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Citizen Satisfaction Survey Data: A Mode Comparison of the Derived Importance–Performance Approach

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Abstract

The purpose of this article is to provide evidence regarding the comparability of results provided by two survey methods—a random phone survey and a nonrandom online survey—using the derived importance–performance approach to examine service satisfaction data at the local level. Specifically, we measure whether nonprobability opt-in online survey results produce results that are convergent or divergent to random phone survey results. The findings show that the phone and online survey techniques yield divergent results when simple univariate statistical techniques are employed but produce similar results when the data are analyzed using the more advanced derived importance approach. Though preliminary, the findings suggest that recent advances in the analysis of satisfaction survey data might have the possibility to offset the methodological drawbacks of nonrandom survey techniques such as opt-in online questionnaires. Because of the cost and resource implications of the use of each survey technique, the results hold potentially important lessons for researchers and administrators interested in understanding the costs and benefits of using various survey methods to assess satisfaction with municipal services.

Keywords

public budgeting, derived importance, citizen satisfaction, survey methods, quadrant analysis

Introduction

Commonly, municipalities in the United States use surveys to gauge "customer" satisfaction with their services (Miller & Miller, 1991; Stipak, 1980). The surveys provide snapshots and baseline data about customer satisfaction to compare against benchmarks or as part of broader performance measurement efforts. To bolster the information that surveys can provide to elected officials and managers, the use of quadrant analysis—a technique developed to provide a more nuanced understanding of customer satisfaction data that heretofore has been used outside of the government

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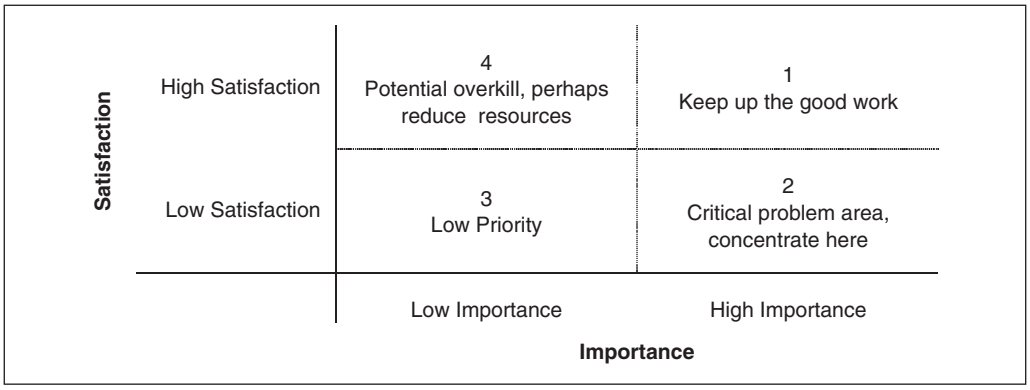


Figure 1. Importance–performance grid
Source: Table adapted from Van Ryzin and Immerwahr (2004).

services assessment context (e.g., Chu, 2002; Dodek, Heyland, Rocker, & Cook, 2004; Joppe, Martin, & Waalen, 2001; Matzler, Bailom, Hinterhuber, Renzl, & Pichler, 2004; Nitecki & Hernon, 2000)—has been encouraged (Miller & Kobayashi, 2000; Van Ryzin & Immerwahr, 2004). Quadrant analysis, rather than simply relying on descriptive statistics such as means and frequencies, examines respondents' satisfaction with a service in relation to the overall importance of the service. This approach to data analysis provides officials with more meaningful data for strategic decision making by providing a context in which to evaluate satisfaction with services.

Although the advantages of using quadrant analysis are almost self-evident, an important aspect of survey administration has been overlooked. Specifically, does the way in which a survey is offered to residents affect the outcomes of quadrant analysis? As there are numerous ways in which to administer satisfaction surveys, and because there are methodological implications of each approach (see Chang & Krosnick, 2009), this constitutes a significant gap in our understanding of the implications of various survey modes. The purpose of this article is to use quadrant analysis to compare the results of two identical surveys—one conducted through a random digit dial telephone survey and one conducted online with a nonrandom sample of respondents—to examine whether results might differ as a function of different survey modalities.

Quadrant Analysis

Quadrant analysis, also called importance–performance analysis, has become a fairly standard technique in the analysis of government satisfaction survey data (Miller & Kobayashi, 2000; Segal & Summers, 2002). The purpose of quadrant analysis is to provide more meaningful information to policy makers at the local level by examining individuals' satisfaction with services in relation to the amount of importance that they give to each service. To do this, the satisfaction and importance ratings of various services are placed on a grid. The grid is divided into four quadrants: high satisfaction/low importance; low satisfaction/low importance; high satisfaction/high importance; and low satisfaction/low importance. By placing the services in one of the four quadrants, local managers can begin to see where various services fall on the importance–performance matrix (see Figure 1).

