape, 3) V-shape, 4) level, 5) linear, and 6) Gaussian. The main idea behind using these preference functions is to translate the deviation between the evaluations of two alternatives into a preference degree ranging from zero to one, for each criterion.
- *Determining the threshold values for each criterion*: The threshold values that should be computed are the indifference threshold value, the preference threshold value, and the Gaussian threshold value. The value of an indifference threshold represents the largest deviation to consider as negligible on a criterion. On the other hand, the smallest deviation to consider as decisive in the preference of one alternative over another is represented by a preference threshold. The third threshold value, Gaussian threshold, is only used with Gaussian preference function and it represents an intermediate value between the indifference threshold and the preference threshold.
- *Computing aggregated preference indices*.
- *Computing outranking flows*: The computation of outranking flows is a part of the PROMETHEE I partial ranking.
- *Computing net outranking flow*: The computation of outranking flows is a part of the PROMETHEE II complete ranking. The alternative with the higher net flow is considered to be superior.

For a thorough discussion of the PROMETHEE I and II, readers are directed to Brans (1982) [9], who developed them for partial and complete ranking of alternative of a multi-criteria-decision-making problem.

2.3. *AHP-PROMETHEE integrated approach*

The integrated approach presented in this article is based on four main stages. The first stage, which is called data gathering stage, consists of the identification of the criteria that will be used by a construction company in the urban renewal project selection process and the decision hierarchy is developed by the decision-making team, which is responsible for evaluating and/or selecting urban renewal projects. The next stage involves AHP computations, which consist of four steps, namely, forming the pairwise comparison matrices to determine the weights of the criteria determined in the previous stage, determining the values of the elements of the pairwise comparison matrices, calculating the weights of the criteria by using the geometric mean of the values obtained in the previous step, and forming a final pairwise comparison matrix. The calculated weights of the criteria should be approved by the decision-making team. The third stage is based on PROMETHEE computations, which are partial ranking with PROMETHEE I and complete ranking with PROMETHEE II. By using these calculations, the decision-making team determines the preference functions and parameters, and the urban renewal project priorities. In the final stage, the most appropriate urban renewal project is selected through the rankings provided by PROMETHEE I and II.

3. An application of the AHP-PROMETHEE integrated approach: Case study

A real-life case study is used to illustrate the proposed approach. The case study is based on a project selection problem of a Turkish construction company, which is mainly specialized in urban renewal projects. The company intends to select the most appropriate urban renewal project among twelve alternatives. First, the contractor's team consisting of 3 members, who are in charge of the urban renewal project selection process, determined seven main criteria namely, company related factors (MC-1), project related factors (MC-2), cost related factors (MC-3), contract related factors (MC-4), profit related factors (MC-5), management capability related factors (MC-6), finance related factors (MC-7) and seventeen sub-criteria, namely, reputation (SC1-1), gaining experience (SC1-2), experience in similar works (SC2-1), familiarity with the location of the project (SC2-2), size of the project (SC2-3), duration of the project (SC2-4), cost of the construction work (SC3-1), other costs (SC3-2), penalty (SC4-

1), fair contract clauses related to the dispute resolution (SC4-2), rate of return of investment (SC5-1), duration of return of investment (SC5-2), closeness of the construction site to the head office (SC6-1), safety of the construction site (SC6-2), accessibility of the construction site (SC6-3), amount of credit needed (SC7-1), amount of bond needed (SC7-2), which should be taken into account during the project selection process in the case study.

