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# **ASSESSING THE QUALITY OF G2B INTERNET PORTALS – A BENCHMARKING APPROACH**

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*Public administrations transform themselves into customer-oriented service providers. Consequently, the availability of G2B electronic services (e-services) is increasing. Within this exploratory paper, we present the status quo of the G2B portals with two research objectives: Firstly, we provide a benchmarking quality assessment with a scoring model and a maturity model. Secondly, we analyse the data empirically from a descriptive and an inferential point of view. The inferential analysis implies microeconomic factors. Hence correlations between and the influence on the quality of G2B e-services and regional economic structures (e.g. GDP growth rate, GDP per Capita, unemployment rate) can be analysed. With these methods, we analyse the offer of G2B e-services in all 27 European capitals and all European cities with more than 500.000 inhabitants. The results show, that the best portal achieves 60 % of the overall scores. Moreover the economic factors only have limited influence over the quality of G2B services. The rising of the directive on services in the internal market, gives a starting point for the results. Our results provide a starting for quality recommendations on the one hand and for further research on the other hand.*

*Keywords: G2B e-services, empirical study, European capitals, benchmarking, EU services directive*

# 1 Introduction

E-services are increasingly bundled and presented on Internet portals. The accessibility of individuals, data, programs and objects via Internet requires target-oriented and efficient transactions of public administration procedures. Municipalities aim at optimization of administrative processes, cost savings for the businesses and a reduction in bureaucracy (Ronaghan 2001). Up to the time of executing this survey, the status quo of the implementation of Government-to-Business (G2B) e-services in corresponding Internet portals has not yet been analyzed. Existing international studies focus on different aspects of E-Government (Keehley 2008), (Brown 2007), (Horan et al. 2006), (Ronaghan 2002). The subject of the business-oriented studies (Zhao et al. 2007), (Cap Gemini 2006), (Graafland-Essers and Ettegui 2003) is targeted on comparisons of state institutions portals at national or regional level. In comparison to this, municipalities are especially affected to provide G2B e-services, as they hold most of the process and decision-making authorities of the government services sector for companies (Soria 2007). Studies published up to now do merely provide an analysis of the used criteria. This paper is bridging this gap by giving a structured overview to G2B e-services offered by European capitals and large cities. As the paper is exploratory in nature, no underlying theory is applied. Hence, the paper focuses on comparing the state-of-the-art in implementing G2B services in municipalities' internet portals. The research objective is divided into two areas:

Firstly, we assess the quality of European metropolises with regard to the quality of G2B the corresponding portals. For that purpose we have developed two approaches:

- A score model depending in order to assign a score to each metropolis in scope.
- A maturity model in order to map each metropolis' online portal to a maturity level. In order to be assigned to a specific maturity level, a portal needs to implement a specific set of criteria completely. Even if a portal fulfils some criteria of a higher maturity level it is not assigned to that level until all criteria of that level have been implemented. Theoretically, a portal could exhibit a high quality score but a low maturity level. This would be the case if the portal does not implement one or more criteria in each maturity level but altogether implements a lot of criteria.

Using these two approaches we show descriptive empirical results about the scores of metropolises and their maturity levels. The results address the following questions:

D1: What quality scores and maturity levels have been assigned to the European metropolises and which are at the top of the list? What percentage of portals is mapped to the defined maturity levels?

D2: How are the scores statistically distributed?

D3: What is the average quality score and standard deviation of European countries?

Secondly, we define a set of statistical assumptions for inferential purposes. Our special interest focuses on a quantitative explanation of a portal's quality score. We assume a relationship between the quality score and the economic environment of a metropolis (Corbin and Strauss 2008). In detail, our hypotheses are:

H1: There is a significant impact of the metropolis' structure and regional economic performance on the identified quality score.

H2: High Quality Portals in native language also provide a High Quality Portal in a Second one (English).

H3: Portals with high quality scores exhibit a high maturity level.

The paper is structured as follows: First we explain our research objective and sum up benchmarking approaches in E-Government. Subsequently, we give a detailed description of our methodological approach. The results of our research are presented and discussed. The paper closes with a summary and a discussion of further research questions.