To conduct such an analysis, it is, of course, necessary to know both the respondents' satisfaction with the service in conjunction with the importance of that same service to the individual. Ideally, both types of questions would be asked on the same survey so that the data are available. For example, using satisfaction with fire services to illustrate, with the stated importance approach, respondents would be asked "How important do you think fire services are?" In

addition, respondents would be asked, "How satisfied with fire services are you?" Responses to both of these questions would then be plotted on an *x*-axis and *y*-axis, respectively, to determine the place of fire services on the importance–performance grid. This technique would then be repeated for each of the services in question allowing for a large number of services to be arrayed on the grid.

However, it is not always the case that both importance and satisfaction data are available. To reduce the length of surveys either because of resource or practical limitations, it is common to simply omit the importance questions, particularly when the survey is focused on measuring resident satisfaction with services. Although such an omission would theoretically interfere with the ability to conduct a quadrant analysis, researchers have used derived importance rather than stated importance to analyze their data (Van Ryzin & Immerwahr, 2004, 2007). Derived importance is different from stated importance in that the importance of a service is determined by the statistical relationship between satisfaction with a service and some outcome variable such as overall satisfaction with local services. Again, using fire services to illustrate, respondents would be asked, "How satisfied with fire services are you?" Then, respondents would be asked, "Overall, how satisfied are you with city services?" To measure the derived importance, responses to the two questions would either be correlated or responses to the overall satisfaction question would be regressed on responses to the fire service satisfaction response. The resulting coefficient would serve as the measure of derived importance.

Therefore, the derived importance approach to importance–performance analysis has an important advantage over the stated importance approach: The derived importance method allows measurement of service importance without the need to ask a battery of questions about both the importance of and satisfaction with various services offered by a locale. Imagine that we were interested in the importance–performance of 20 local services. Using the stated importance method, we would need to ask 40 questions to complete our analysis. By using the derived importance approach instead, the length of the survey would be reduced substantially as none of the importance questions would need to be asked. Thus, by reducing survey length, the derived importance method can significantly reduce the cost of a survey, particularly in those cases where relatively costly random digit dial (RDD) phone surveys are used. In addition, the increased brevity of the survey can improve the quality of the data by improving survey response rates, potentially reduce the number of partial completes, and reduce response bias that might result from respondent fatigue.

An additional benefit of the derived importance method over the stated importance approach is significant from a methodological perspective. Van Ryzin and Immerwahr (2007) note that the stated importance approach has a number of drawbacks. For instance, many respondents do not necessarily know the importance of a service, yet will provide a response anyway. This could be a result of desirability bias where respondents are reluctant to look "imprudent or irrational" (Van Ryzin & Immerwahr, 2004, p. 147) or perhaps because many respondents take some services for granted. Fire protection, for example, is a service that Van Ryzin and Immerwahr note is especially likely to be given high satisfaction ratings. With such services as fire (and police), it is difficult to determine satisfied customers from unsatisfied customers because of the lack of variation in responses. Consequently, the mean score of the stated importance of fire services may not accurately reflect the importance of the service to citizens. In contrast to the stated importance method, then, the derived importance method provides an objective measure of the importance of a service.

RDD Telephone Sample Versus Nonrandom Online Sample

Though a significant body of literature regarding quadrant analysis has been developed, scholars have generally been slow to examine the mode effects that might impact the results of their

findings. For example, Van Ryzin and Immerwahr (2007) used a nonrandom national online sample of participants as a basis for an examination of quadrant analysis in the context of citizen satisfaction. In another study, however, Van Ryzin and Immerwahr (2004) used data derived from a probability-based sample of New Yorkers to study the applicability of quadrant analysis. Taking the two works together, the authors draw a number of conclusions about the ability of researchers to legitimately use quadrant analysis in their work. However, this approach is somewhat problematic because each generally ignores the implications of the survey methods used to collect each sample of data. In particular, the critical distinctions between data derived from a random telephone sample and a nonrandom online sample have largely been ignored. Modal issues in the context of citizen satisfaction and political choice have been explored to some extent (see James, 2009; Sanders, Clarke, Stewart, & Whiteley, 2006), but, in general, the topic has not been adequately studied.