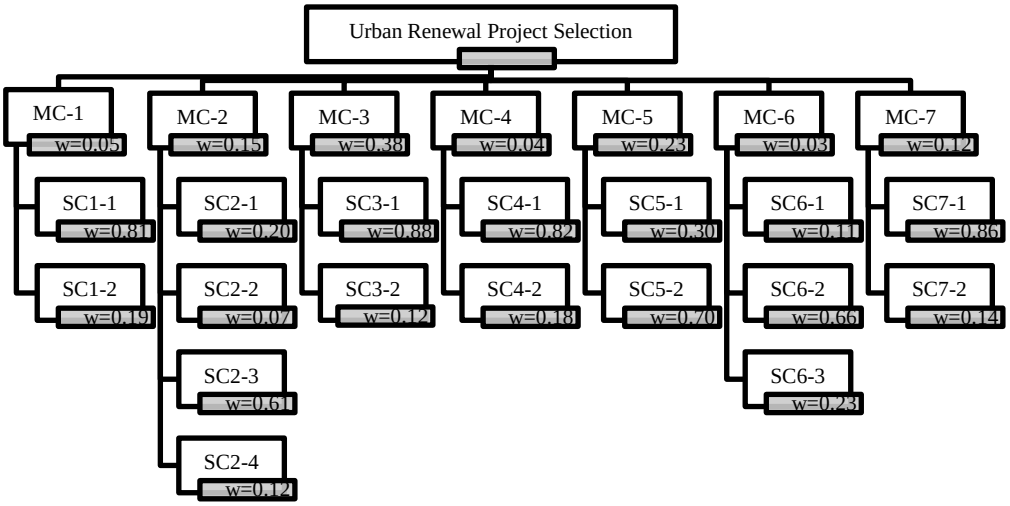

Figure 1. Decision hierarchy of urban renewal project selection problem

3.1. *AHP computations*

After forming the decision hierarchy for project selection problem, the AHP method is used to compute the relative priorities of the criteria. The decision making team individually formed the pairwise comparison matrices and calculated the geometric values of these values to get the final pairwise comparison matrix. As an example, the aggregated pairwise comparison matrix developed for the main criteria is shown in Table 1. Due to the space limitations, the aggregated pairwise comparison matrices established for the sub-criteria could not be presented in the paper. Cost related factors (MC-3), profit related factors (MC-5) and project related factors (MC-2) were found to be the most important criteria in selection of urban renewal projects. Consistency ratio (CR) of the pairwise comparison matrix is calculated as 0.001 < 0.10, which indicates that the judgment matrix is consistent and the weights can be used in the selection process.

Table 1. Pairwise comparison matrix for criteria and results obtained from AHP computations.

Criteria	MC-1	MC-2	MC-3	MC-4	MC-5	MC-6	MC-7	Weights
MC-1	1.00	0.28	0.16	1.59	0.22	2.00	0.30	0.05
MC-2	3.63	1.00	0.25	4.31	0.33	4.64	2.62	0.15
MC-3	6.32	4.00	1.00	7.00	2.62	7.00	4.00	0.38
MC-4	0.63	0.23	0.14	1.00	0.22	1.59	0.25	0.04
MC-5	4.64	3.00	0.38	4.64	1.00	5.31	3.30	0.23
MC-6	0.50	0.22	0.14	0.63	0.19	1.00	0.23	0.03
MC-7	3.30	0.38	0.25	4.00	0.30	4.31	1.00	0.12

3.2. *PROMETHEE computations*

When the AHP computations are over, the first step of the PROMETHEE computations is to form the evaluation matrix. The decision-making team individually evaluated the performances urban renewal project alternatives according to each criterion and the aggregated evaluation matrix, which includes the geometric means of the individual evaluations, is shown in Table 2.

Table 2. Evaluation matrix.