## 2 Methodology

### 2.1 Procedural model for benchmarking services

The main method in this work is the benchmarking approach (Camp 1989), (Carpinetti and de Melo 2002), (Heeks 2006). In information science, benchmarking is a method in the context of quantitative-empirical and qualitative-empirical cross-section analysis and is applied “to show that one’s solution has reasonable performance or is better than some other available solution” (Vaishnavi and Kuechler 2008). Benchmarking in the public sector in general and in e-Government in particular is an established method of conducting performance management (Heeks 2006), (Kouzmin et al. 1999). Our benchmarking study is accomplished methodologically according to the “Procedural model for the Benchmarking of Service” – DIN PAS 1014 (German Institute for Standardization 2001) that comprises basic benchmarking activities (Drew 1997).

The accomplishment of the benchmarking study follows the methods of “Third-party Web Assessment” (Heeks 2006), whereas the approach “mystery user” is applied in a first step. The principle of the “mystery user” approach – also known as “mystery shopping” (Wilson 1998) – indicates that an examiner puts himself in the role of a client that requires the municipal services, to objectivity and realism the survey. In a second step, another approach belonging to “Third-Party Web Assessment” is applied: following (Heeks 2006), firstly we analyze presence and absence of defined services and web portal characteristics, secondly, we classify the services according to a stage model rating (maturity model).

### 2.2 Scoring model for rating the results

The importance of qualitative criteria in moments of decision-making is beyond dispute (Leonard and Laurier 1996). In the present case, the use of a scoring model is appropriate to rate the differences by the specifications of criteria (Gehrlein and Wagner 1997). Our scoring model is constructed using six recommended phases (Gehrlein and Wagner 1997) and is qualitatively validated by experts’ opinion.

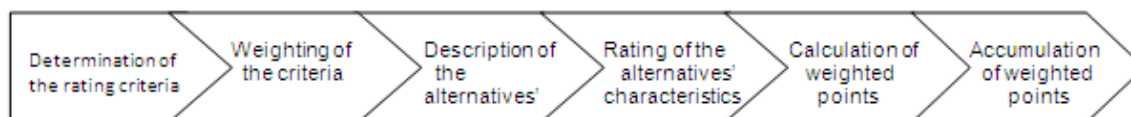


Figure 1. *Phases of the Scoring Model (based on Gehrlein and Wagner 1997, p.160)*

The expert group comprises 4 IS researchers, 9 CEOs of Small and Medium Sized Enterprises, and 7 experts of public sector. A widely known problem is the choice of criteria and the determination of weights, as subjectivity is hard to handle. We solve this challenge by revealing our approach (Davis, 1959). Consequently the choice of qualitative criteria and the consulting of certain weights are intersubjectively verifiable. In the following, we describe the results of each of the phases.

#### 2.2.1 Determination of the rating criteria (Phase 1)

The choice of criteria is based on the results of structured expert interviews as well as businesses interviews. We accomplished the study analysing 25 criteria divided into five categories: Category 1: Search functionalities for G2B e-services; Category 2: Clarity of e-services (structure); Category 3: Contact partner services for businesses; Category 4: Form services for businesses; Category 5:

Municipal G2B e-services. The particular services of category 5 comprise industrial real estate and commercial property, services for founders of new businesses, registration of a business and e-tendering (cp. Table 1).