Generalizability

Perhaps, the most critical difference between random phone surveys and nonrandom online surveys is the ability of researchers to generalize the data to the broader population (Malhorta & Krosnick, 2007). Theoretically, phone survey results derived from RDD sampling allow researchers to generalize findings—within a particular margin of error—to the broader population from which the sample was drawn because of the probability-based nature of the sampling techniques employed and the comprehensiveness of the frame from which the sample is derived (Groves et al., 2004). As a result, one can have confidence that the results of the survey accurately reflect the attitudes of the population of interest.[1]

In contrast, opt-in Internet surveys detract from researchers' ability to generalize survey results to the larger population because of the nonsystematic way in which the sample is drawn (Chang & Krosnick, 2009). Rather than a random selection of respondents, participants to opt-in online surveys typically choose to participate, even in those cases where survey panelists are used; this may lead to participation by respondents who have more intense attitudes regarding an issue (Postoaca, 2006). Of course, there are numerous methods with which to invite potential participants to take an Internet survey,[2] there is no comprehensive frame yet developed that matches the scope and quality of sampling frames used for phone surveys (Couper, 2000), thus there are numerous issues related to nonresponse bias (Groves et al., 2004). Therefore, although Internet surveys can, in fact, yield important information for researchers, the generalizability of the results cannot be ensured (Malhorta & Krosnick, 2007).

Response Effects

Phone and Internet surveys also produce distinct experiences for survey respondents, thus leading to potential effects on the survey responses provided by participants. Chang and Krosnick (2009) discuss the advantages of phone surveys over Internet surveys and vice versa. Drawing on the extant literature, Chang and Krosnick note that the presence of interviewers in telephone surveys, who can provide feedback to respondents, more effectively engages the respondent in relation to online surveys (Chartrand & Bargh, 1999; Neumann & Strack, 2000). In addition, the presence of live interviewers can increase the accountability of responses such that responses to questions may become more accurate and precise (Lerner & Tetlock, 1999). Finally, Chang and Krosnick tell us that telephone surveys provide access to participants who may not have the literacy levels necessary to complete a survey online.

Discussing the advantages of Internet surveys over phone surveys, Chang and Krosnick (2009) note that the presence of human interviewers might also have disadvantages. Specifically, the presence of interviewers might produce social desirability effects (Kiecker & Nelson, 1996),

particularly when surveys concern sensitive issues (Tournageau & Smith, 1996). Also, poorly trained interviewers or interviewers who are not particularly good at their job might provide inappropriate cues to respondents (van der Zouwen, Dijkstra, & Smit, 1991) or might change the wording or questions (Lyberg & Kasprzyk, 1991). Finally, Internet surveys are advantageous because they allow the respondent to complete the survey at a convenient time and at a pace that is comfortable for the respondent (Chang & Krosnick, 2009).

Survey Costs

The cost of implementing RDD telephone surveys can be prohibitive, especially in times when local governments are faced with challenging fiscal situations. As an alternative, local governments can choose to use less expensive methods such as opt-in online surveys. As there is a wide variety of online survey software available, and because local governmental entities can implement the survey on their own, online surveys that do not rely on probability samples cost a fraction of the price of an RDD phone sample and are commonly less expensive than mail surveys (Couper, 2000). There are, of course, probability samples available for online surveys, but again, such methods are relatively expensive in relation to nonrandom surveys.

In sum, there are clear tradeoffs involved in the survey methods that local governments choose to employ when administering a citizen satisfaction survey. Specifically, the use of nonrandom online surveys diminishes the ability to generalize the results of the survey because of the nonprobability-based nature of the sampling method. At the same time, the use of opt-in online surveys increases the convenience for survey respondents and lowers the costs for the governmental entity sponsoring the survey.

Research Questions

Drawing on the literature reviewed above, we identified three research questions to explore the distinctions between using random phone surveys and nonrandom online surveys in the realm of quadrant analysis:

Research Question 1: Are there significant differences between the phone and online samples in terms of respondents' satisfaction with services?
Research Question 2: Using the derived importance method, are there differences between the phone and online samples in terms of the importance that respondents give to various services?
Research Question 3: Using quadrant analysis, do we observe substantial differences in the importance–performance ratings between the phone and the online samples?

Based on our knowledge of the methodological implications of using phone and Internet surveys, we expect there will be significant differences between the responses provided by the two samples. Specifically, because of the nonrandom nature of the Internet survey and the possible interviewer effects that accompany the phone survey, we can expect that respondents to the two different survey modes will provide divergent responses in terms of their satisfaction with city services and the derived importance of each of the services. However, we will not provide a directional hypothesis as to whether the phone and Internet samples differ.

We are less confident hypothesizing differences between the two samples when examined through the derived importance–performance framework. The insufficiency of the research comparing phone and Internet respondents in this context limits our ability to state a hypothesis concerning potential differences between the two samples. Thus, we take a largely exploratory approach to this particular research question.