Criteria	Unit	Min/Max	Weights	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9	P-10	P-11	P-12
SC1-1	-	Max	0.04	3.00	9.00	3.30	7.32	6.32	8.32	8.32	9.00	4.31	5.31	2.00	2.00
SC1-2	-	Max	0.01	2.00	6.65	3.30	9.00	9.00	5.65	6.65	6.32	2.52	6.00	4.00	3.30
SC2-1	-	Max	0.03	9.00	9.00	9.00	1.59	2.62	9.00	9.00	9.00	9.00	9.00	9.00	9.00
SC2-2	-	Max	0.01	7.61	9.00	3.30	5.94	1.26	9.00	9.00	9.00	5.65	8.28	3.30	1.26
SC2-3	m^2	Min	0.09	1230	2422	2238	12480	8640	2657	3726	2898	1904	5382	4300	3281
SC2-4	Month	Min	0.02	12	18	18	24	18	16	18	18	16	18	16	18
SC3-1	TL ($x10^3$)	Min	0.33	1845	4844	3917	22419	15920	5314	7452	5796	3332	10764	7310	5742
SC3-2	TL ($x10^3$)	Min	0.04	98	1890	1116	3938	2094	1034	1674	1500	738	1344	524	730
SC4-1	TL ($x10^3$)	Min	0.03	6	30	18	25	20	16	25	25	15	25	15	18
SC4-2	-	Max	0.01	6.32	3.30	6.32	1.59	2.29	4.31	4.31	3.30	6.32	4.64	7.00	8.65
SC5-1	%	Max	0.07	0.85	0.26	0.25	0.25	0.42	0.26	0.25	0.21	0.38	0.39	0.29	0.30
SC5-2	Month	Min	0.16	24	30	30	36	30	28	30	30	24	28	28	30
SC6-1	-	Max	0.01	5.94	9.00	5.94	5.94	3.63	9.00	9.00	8.65	8.65	8.65	3.63	2.00
SC6-2	-	Max	0.02	5.00	9.00	5.31	5.00	3.91	7.32	7.32	9.00	5.31	5.94	2.62	1.00
SC6-3	-	Max	0.01	7.00	4.31	6.65	7.00	3.30	5.59	5.59	4.64	7.00	5.94	5.94	8.00
SC7-1	TL ($x10^3$)	Min	0.10	0	0	0	5000	3000	0	1000	0	0	2000	1000	0
SC7-2	TL ($x10^3$)	Min	0.02	0	3000	3000	5000	4000	3000	3000	3000	2500	3000	2500	2000

The evaluation matrix is the starting point of determining the preference functions and threshold values. They should be determined by considering the nature of the criteria and features of the alternative urban renewal projects. The preference functions and threshold values that are necessary to rank the alternative urban renewal projects are presented in Table 3.

Table 3. Preference functions.

Criteria	Preference Function	Threshold Values		
		q	p	s
SC1-1	Level	1	2	-
SC1-2	Level	1	2	-
SC2-1	Level	1	2	-
SC2-2	Level	1	2	-
SC2-3	Linear	1,000	4,000	-
SC2-4	Linear	4	10	-
SC3-1	Linear	1,500,000	3,000,000	-
SC3-2	Linear	250,000	750,000	-
SC4-1	Linear	10,000	20,000	-
SC4-2	Level	1	2	-
SC5-1	Linear	0.1	0.2	-
SC5-2	Linear	6	10	-
SC6-1	Level	1	2	-
SC6-2	Level	1	2	-
SC6-3	Level	1	2	-
SC7-1	Linear	750,000	1,500,000	-
SC7-2	Linear	1,000,000	3,000,000	-

The following step is the evaluation of alternatives via Decision Lab software, which is used for PROMETHEE computations. When the evaluation matrix, preference functions and thresholds are inputted, this software is capable of performing all calculations efficiently and rapidly. The positive flow ($\boldsymbol{\phi^+}$), negative flow ($\boldsymbol{\phi^-}$), and net flow ($\boldsymbol{\phi}$) values are obtained through the calculations performed by Decision Lab software (Table 4).

Table 4. PROMETHEE flows.

Alternatives	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9	P-10	P-11	P-12
$\boldsymbol{\phi^+}$	0.5416	0.2637	0.2676	0.0468	0.1165	0.2613	0.2015	0.2257	0.3552	0.1677	0.1842	0.1942
$\boldsymbol{\phi^-}$	0.0525	0.0928	0.0947	0.7074	0.5936	0.0725	0.2134	0.1142	0.0537	0.4373	0.2449	0.1489
$\boldsymbol{\phi}$	0.4891	0.1708	0.1729	-0.6606	-0.4771	0.1888	-0.0119	0.1115	0.3014	-0.2696	-0.0607	0.0453

The positive flow values were used to get the partial ranking (Table 5). According to the PROMETHEE I partial ranking, P-1, P-9, P-3, P-2, and P-6 are the superior ones among the twelve alternatives and P-10, P-5, P-4 and P11 are the alternatives that are found to be inferior to the other alternatives. It should be noted that the PROMETHEE I partial ranking may not help to find the most comprising alternative. Therefore, the complete ranking was determined, which is based on the net flow values given via PROMETHEE II, to identify the most comprising alternative (Table 5).