Category	Criterion	Measurement Unit	weighting coefficient
Search functionalities for G2B e-services	Does an official web portal for the considered city exist?	presence / specification	1
	Do link functionalities to a dedicated website for economy or businesses with bundled G2B eServices exist?	presence / specification	1
	Does the entry of search terms "economy" and / or "businesses" into the input field "search" lead to G2B eServices?	presence / specification	1
	Search path from the main portal to the overview of G2B eServices on the business portal.	Quantity	1
Clarity of e-Services offered to businesses	Does a dedicated web portal for economy or businesses exist?	presence / specification	2
	Is location information for businesses available?	presence / specification	1
	Are there photos (optical impressions by static pictures from the location) available?	presence / specification	1
	Are there video clips (optical impressions by dynamic pictures from the location) available?	presence / specification	1
	Is a geographic information system (GIS) available (e.g. web.gis-applications)?	presence / specification	2
	Is a forum (e.g. idea box, suggestion box, complaint box) available?	presence / specification	2
	Is a feedback possibility available?	presence / specification	2
	Is the portal available multilingual (the portal is available at least in 1 foreign language)?	complexity level	3
Contact	Is a central hotline for businesses to contact the administration available?	presence / specification	1
	Are central contact partner for businesses named?	presence / specification	2
	Are visible service guarantees for initial responses by the administration available?	time value	2
Form services for businesses	Are business-oriented form download services available?	presence / specification	2
	Are help functions for forms and procedures (e.g. completion support, check lists) available?	presence / specification	2
	Is digital signature for authentication embedded in the form management?	presence / specification	3
	Is application processing per form directly online available?	presence / specification	3
	Are the form services connected to external bodies? (e.g. country administration, state administration).	presence / specification	2
Municipal G2B eServices	Industrial real estate and commercial property - in which complexity level available on the business portal?	complexity level	3
	Services for founders of new businesses - in which complexity level available on the business portal?	complexity level	3
	Registration of a business - in which complexity level available on the business portal?	complexity level	3
	E-Tendering / E-placing - in which complexity level available on the business portal?	complexity level	3
	Other municipal business-oriented services - in which complexity level available on the business portal?	complexity level	3

Table 1. Criteria Catalogue for G2B e-services

As Category 5 consists of municipal G2B e-services, we give a short description of the particular services:

- Industrial real estate and commercial property: Industrial real estates and commercial properties comprise estates and buildings (including equipment) for commercial use. According to this, departments for communal business development provide municipal offers and information services for businesses.
- Services for founders of new businesses: Founding of new business means the realisation of self-employment. The founding of a new business starts with the entry in business operations and due to formal legal reasons with the registration of a business. Services for founders comprise: consulting, support programs, official registrations etc.
- Registration of a business: The registration of a business means the official registration of self-employment at the responsible authority.

- E-Tendering / E-placing: Public tendering is part of the procedure to allocate assignments. Hence, tenderers are invited to submit offers. These procedures are usually strongly standardized by legal frameworks.

### 2.2.2 Weighting of the criteria (Phase 2)

As the analyzed criteria do have different dimensions of importance, the point values are weighted according to their economic importance for businesses with weighting coefficients, whereas coefficient “1” considers the economic importance of an e-service for businesses as fundamental, “2” the economic importance of an e-service for businesses is especially important and “3” the economic importance of an e-service for businesses is high. As with the categories, the differentiation of the coefficients results from expert interviews as well as from interviews with businesses. The relationship between these terms relative to each other is equidistant (Bortz and Döring 2006). The determination characteristics, whether a service is fundamental, especially important or high important were analysed by a written survey of 360 Small and Medium Sized Enterprises and completed by two workshop with enterprises.

### 2.2.3 Description and rating of the characteristics of alternatives (Phases 3+4)

The description of the characteristics of alternatives results from the experts interviews. As mentioned before, some subjectivity remains. Nevertheless our differentiating factors are defined in inter-subjective revisable way. As the different criteria have different types of characteristics, varied measurement indicators have to be applied. Selected criteria are rated according to complexity levels (Baum and Maio 2000) whereas 6 specifications are possible: Complexity Level 0: no e-services (for a certain service available); Complexity Level 1: information (on a certain service is available online); Complexity Level 2: interaction (download of files is available); Complexity Level 3: two-way interaction (editing of forms and authentication is available); Complexity Level 4: online-tracking (presentation of current time perspective and status of the proceedings or open steps until a process is completed); Complexity Level 5: transaction (complete online processing – admissions and payment included).

The measurements point for the complexity levels were given according to the complexity level that means e.g. a service in complexity level 4 is calculated with 4 points for the considered city.