Data

The data for this analysis were gathered as part of a public input effort in a moderately sized city in the Great Plains/Midwest region. The data collection effort included both an RDD telephone sample and a nonrandom online survey. The telephone survey was conducted over the course of a week, and 607 respondents took part in the survey. The online survey was hosted on the city's website and was available for 4 weeks. The online survey was publicized and city residents were encouraged to participate through a public outreach effort put forth by the mayor's office. In particular, the mayor held several press conferences alerting city residents of the survey and encouraging them to take it. Furthermore, the survey was discussed in the local newspaper in a weekly column by a beat writer that covers local government and politics in the city. As a result, the online survey was most likely to be publicized to individuals who pay attention to local politics in general and those who read the weekly columns covering city government in general. In total, 1,024 residents took the online survey. The demographics for both samples are presented in Table 1. As the table shows, the demographics of our survey respondents are statistically different by gender, age, race/ethnicity, and education. In general, the online survey respondents are more likely to be male, younger, less racially diverse, and more highly educated than the phone survey respondents. Clearly, the two survey modes are drawing on distinct samples of residents.

Analysis

Satisfaction

We begin our analysis by examining the mean satisfaction ratings that residents provided on 24 questions regarding city services. The services used in this analysis were identified by the city in two ways: (a) services were identified where the city had no performance indicators at their disposal and therefore needed public input to serve as a performance measure and (b) the city chose to ask questions about city services that had been asked about in previous surveys. In addition to questions regarding city services, a number of other questions about the quality of life in the city were asked.[3] All questions were asked on a 1-5 scale with 1 representing *very dissatisfied* and 5 representing *very satisfied*. Table 2 provides the descriptive statistics as well as the results of the analysis of variance to test for significant differences between the satisfaction levels indicated by phone and online respondents. As Table 2 shows, the telephone respondents are significantly more satisfied with each of the 24 services than the online respondents. Although it is not clear what is driving the significant differences between the groups, the literature points to a number of possibilities.

First, it is quite possible that two survey methods attracted respondents with distinct attitudes. We already know that the survey respondents are demographically different. It might be the case that respondent attitudes are highly correlated with their demographic characteristics, thus driving the divergent responses toward the satisfaction questions that we observe. In this case, it appears that the online survey attracted survey respondents who were relatively pessimistic toward the services offered by the city; this finding is not surprising as individuals with a particular interest in a subject are more likely to volunteer to participate in a study about it (Postoaca, 2006). Second, the significant differences could also be driven by an interviewer effect. That is, phone survey respondents might have been more likely to provide positive feedback regarding satisfaction with services when interacting with another individual on the telephone. Online survey respondents, in contrast, were perhaps more likely to state dissatisfaction with services as there may be less pressure to provide socially desirable responses to the questions. Nonetheless, although the mean ratings of each of the services is significantly lower for the online survey participants, the rankings of mean support are fairly consistent across the two groups. That is,

Table 1. Demographics: Online Sample and Phone Sample Comparison

	Survey mode			
	Phone	Online	Total	Chi-square
Gender				
Male	50.1%	57.3%	54.5%	$\chi^2 = (1, n = 1{,}590) = 7.827, p = .005$
Female	49.9%	42.7%	45.5%	
n	607	983	1,590	
Age				
20-24	2.0%	2.7%	2.4%	$\chi^2 = (6, n = 1{,}574) = 69.637, p < .000$
25-34	8.4%	18.5%	14.6%	
35-44	14.0%	17.7%	16.3%	
45-54	23.2%	22.2%	22.6%	
55-64	29.2%	25.9%	27.1%	
65-74	13.8%	10.5%	11.8%	
75 and above	9.4%	2.5%	5.1%	
n	607	967	1,574	
Race/ethnicity				
American Indian/Alaskan Native	1.3%	0.3%	0.7%	$\chi^2 = (6, n = 1{,}563) = 26.996, p < .000$
Asian	1.5%	0.1%	0.6%	
Black or African American	0.7%	0.3%	0.4%	
Hispanic/Latino	1.7%	0.8%	1.2%	
Native Hawaiian/Pacific Islander	0.5%	0.1%	0.3%	
Other	3.3%	1.9%	2.4%	
White	91.0%	96.5%	94.4%	
n	598	965	1,563	
Education				
Less than high school	0.7%	0.2%	0.4%	$\chi^2 = (7, n = 1{,}586) = 46.589, p < .000$
Some high school	0.8%	0.4%	0.6%	
High school diploma	14.4%	6.4%	9.5%	
Some college	17.4%	18.6%	18.1%	
2-year college or technical degree	14.7%	14.2%	14.4%	
4-year college degree	24.6%	24.6%	24.6%	
Some graduate school	4.6%	10.9%	8.5%	
Advanced degree	22.8%	24.8%	24.0%	
n	605	981	1,586	

both the phone and online survey groups tended to indicate satisfaction with services similarly when the services are ranked based on their means. For example, "overall quality of libraries" was the highest ranked service for the phone survey respondents ($M = 4.25$, $SD = .619$) and was also the highest ranked service for the online survey group ($M = 4.09$, $SD = .767$). Furthermore, the mean service satisfaction scores for the two survey groups were correlated at .972 ($p < .001$).