Table 5. Alternative rankings.

Partial ranking	P-1	P-9	**P-3**	**P-2**	**P-6**	P-8	**P-7**	**P-12**	P-11	P-10	P-5	P-4
Complete ranking	P-1	P-9	**P-6**	**P-3**	**P-2**	P-8	**P-12**	**P-7**	P-11	P-10	P-5	P-4

According to the results of PROMETHEE II, P-1 was selected as the most comprising alternative. The other alternatives are listed in a descending order of their net flow values, also shown in Table 5.

In order to check the validity of the proposed approach and its usability in their company, the opinions of three decision makers, who had the opportunity to utilize the proposed approach, were sought through face-to-face interviews. The decision makers claimed that the proposed approach was a useful and efficient tool, and could be easily used in their company.

4. Conclusion

Project selection is one of the crucial decisions of construction companies. This study aims to propose an integrated approach utilizing the combination of AHP and PROMETHEE methods, which may assist construction companies in selecting their urban renewal projects in a more objective, realistic, and objective way. The proposed approach was applied in a construction company, which predominantly undertakes urban renewal projects in Turkey. The company management found the proposed approach beneficial, easy, efficient, and useful. In future studies, fuzzy numbers can be used when evaluating the qualitative factors.

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Challenges in public facility management: Some remarks to the EN 15221 FM standard

Dr. István Hajnal*

BUTE, Budapest, Hungary

Abstract

The collective of Standards of EN 15221:2011 refer to the facility management (Facility Management, FM) focusing on the FM as a product and the budget of FM. This standard was created with the aim of unification the operation of business service processes. In the public sphere, while the application of the standards arise as a great challenge, its understanding, and the lessons drawn from it might be important for both the community facility operators and managers. In the article, the Author sets up the model of the public facility management according to the descriptions of the Standard, and highlights the problems and focus points of the public utilization of the Standards by systematic examination of elements and analysis of relating literature. The article, based on the model set up, articulates suggestions for the adopters and the users of the public FM.

Keywords: Facility Management, EN 15221 Standard, Public Organization, SLA, Building Operation

1. Introduction

At certain fields of real estate industry – no matter how surprising this fact is – there are no public standards; experts work based on inner guidance of professional organisations exclusively. There is only one exception area in real estate industry, that is the facility management (FM), ruled by a public standard. The EN 15221 standard (referred to as the Standard) was started to be composed in 2002 and nowadays has seven sections which were launched between 2006 and 2011, that are obliged to apply in all member countries of the European Union. Even though, because of the overlap of different branches, it is difficult to estimate the volume of the European market of facility management, a study calculated it roughly to 655 billion Euros [1]. A standard describing the operations of this huge market would be determinative in the field of management. At the same time, among the tightly taken profession as well as the targeted companies the standard is less known and still less applied [2, 3]. In an actual market review [4] the interviewed companies, being familiar with the FM as a business branch, criticized the lack of integrated European standards!

The Standard was established for for-profit companies, according to business demands, targeting on the so-called FM product and the relating budget. Keith in his article, prepared for decision making of the standards [5], emphasized the interdisciplinary of the special field of FM and found that in business life, the show up of FM would indirectly have a positive effect on the way of thinking of the public sphere. In our opinion, for non-profit companies and for public users, the collective of EN 15221 Standards bears important edifications and raises important questions at the same time. Some of these questions affect directly the standard, while other questions highlight the problematic focus points of the public facility management. In our article we mention some of these questions.

2. Model of FM, Based on the EN 15221 standard

The seven chapters of the Standard discuss the definitions and description of processes relating to FM on 356 pages. The chapters also discuss the explanations of FM definitions, FM contracts, quality insurance, processes, area measurement and benchmarking. In our opinion, the substance of the group of Standards is best-presented by Table 2 of Issue 4. (See Figure 1).