### 2.2.4 Calculation and accumulation of weighted points per alternative (Phases 5+6)

After rating and weighting the criteria, the total of points for each city can be calculated. During the time period of the study, the city with the highest total of points has the best online portal concerning quantity and quality of G2B e-services. The scoring model resulting from the steps described above is:

$$S_n = \sum_{m=1}^M r_{nm} \cdot w_m$$

## 2.3 Maturity Model Approach

Maturity models are known approaches to describe the characteristics of organisations in different evolution levels (BPMM 2008; CMMI 2006; de Bruin et al. 2005). The maturity of processes or maturity of capability is focused on this. Maturity models usually consists of five levels, whereas the

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<sup>1</sup> whereas:  $S_n$  : score of n-th alternative;  $r_{nm}$  : rating of the n-th alternative by m-th criterion with an appropriate scale;  $w_m$  : weighting of m-th criterion  $C_m$

highest level represents “Good Practice” respectively “Best Practice” (Fraser et al. 2002). The lower levels characterize organizations in interim states. That means these processes or capabilities have improvement potential. For the field of E-Government, a special maturity model has been developed (EICTA 2008). Based on the requirements of the directive on services in the internal market, also named EU Services Directive (European Parliament 2006), this model focuses especially on services in the internal market. The model consists of 5 maturity levels with regard to the different articles of the Directive. Level 1 and 2 had to be implemented technologically by the end of 2009. In order to classify the maturity levels of the G2B portals, we adapted this model. The criteria were allocated to the different levels in order to determine the levels by certain characteristics. Based on an iterative design process (Generate/Test-Cycle, Simon 1996) the expert group developed in sum 25 criteria, which are different in their relevance to the enterprises. Thus it was necessary to distinguish and to value each criterion depending on its relevance. As much more relevant, the criterion has a higher value. By trend criteria with a higher value it has been selected as an indicator for the classification into a higher maturity level.

### **3 Descriptive and Inferential Results**

#### **3.1 Descriptive Results**

The research and analysis method described above was applied to all European capitals and all European large cities with more than 500.000 inhabitants. In the capitals of EU the core administration and decision units are resident. So, for enterprises these kinds of cities are attractive in a higher way than other cities of a nation. Additionally, the core businesses of trade and services are resident in big municipalities. Therefore, the set is extended by cities with 500,000 and more inhabitants. According to this, the sample for the study comprises 27 European capitals and additionally 36 large cities, in total 63 cities. In the following we describe our empirical results. We will start with the descriptive results.

*D1: What quality scores and maturity levels have been assigned to the European metropolises and which are at the top of the list? What percentage of portals is mapped to the defined maturity levels?*

A remarkable finding is that the best portal achieves only 85 out of 150 possible points, hence only 56,7 % is achieved. The most potential is seen in the development of complexity levels 3-5 for municipal services. The top ten positioning is depicted in table 1, for the overall positioning cp (anonymous). In table 2, we present the percentage of maturity levels reached.

*D2: How are the scores statistically distributed?*

The tables 2 and 3 show the top 10 positioning of the European cities and the distribution of the maturity levels, respectively.

Positioning	City	Points	Maturity
1	Berlin	85	3
2	Wien	83	3
3	Düsseldorf	78	3
4	Dortmund	74	3
5	Amsterdam	67	2
6	Praha	66	1
7	Hannover	65	1
8	Essen	62	2
8	Frankfurt a.M.	62	2
10	Bremen	61	2

Table 2. Top 10 positioning overview

Maturity	Cities	Percentage
0	Athina, Bucuresti, Budapest, Glasgow, Helsinki, Lefkosia, Lisboa, Ljubljana, Luxembourg, Lyon, Madrid, Málaga, Marseille, Milano, Nantes, Nice, Poznan, Riga, Roma, Rotterdam, Sevilla, Sofia, Toulouse, Valletta, Zaragoza	39,68 %
1	Birmingham, Bordeaux, Bratislava, Bruxelles, Dublin, Genova, Hamburg, Hannover, København, Krakow, Leeds, Lille, Lodz, London, Napoli, Palermo, Paris, Praha, Sheffield, Stockholm, Stuttgart, Tallinn, Torino, Valencia, Vilnius, Warszawa, Wrocław	42,86 %
2	Amsterdam, Barcelona, Bremen, Essen, Frankfurt am Main, Köln, München	11,11 %
3	Berlin, Dortmund, Düsseldorf, Wien	6,35 %