Derived Importance

To obtain a measure of derived importance, reported levels of satisfaction with city services are correlated with responses to a number of outcome variables of particular interest to the city.[4] In

particular, we use three separate measures to determine derived importance. By using three separate measures, we have the ability to conduct multiple tests of our research questions and, as a result, are able to generate more reliable conclusions to Research Question 3. The descriptive statistics of each of the outcome variables and the statistical tests for differences between the two samples are provided in Table 2. The first two outcome variables are questions regarding respondents' overall satisfaction with city services and perceived value for tax dollars. The third outcome variable is a scale developed from five questions pertaining to respondents' trust and confidence in city government. The specific wording of each of the questions is listed in the left hand column. As Table 3 shows, there are again statistically significant differences between the samples on each of the three outcome variables, with the online sample again appearing to be less positive in its assessment of city government.

We now move to developing our measures of derived importance. The first measure of derived importance is measured by correlating the 24 service satisfaction questions with the question regarding overall satisfaction with the job that the city is doing. The second measure is obtained by correlating the 24 service satisfaction questions with a question regarding the value that respondents perceive they receive from city government. The third measure is a correlation between the 24 satisfaction questions and a set of questions regarding trust and confidence in city government. To begin to see the relationships between the derived importance measures produced by the phone and online samples, we correlate the correlations from each. This simple approach provides a preliminary analysis of the relationship of the scores that each method produces. As Table 4 indicates, there are strong, significant correlations between the derived importance measures obtained from each method.

Derived Importance–Performance Analysis

Now that the service satisfaction ratings and the derived importance measures have been obtained, we can determine the importance–performance measure for each of the 24 city services and compare the results of the phone and the online samples. Recall that the grid is based on the importance of, and satisfaction with, each of the 24 services; Figure 1 illustrates the significance of each quadrant. It is important to note that rather than using raw mean scores for our measures of satisfaction and correlations for our measures of derived importance, we follow convention (Van Ryzin & Immerwahr, 2004, 2007) and transform both the mean scores and the correlation coefficients into a Percent to Maximum (PTM) Scale. This scaling technique essentially ranks the magnitude of the means and the strength of the correlation coefficients on a 0-1 scale, thus allowing us to plot both the *x*- and *y*-axes on a 0-1 scale and simplifying the interpretation of the results.[5] It is also important to note that the cutpoints to determine the placement of the quadrants are all determined by taking the mean of the PTM scores for the derived importance scores (*x*-axis) and the satisfaction scores (*y*-axis). Graphical representations of each of the quadrant analyses are presented in the appendix.

Table 5 presents the results of the first analysis, where respondents' rating of the overall performance of city government was used to develop our measure of derived importance. As Table 5 shows, the results of the quadrant analysis are fairly similar between the phone and online samples as 16 of the 24 (67%) services fall into same quadrant with each sample. On five of the eight services where there is disagreement among the two samples, we see that the disagreement between the services is driven by those that fall into Quadrant 1 (high importance/high satisfaction) in one sample and Quadrant 4 (low importance/high satisfaction) in the other, or vice versa. These services include health department services, management of sewage and storm water, overall quality of parks, recreational opportunities, and the cleanliness of the city.

Table 2. Mean Satisfaction Scores on City Services: Random Phone Sample and Nonrandom Online Sample