* Corresponding author. Tel.: +36-1-464-00-00
*E-mail address:*drhajnali@gmail.com

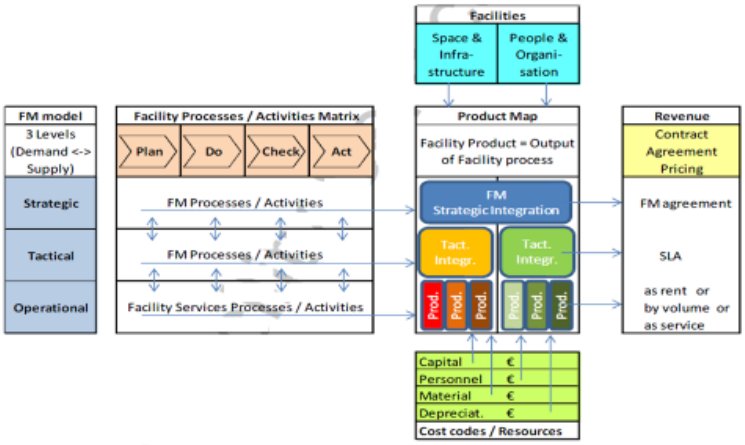

Figure 1: Relationship Model of FM (EN 15221:4.-2011, Fig. No. 2)

In the centre of the table, there can be found the map of products of FM levels with relating costs and revenues. The Standard lists the activities into three main groups such as strategic, tactical and operational activities, while it makes a distinction between the superposing facility processes of planning, doing, checking and acting. The activities of the processes create the FM products and services. The exact description, costs and budgeting of FM products and services can be generally found in the FM agreement, in the SLA (Service Level Agreement). Applying the above point of view, on the below Figure No. 2, we attempted to rearrange the elements to indicate the key problems of public FM and their relationships to each other.

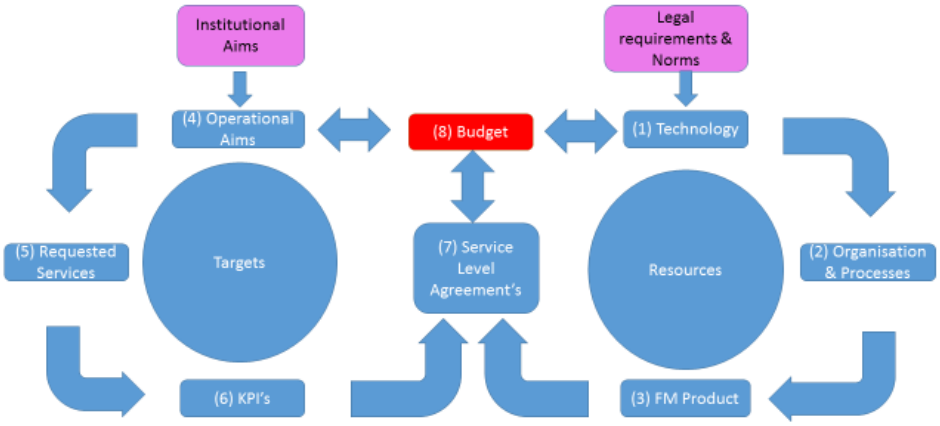

Figure 2: Model of Public FM

In our model with two loops presented in Figure 2, we divided the one-poled standard of EN 15221 focusing exclusively on the resources into two poles; while in the corporate sphere the target system of FM can easily be defined as the main service of main corporate processes, at the same time in the public sector, the target system is complex and varies according to institutions. Therefore, in our opinion, the target system and the resources are to be considered as the two different poles of the public model.