Table 3. Maturity Levels

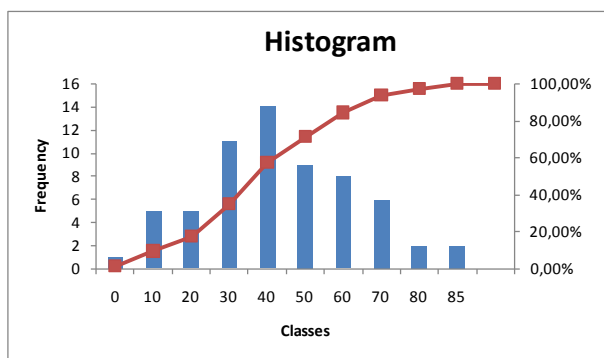


Figure 2. Distribution of Scores, n=63

Figure 2 shows the distribution of the quality scores for the portals of 63 European cities. As a result, a mean of 39.73 and a standard deviation of 19.93 scores have been calculated. Obviously, the distribution of scores can be represented by a normal distribution. Moreover, a representative European city has a quality score of around 40. Better and worse cities are spread systematically around this representative score. Neither very good nor very bad portals dominate the quality distribution.

D3: What is the average quality score and standard deviation of European countries?

Although integrated in the European Union, countries in Europe are still independent to a great extent. Taking this fact into account, the average score and standard deviation of European countries is an interesting subject for a comparison. Additionally, some European countries possess centralized standards for G2B services whereas others are organized in a decentralized way (European Commission 2007). At first glance one would assume that scores within a country with centralized standards are less spread around the average than within countries without centralized standards. Table 4 compares the quality scores of several European countries.

Country	eGov Standards		Average Score	StdDev	Number of Cities
	YES	NO			
Germany		x	64,91	9,90	11
France		x	27,38	16,41	8
Spain	x		33,33	16,27	6
Italy		x	27,83	5,42	6
Great Britain	x		43,40	8,17	5
Poland	x		44,00	5,66	5
Netherlands	x		52,00	21,21	2

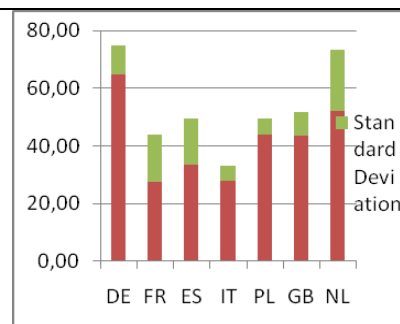


Table 4. Average Scores and Standard Deviations of European Countries



Countries have only been taken into consideration if more than one city in a country was included in our sample. It turns out that Germany (11 Cities) exhibits the highest average quality score. Although Germany has no central e-government standards, the standard deviation of scores of German cities is relatively low. France has the lowest average quality score and additionally a relatively high standard deviation. Obviously, one cannot identify that there is a clear impact of the existence of centralized standards on the standard deviation within a country. Overall, one cannot identify a definite influence. We actually do not have an explanation for this phenomenon. It will be addressed in further research.

### 3.2 Inferential Results

#### *Hypothesis 1: Quality of Portals depend on Structure and Performance of the Regional Economy*

After having explained the descriptive results our focus changes to statistical inference procedures. At this stage we aim to explain the quality score of the European G2B portals. The question here is: What variables could be relevant to explain a portals' score and how do these variables influence a portals' score? To answer this question the EU Services Directive has been investigated for objectives. As a result, we used the following exogenous variables in order to estimate the influence and test for significance. We also report on our assumed influence of each variable (c.p. table 5).