	Phone survey			Online survey				
	N	*M*	*SD*	*N*	*M*	*SD*	*F*	Significance
Availability of affordable quality housing	587	3.68	0.867	1,011	3.37	0.965	41.488	.000
Building safety permits and inspections	558	3.42	0.846	1,007	3.06	0.858	64.313	.000
City recycling and sustainability efforts	600	3.72	0.964	1,016	3.31	1.026	62.261	.000
Community spirit of Lincoln's people	604	4.14	0.774	1,010	3.56	0.951	159.182	.000
Ease of bike travel in the city	563	3.95	0.861	1,011	3.53	0.977	72.137	.000
Ease of bus travel in the city	518	3.18	0.971	1,008	2.72	0.934	80.439	.000
Ease of car travel in the city	605	3.49	1.071	1,018	2.94	1.210	85.893	.000
Employment opportunities	578	3.25	1.004	1,011	2.81	1.032	66.947	.000
Fire and ambulance services	598	4.09	0.723	1,018	3.81	0.913	40.406	.000
Health department services	572	3.72	0.813	1,008	3.39	0.843	58.311	.000
Job creation and economic development	588	3.02	0.976	1,019	2.68	1.019	44.010	.000
Management of sewage and storm water	584	3.87	0.686	1,017	3.68	0.781	23.674	.000
Overall natural environment	603	4.12	0.631	1,009	3.66	0.819	140.560	.000
Overall quality of libraries	488	4.35	0.619	824	4.09	0.767	39.629	.000
Overall quality of life in the city	607	4.25	0.695	1,014	3.81	0.911	103.077	.000
Overall quality of parks	603	4.10	0.697	1,002	3.72	0.878	81.835	.000
Recreational opportunities	600	3.89	0.908	1,016	3.52	1.004	53.445	.000
Snowplowing of city streets	601	3.42	1.056	1,024	3.00	1.319	44.012	.000
Street maintenance	607	3.17	1.064	1,009	2.51	1.130	135.122	.000
The cleanliness of the city	607	4.15	0.653	1,019	3.69	0.887	124.932	.000
The number of unsightly or blighted properties in the city	586	3.15	0.986	1,017	2.72	0.971	69.855	.000
The overall appearance of the city	606	4.10	0.659	1,015	3.57	0.883	158.622	.000
The safety and security of the city	605	4.07	0.763	1,017	3.82	0.916	32.257	.000
Zoning and growth planning	585	3.25	0.946	1,021	2.76	1.005	91.395	.000

Note: All questions were asked on a 1-5 scale with "1" being *very dissatisfied* and "5" being *very satisfied*. One-way analysis of variance was used to determine whether there were statistically significant differences between the satisfaction levels reported by the two samples. The results of those tests are presented in the far right columns.

A discrepancy that is of concern is one between those services that fall into Quadrant 2 (high importance/low satisfaction) in one analysis but not the other because Quadrant 2 is considered the "critical" area where managers should focus their attention. In Table 5, availability of affordable housing, ease of car travel in the city, and possibly snowplowing of city streets would be the services where we would be less confident that the two samples are producing similar results. However, we do see that employment opportunities, job creation and economic development, street maintenance, and zoning and growth planning all consistently fall into the critical region, thus providing confidence about the findings placing these services in Quadrant 2. Because of these discrepancies, it is important to understand the extent to which the importance–performance approach provides convergent results between the phone and online samples.

Table 3. Derived Importance Outcome Variables

	Phone survey			Online survey				
	N	*M*	*SD*	*N*	*M*	*SD*	*F*	Significance
Overall, how would you rate the performance of Lincoln city government?[a]	604	2.64	0.933	988	2.51	1.023	6.561	.011
I receive good value for my city government tax dollars[b]	601	3.16	1.031	991	2.94	1.215	13.535	.000
Trust and Confidence Scale[c]	607	3.12	0.802	997	2.63	0.945	113.508	.000
I have great confidence in Lincoln city government	601	3.17	0.973	991	2.63	1.121	93.391	.000
Lincoln city government can usually be trusted to make decisions that are right for residents as a whole	604	3.14	1.013	991	2.66	1.139	74.590	.000
Lincoln city government officials treat residents with respect	597	3.59	0.838	996	3.12	1.083	82.204	.000
Lincoln city government officials base their decisions on the facts, not their personal interests	597	2.92	1.013	996	2.48	1.077	66.797	.000
The city treats all neighborhoods and areas of town fairly and equally	592	2.79	1.057	992	2.27	1.088	85.662	.000

Note: The Trust and Confidence Scale was developed by averaging the scores to five questions at the bottom of this table. The five questions have a high level of reliability with a Cronbach's $\alpha = .91$.
a. Question response options ranged from 1-5, with 1 being *poor* and 5 being *excellent.*
b. Question response options ranged from 1-5, with 1 being *strongly disagree* and 5 being *strongly agree.*
c. Question response options ranged from 1-5, with 1 being *strongly disagree* and 5 being *strongly agree.*

To do this, a McNemar test for association was conducted. The McNemar test for symmetry tests for significant differences between related samples on a dichotomous dependent variable, and the test is reliable enough to be used with small samples of data (Sheskin, 1997). To apply this technique, we took the data from the quadrant analysis in Table 4 to measure the extent to which the importance–performance approach classified each service in Quadrants 4 and 2. We chose to examine the consistency between the methods in placing services into these two quadrants for two reasons. First, as the placement of services into Quadrant 4 suggests an overutilization of resources, it is beneficial to understand how the importance–performance approach places the services derived from different methods into various quadrants. Second, because Quadrant 2 is the "critical area," it is important to determine whether there is divergence in the likelihood of services being placed in this quadrant. As the results of the McNemar test show, the two methods did not significantly differ in the placement of services in Quadrant 4 ($p = .5$). In addition, the McNemar test yields no significance difference in the proportions with which services are placed into Quadrant 2 ($p = .75$). The nonsignificant results of these analyses suggest that there are no systematic differences when the derived importance–performance approach is applied to data from the phone and online samples.