We have to consider two main drivers above the operating cycles, namely, the unity of institutional targets and the consequences determined by the law, rules, regulations and standards. The targets of functioning are derived from the institutional aims. While the general aim (errand) of the institution is independent from operations, the targets of function are already part of the two-loop FM cycle being in a constant interaction of its elements. Another input point of the cycle is the system of legal requirements determining the resources of the real estate and built-in technical specifications. Public real estates are to satisfy all sort of needs to which needs there are countless

legal rules and regulations, standards, demands joining, made on habits. The buildings and the built-in technologies might be in compliance on different levels, which can appear in the model as the variables of the FM loop-cycle also. The cycle gets to the determination of costs of the agreement (SLA) on the side of the target system, starting from the principle of creating aims of function, beyond the adjustment of service levels and the relating expected output indicators, while on the side of the resources, from the direction of the processes built on technologies, and from the relating organisation arrive to the description of the product, that becomes the input data of the SLA and the budget. In the following chapters, we will consider one after the other, the elements of the two-cycle loop in view of the Standard and the technical literature; first we will examine the resources, than the targets, and finally, the cross-section of SLA agreements and budget.

3. Resources

3.1. *Built-in Technology*

The FM Standard considers the buildings to be maintained and the built-in technologies as a given facility. The everyday maintenance practice is expressible in differences considering the conditions, facilities, building automation and method of utility of two buildings with similar functions. As these differences are huge, the processes relating to the buildings will be necessarily different. The above is increasingly true in respect of public buildings. On the one hand, the functions might be heavily different (as two office buildings show numerous similarities, a school building and a hospital have nothing common but the differences), and on the other hand, the conditions of the buildings are fluctuating between extreme boundaries. At the same time, in general we can say that the public sphere is frequently suffering from the existence of outdated, unsuitable technologies, and the lack of sources for investments [6].

Even though it would be essential, the facility operators are not involved in the process of planning of the technology, therefore, even in the case of newly built real estates, they cannot be optimally facility managed [7]. The above is confirmed by Benett and his fellow author [8], as examining mathematical models they found that it is more expedient, to outsource the investment and facility management bundled, being a more cost effective solution. **Seeing that the Standard will presumably not deal with the built-in technologies, in this question, we do not see any difference between the private and public utilisation of the Standard.**

3.2. *Organisation & Processes*

The Standard, in its fourth chapter pays special attention to the structure, relation and changes of processes. At the same time, the Standard considers that the setup of the organisation providing the basis and structure of processes are given, supposing that an effective organisation is existing within the company suitable for reaching the business target in the most effective way, and this organisation is also able to manage the FM area too. We can consider it as an aptitude that the public sphere is organised differently from the business sphere, along multidimensional principals therefore its' efficiency, considering it from strictly business standpoint, is worse [9]. It is well-known for example, that the organisational changes become more effective in the private sphere than in the public areas [10]. It is also undoubted that the innovation spreads much more difficult in the public area [6].

Even though the public projects are considered more bound, an actual study [11] indicated that, regardless to the culture, public building projects might function with success, based on the trust of cooperating parties. Jalocha highlights that in the interest of the mentioned multi-dimensional compliance, a project manager working in a public sector ought to have numerous additional competences than a project manager working in market environment [12]. This statement stands for not only one individual but for the whole of an organisation. **All the above mean that the facility management processes of an organisation under public direction should be planned more accurately and prudent than the ones of business entrepreneurs.**

3.3. *The FM Product*

The Standard takes precious good care of defining the certain FM products and services. It is a highly important aspect, since who could interpret the meaning of a unit of cleaning or a unit of supply without this knowledge. The Standard assigns definitions to FM activities habitual in business life, and provides the frame for further definitions of activities. Of course no definitions were made for all diverse public activities, **one of the first exercises for the public user to determine, to circumscribe his own activities according to the methodology given by the Standard.**

4. Targets

4.1. *Operational Aims*

The Standard considers it as an aptitude that the functioning aim is not more than the cost-effective service of the main activity. Even in the classical paper of location analysis [13], it is already mentioned, the difficulties of quantifications of public expectations, therefore the decision-preparation models of private sector cannot be directly applied. The different expectations and intentions might be considered as special "switches" [7], among which the financial effectiveness is only one. Financial effectiveness can be examined with the analysis of the life-cycle costs. The importance of LCC-analysis in public investments is also emphasized in the study of Perera et al, issued by IISD [14], highlighting the fact that this is only one of the possible target values among others for optimisation. The targets and indicators of functioning can be directly derived from the institutional targets by careful analysis [15].