Variable	Source	Assumed Influence	Reference in EU Services Directive
Population of City	Eurostat, latest population data between 2003-2006, retrieved 11 <sup>th</sup> of July 2008, <a href="http://epp.eurostat.ec.europa.eu">http://epp.eurostat.ec.europa.eu</a>	The larger the city, the better the quality score since there is more demand for G2B services.	The requirements of the directive have to be fulfilled by all municipalities no matter what their size or population. But the population of a municipality is an indicator to the question what G2B services are needed since not all services are necessary for e.g. smaller cities. Thus, population size might influence the achievement of the objectives set by the Directive (reasons 1, 43, 46, 50, 52, 96, article 4, 5 of the directive).
Yearly GDP Growth Rate (1995-2005), PPP \$ Base 2000	OECD Regional Statistics, Small Regions (2005), retrieved 29 <sup>th</sup> of April 2009, OECD Regions at a Glance 2009 [OECD 2009]	The lower the growth rate, the better the quality of the G2B services since the growth rate shall be improved.	Weak economic regions should stimulate economic growth, because the goal of the Directive is to attain lasting economic growth in order to make the EU the most competitive and most dynamic economic area in the world by 2010. The growth rate is an indicator for measuring the objectives (reasons 2, 4 of the directive).
GDP per Capita, PPP \$ Base 2000	OECD Regional Statistics, Small Regions (2005), retrieved 10 <sup>th</sup> of April 2009, <a href="http://stats.oecd.org/OECDregionalstatistics/">http://stats.oecd.org/OECDregionalstatistics/</a>	The lower the GDP per capita, the better the quality of the G2B services since a low income shall be a reason to improve income per capita.	Weak economic regions should stimulate economic growth to improve the GDP per capita, because by implementing the Directive the quality of life and standard of living of the inhabitants should be comparably improved. The GDP per capita is an indicator for measuring the objectives (reasons 1, 36, 38 of the directive).
Unemployment Rate	OECD Regional Statistics, Small Regions (2005), retrieved 10 <sup>th</sup> of April 2009, <a href="http://stats.oecd.org/OECDregionalstatistics/">http://stats.oecd.org/OECDregionalstatistics/</a>	The higher the unemployment rate, the higher the G2B services since good G2B services support the creation of new jobs.	Cities with high unemployment rates should reduce bureaucracy for businesses and thereby giving a faster possibility for job creation. Through the Directive a more competitive service market in the European Union should be achieved which is important for the creation of jobs. The unemployment rate is an indicator for measuring the objectives (reasons 2, 4 of the directive).

*Table 5. Exogenous Variables used for Explanation of the Portals' Score*

We used the latest OECD data available. For some cities small regional statistics were not been available (especially for cities in Eastern European countries). Overall, our sample size for this statistical analysis was 54. We use regression analysis to verify the impact and significance of the exogenous variables. Since the quality score is limited to between 0 and 150, a normal linear model cannot be used because this would theoretically allow estimating values for the quality score to be less than zero or more than 150. For this reason we did two transformations. Firstly, we scaled the quality score to an interval from 0 to 1 in order to standardize the score. Secondly, we calculated the so-called

Logit (Johnston and Dinardo 1997, p. 424) of the standardized score in order to assure that all estimations of the standardized score remain within the interval 0-1. As a result, we calculated the following regression equation (only score for native language):

$$\ln\left(\frac{p_i}{1-p_i}\right) = \alpha(1) + \alpha(2) \cdot \text{Population}_i + \alpha(3) \cdot \text{GDPperCapita}_i + \alpha(4) \cdot \text{GDPGrowthRate}_i + \alpha(5) \cdot \text{UnemploymentRate}_i$$

Whereas  $p_i$  is the  $i$ -th standardized score. For interpretation reasons, we used the unit “100,000” for the population and the unit “1,000” for GDP per capita. Although theoretically not fully correct, we also calculated a normal linear model:

$$\text{Score}_i = \alpha(1) + \alpha(2) \cdot \text{Population}_i + \alpha(3) \cdot \text{GDPperCapita}_i + \alpha(4) \cdot \text{GDGrowthRate}_i + \alpha(5) \cdot \text{UnemploymentRate}_i$$

whereas Score  $i$  is the  $i$ -th absolute score of a city. Table 7 illustrates the results of both model tests. The coefficient of determination (R-squared) of 15% (logit model) resp. 19% (linear model) is not very high. Nevertheless we calculated a critical F-Probability of 0,082 resp. 0,027 for the complete regression (not shown in table 6). Thus, on a 91% resp. 97% confidence level the result can be considered to be significant. The score seems mainly to be determined by unspecific influences not expressed by regional economic indicators. Each city seems to have its own initiative independent from its environment. When looking at the significance of the variables one can see that only two are significant: the constant and the GDP growth rate (see row “Prob.”). Please bear in mind that a constant of 0 in the Logit model would mean a standardized score of 0.5 and an absolute score of 75. Thus, a constant of 0 would not mean that there is no constant influence as is usual in linear models. Because the constant is not easy to interpret in the Logit model we calculated the linear model as an aid.