Applying the same approach to the derived importance data developed from the question regarding receiving value for tax dollars, we see somewhat different results in terms of the proportion of services that fall into the same quadrants when delineated by survey type (Table 6). Using this question to determine each service's place in the grid produces only a 46% (11 out of 24) agreement rate. However, once again we see that the relatively high disagreement rate between the services is driven by those that shift between Quadrant 1 and Quadrant 4. This shift is responsible for 9 of the 13 services where there is no concordance between the quadrants. The

Table 4. Derived Importance: Correlations Between Satisfaction With City Services and Outcome Variables

	Overall, how would you rate the performance of Lincoln city government?		I receive good value for my city government tax dollars.		Trust and Confidence Scale	
	Phone	Online	Phone	Online	Phone	Online
Availability of affordable quality housing	.288	.287	.267	.290	.265	.330
Building safety permits and inspections	.243	.362	.277	.317	.283	.368
City recycling and sustainability efforts	.191	.250	.198	.230	.225	.265
Community spirit of Lincoln's people	.309	.389	.276	.332	.315	.398
Ease of bike travel in the city	.153	.250	.158	.232	.211	.229
Ease of bus travel in the city	.193	.184	.088	.061	.250	.201
Ease of car travel in the city	.246	.421	.201	.444	.286	.399
Employment opportunities	.337	.442	.305	.371	.384	.456
Fire and ambulance services	.221	.320	.199	.347	.245	.272
Health department services	.238	.369	.233	.338	.300	.369
Job creation and economic development	.391	.488	.389	.431	.486	.507
Management of sewage and storm water	.286	.303	.262	.289	.321	.297
Overall natural environment	.312	.377	.254	.336	.312	.355
Overall quality of libraries	.253	.305	.238	.287	.224	.284
Overall quality of life in the city	.368	.515	.314	.470	.354	.509
Overall quality of parks	.332	.356	.290	.336	.335	.374
Recreational opportunities	.264	.382	.274	.330	.326	.382
The safety and security of the city	.303	.422	.237	.429	.302	.420
Snowplowing of city streets	.320	.367	.255	.414	.344	.357
Street maintenance	.335	.443	.323	.464	.404	.433
The cleanliness of the city	.223	.400	.195	.357	.233	.385
The number of unsightly or blighted properties in the city	.234	.286	.209	.243	.284	.285
The overall appearance of the city	.293	.380	.245	.332	.301	.377
Zoning and growth planning	.388	.511	.328	.434	.474	.529
Correlation of correlations	.801**		.717**		.820**	

**$p < .001$.

Table 5. Quadrant Analysis: Phone Sample and Online Sample Comparison Using Overall Satisfaction With City Services as Determinant of Derived Importance

	Quadrant			Quadrant	
	Phone	Online		Phone	Online
1. Availability of affordable quality housing	1/2	4	13. Overall natural environment	1	1
2. Building safety permits and inspections	3	3	14. Overall quality of libraries	4	4
3. City recycling and sustainability efforts	4	3	15. Overall quality of life in the city	1	1
4. Community spirit of Lincoln's people	1	1	16. Overall quality of parks	1	4
5. Ease of bike travel in the city	4	4	17. Recreational opportunities	4	1
6. Ease of bus travel in the city	3	3	18. Snowplowing of city streets	2	2/3
7. Ease of car travel in the city	3	2	19. Street maintenance	2	2
8. Employment opportunities	2	2	20. The cleanliness of the city	4	1
9. Fire and ambulance services	4	4	21. The number of unsightly or blighted properties in the city	3	3
10. Health department services	4	1	22. The overall appearance of the city	1	1
11. Job creation and economic development	2	2	23. The safety and security of the city	1	1
12. Management of sewage and storm water	1	4	24. Zoning and growth planning	2	2

Note: McNemar Test of Association—Placement of service into Quadrant 4: Phone 29.2%, Online 25%, $p = .5$ (one-tailed); Placement of services into Quadrant 2: Phone 25%, Online 25%, $p = .75$ (one-tailed).

McNemar test for association is applied to these data; once again, there are no significant differences between phone and online samples when placing services into Quadrant 4 ($p = .29$), nor are there differences when placing services into Quadrant 2 ($p = .5$).