4.2. *Requested Services*

The Standard does not describe nor identify those products, services among the FM products that can be derived from the operational aims. In the public sphere, as it is outlined on Figure No. 2, all services and service levels can be determined based on the operational aims, which are chosen by the user from the well-defined palette of FM products.

4.3. *KPI's*

The Standard dedicates a separate chapter to measurement of output (EN 15221-7, Benchmarking). Townley in Alberta, Canada, examined 16 museum organisations [16] in the public sphere. He stated that the business type output measurement means only one dimension of rationalism for the community of the museum, while the institutional aims can be interpreted along with different "rationalities". De Toni [17], while analysing the study case of a huge Italian hospital states that the public FM has two consumers, one of them is the contractual party, being the management of the hospital, and the other is the final consumer, the patient himself. The output valuation of the two consumers is significantly different. This is why De Toni suggests the introduction of the differentiated method called Balanced Scorecard, making it possible, to measure the contentment of both consumers. From the nineties, the public users also started to apply different quality management systems f.e. the TQM. Since then, it is still a difficulty, to unify the ramifying public targets into one quality management model [18]. In respect of the quality, in the international technical literature, it is already a determining opinion that the public sphere, especially the non-profit organisations are able to provide a higher-lever service, since they are not enforced to minimise costs because of profiteering [19]. **To reach the above, however, the operational aims are to be determined, and the services are to be exactly articulated in the interest of choosing the output indicators in the appropriate dimensions and according to the targets.**

4.4. *The Service Agreement (SLA)*

A complete chapter of the Standard is dedicated to the standardised contents of service agreements (EN 15221-2). The contents of the SLA are partly made of the FM products, partly of the expected level of services and also of the relating output measuring indices. The unified form of the agreement and contents is just an illusion in the business life as well; so many law firms, so many forms of agreements, especially considering the public sector. The unwritten law, the inspection bodies, the relating rules and regulations, for example rules of procurement, are different in every institute, in every specialty and in period of time. Bureaucracy is a significant hindrance of quick changes [10]. **The Standard provides an excellent content guideline, the agreement writers in public sphere also should take advantages of it.**

4.5. *Budget*

According to the Standard, the budget is in the centre of the FM relationship model (Figure No. 1). It is true that opposite to the corporate thinking, in public sector, the optimisation of budget is not the sole target [21], this is why it is important to choose the correct "switches" of the target system. Rostás articulates as: the balance of the tangible and intangible profits between the before and after conditions of the public developments are altogether always positive for all affected social and professional groups [22]. At the same time, in public medium, budget used to be tightest bottleneck, therefore it is necessary to place it into the centre of the iteration cycle of the double loop. It derives from the model and the conceptuality of the Standard, that an operational aim based budget has to be prepared for the FM. The budget should contain both the investment and operational costs. Opposite to

that, the public sphere is usually applies the base line budget applying the budget modifying the previous budgetary period [20]. The institutional budget, in the focus of the target and toolkit system, expresses and makes links between the aims and the targets with numbers, but only in the case when the contents and activities of the SLAs' are clearly defined. **In public sphere, this can be happen only in case the budget is prepared by the breakdown of activities, to exceed the earlier base approach budgeting practice.**

5. Summary

Even though the FM Standard was made for companies, it also articulates important guidelines for the public sector users as well. We should mention the methodical system of facility management that provides a frame for the FM activities. The Standard offers a methodology for planning processes and defining products; it highlights the necessity to prepare an activity-based budget. For the latter, it is essential, the working out of SLA agreements. Kwak et al [23] while analysing the literature of PPP (Public-Private Partnership) projects, rank the problems of the company and public cooperation into four main groups that are as follows: the competence of the public direction, the choosing of the suitable partner, the appropriate distribution of risks and financial sources among participants. Therefore, the application of SLA agreements according to the Standard should highly contribute, not only within the public sphere, but also within business and public relations, to the improvement of efficiency.

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