LOGITS=C(1)+C(2)*POPULATION+C(3)*GDPPERCAPITA+C(4)*GDPGROWTHRATE+C(5)*UNEMPLOYMENTRATE					SCORE=C(1)+C(2)*POPULATION+C(3)*GDPPERCAPITA+C(4)*GDPGROWTHRATE+C(5)*UNEMPLOYMENTRATE				
	Coefficient	Std. Error	t-Statistic	Prob.		Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.859545	0.505862	-1.699168	0.0956	C(1)	48.87260	12.23583	3.994219	0.0002
C(2)	0.000531	0.013159	0.040365	0.9680	C(2)	0.040849	0.318288	0.128341	0.8984
C(3)	0.006195	0.008644	0.716709	0.4770	C(3)	0.123597	0.209084	0.591138	0.5571
C(4)	-0.160771	0.065534	-2.453245	0.0178	C(4)	-4.593006	1.585137	-2.897545	0.0056
C(5)	0.007169	0.028741	0.249443	0.8041	C(5)	0.266500	0.695193	0.383347	0.7031
R-squared	0.152121	Mean dependent var	-1.059112		R-squared	0.197570	Mean dependent var	42.22222	
Adjusted R-squared	0.082906	S.D. dependent var	0.772082		Adjusted R-squared	0.132065	S.D. dependent var	19.19676	
S.E. of regression	0.739385	Akaike info criterion	2.322025		S.E. of regression	17.88429	Akaike info criterion	8.693743	
Sum squared resid	26.78779	Schwarz criterion	2.506190		Sum squared resid	15672.54	Schwarz criterion	8.877909	
Log likelihood	-57.69466	Durbin-Watson stat	1.368759		Log likelihood	-229.7311	Durbin-Watson stat	1.428905	

Table 6. Results of the Logit (left) and the Linear Model (right),  $n=54$

The size of the city (population), the GDP per capita and the unemployment rates do not even have low significance. The significant constant has a value of -0.85 in the Logit model. Since this is a Logit value it needs to be retransformed. Retransformation results in an absolute score of 44.6 and fits well with the constant estimated in the linear model (48.9). This means that European cities exhibit a significant basis quality regarding the G2B portals. The significant GDP growth rate exhibits a negative sign. This means that the higher the growth rate, the worse the quality score of the G2B services. This is in line with our assumed influence. It seems to be that cities with lower economic power try to stimulate economic growth with better G2B services.

#### Hypothesis 2: High Quality Portals also provide a High Quality Portal in a Second Language (English)

The countries of Europe are not one country or nation but they all belong to a common market. One of the basic principles within the European Union is that the exchange of human capital, monetary capital, goods and services between member countries is not limited. But since people in European countries do not have a common language, English is used as a second language for communication.

As a result, G2B services and information need to be provided in the countries' native language and in English. In order to verify if portals with a high score in native language also have a high score in English language, we calculated a simple linear model as follows:

$$ScoreEnglish_i = \alpha(1) + \alpha(2) \cdot ScoreNative_i$$

To keep the analysis simple, we only calculated the linear model and did not run a logistic regression. English speaking countries have been omitted since they do not need to implement G2B services in a second language. The results of the computation for the model are displayed in Table 7.

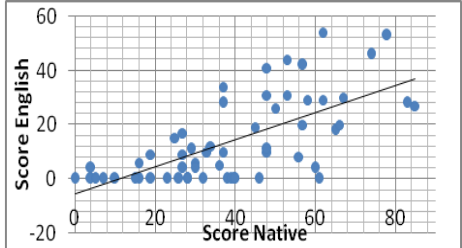
	Coeff	Std Err	t-Stat	P-Value	
$\alpha(1)$ Constant	-5.716	3.315	-1.724	0.090	
$\alpha(2)$ Score Native	0.503	0.074	6.755	9.495E-09	

Table 7. G2B Services in Native and English Language,  $n=57$

Obviously, the empirical data can confirm that portals with a high score in the native language also exhibit a high score in the English language since the slope (0.503) is highly significant. The estimation of the slope shows that one score in the native language results on average in a half score in the English language although many cities are widely spread around the fitted curve. The constant, being negative (-5.7) on a 90% confidence level, can be interpreted as follows: When cities begin with implementing G2B services they start in their native language. Minimum basis functionality is necessary in the native language before services can be implemented in English. According to the regression equation the implementation of English services starts when a score of about 11 ( $=5.7/0.5$ ) in the native language has been reached.

### Hypothesis 3: Portals with High Quality exhibit a High Maturity Level

According to the maturity model as described above a high score of G2B services does not necessarily result in a high maturity level. Maturity levels can only be achieved if specific criteria are met. If a portal implements all criteria except one in each maturity level the maturity level is considered to be 0. Let us consider how scores on each maturity level are distributed. Table 8 shows the distribution of the scores according to maturity levels achieved.

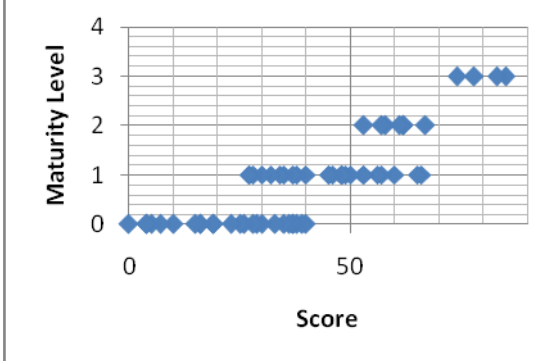
	M 0	M 1	M 2	M 3	
Min Score	0	27	53	74	
Max Score	40	66	67	85	
Average Score	22.84	44.15	60.00	80.00	
StDev Score	12.73	11.65	4.47	4.97	
Sub Sample Size	25	27	7	4	
95% Conf Level Scores					
Lower	-3.38	20.24	49.43	66.21	
Upper	49.06	68.06	70.57	93.79	
95% Conf Level Mean					
Lower	17.58	39.54	55.86	72.10	
Upper	28.10	48.76	64.14	87.90	

Table 8. Empirical Scores and Maturity Levels achieved,  $n=63$

The scatter plot shows the scores achieved by cities in each maturity level. Optically, portals with higher scores achieved a higher maturity level on average. This is also corroborated by the statistical results. The table shows the confidence levels of

- (1) The scores in each maturity level in a 95% confidence interval based on the t-distribution ( $\bar{x} \pm t_{1-0,025;n-1} \cdot \hat{s}$ ). As we can see, scores on a lower level can spread into the space of the next maturity level higher up. Scores overlap from one maturity level and the next maturity level higher up. That also supports the conclusion for our sample that a high score does not necessarily result in a high maturity level.
- (2) The means of the scores in each maturity level in a 95% confidence interval based on the t-distribution ( $\bar{x} \pm t_{1-0,025;n-1} \cdot \frac{\hat{s}}{\sqrt{n}}$ ). These confidence intervals do not overlap comparing the maturity levels. As a result, there is empirical evidence that portals with higher scores exhibit a significant higher maturity level on average.

## 4 Conclusion

We have provided an exploratory and comparative overview on the implementation of G2B e-services. Following the methodological approach of benchmarking, we have provided empirical results. The results show that improvements on all portals are possible since even the best portal only achieved around 60% of the out of 150 possible points. Also, G2B services provided in the second language English need to be improved. Our results also revealed that economic and structural indicator have only a limited influence on the quality of G2B services. The EU Services Directive seems to be stimulus for the municipalities, since the services directive needed to be implemented by the end of 2009. This assumption will be studied in further research. Moreover, our further research will focus on a comparative study between European, Asian and American capitals and large cities. Furthermore we aim to repeat our study in order to show the improvements made in the meantime when the directive has already been effective for a while.

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