The final analysis is conducted using the importance data based on correlations with the Trust and Confidence Scale. The results of this analysis are presented in Table 7. As the table shows, there again is moderate agreement among the samples in terms of the quadrants in which the 24 fall: 14 out of 24 services (58%) fall into concurrent quadrants. Again, the largest source of disagreement is the shift of services between Quadrants 1 and 4. Again, there is some movement among those services that fall into the critical region of Quadrant 2. Nonetheless, the McNemar test shows that there are no significant differences in the placement of services into Quadrants 2 and 4 when the derived importance–performance measure is used.

Discussion

The results of our analysis allow us to address each of our research questions posed above. Demographically, the phone and Internet samples used in this analysis are distinct. Also, the means tests presented in Tables 2 and 3 above show that there are, indeed, clear and significant differences in the attitudes of the phone survey participants and the online survey participants.

Table 6. Quadrant Analysis: Phone Sample and Online Sample Comparison Using Overall Value of Tax Dollars as Determinant of Derived Importance

	Quadrant			Quadrant	
	Phone	Online		Phone	Online
1. Availability of affordable quality housing	1/2	4	13. Overall natural environment	1	4
2. Building safety permits and inspections	2	3	14. Overall quality of libraries	1/4	4
3. City recycling and sustainability efforts	4	3	15. Overall quality of life in the city	1	1
4. Community spirit of Lincoln's people	1	4	16. Overall quality of parks	1	4
5. Ease of bike travel in the city	4	4	17. Recreational opportunities	1	4
6. Ease of bus travel in the city	3	3	18. Snowplowing of city streets	2	2
7. Ease of car travel in the city	3	2	19. Street maintenance	2	2
8. Employment opportunities	2	2	20. The cleanliness of the city	4	1
9. Fire and ambulance services	4	1	21. The number of unsightly or blighted properties in the city	3	3
10. Health department services	4	1/4	22. The overall appearance of the city	1	4
11. Job creation and economic development	2	2	23. The safety and security of the city	4	1
12. Management of sewage and storm water	1	4	24. Zoning and growth planning	2	2

Note: McNemar Test of Association—Placement of service into Quadrant 4: Phone 25%, Online 37.5%, $p = .29$ (one-tailed); Placement of services into Quadrant 2: Phone 29.2%, Online 25%, $p = .5$ (one-tailed).

Likewise, there are significant differences between the two samples on each of the three outcome variables we used to compute our measure of derived importance. In every case we observed, the online sample was less satisfied with city government services, less satisfied with the overall service provided by the city, less likely to agree that they receive value for their tax dollar, and had less trust and confidence in city government. Thus, to answer Research Question 1, it is clear that there are significant differences when simple univariate measures are used. Although the reasons underlying the sample differences do not need to be rehashed here, we can suppose that they are based on selection bias, interviewer effects, or some combination of these two factors along with numbers of other factors.

In contrast to the considerable differences between the two samples we see when examining demographics and simple mean scores, however, the three derived importance–performance analyses conducted here provide evidence that quadrant analysis can be used to obtain citizen satisfaction results that are similar regardless of whether a random phone survey or nonrandom online survey is used. Specifically, we found that there were significant correlations between the derived importance measures that were obtained from the phone and online samples separately. Therefore, we are able to address Research Question 2 by saying that the derived importance approach does appear to produce fairly similar results when applied to both online and phone survey data.

Finally, to address Research Question 3, we examine the extent to which the derived importance–performance method classifies services in the same quadrants of the grid. In total, there is a 59%

Table 7. Quadrant Analysis: Phone Sample and Online Sample Comparison Using Trust and Confidence as Determinant of Derived Importance

	Quadrant			Quadrant	
	Phone	Online		Phone	Online
1. Availability of affordable quality housing	3	4	13. Overall natural environment	1	4
2. Building safety permits and inspections	3	2	14. Overall quality of libraries	4	4
3. City recycling and sustainability efforts	3	3	15. Overall quality of life in the city	1	1
4. Community spirit of Lincoln's people	1	1	16. Overall quality of parks	1	1
5. Ease of bike travel in the city	4	4	17. Recreational opportunities	1	1
6. Ease of bus travel in the city	3	3	18. Snowplowing of city streets	2	3
7. Ease of car travel in the city	3	2	19. Street maintenance	2	2
8. Employment opportunities	2	2	20. The cleanliness of the city	4	1
9. Fire and ambulance services	4	4	21. The number of unsightly or blighted properties in the city	3	3
10. Health department services	3	1	22. The overall appearance of the city	4	1
11. Job creation and economic development	2	2	23. The safety and security of the city	4	1
12. Management of sewage and storm water	1	4	24. Zoning and growth planning	2	2

Note: McNemar Test of Association—Placement of service into Quadrant 4: Phone 25%, Online 25%, $p = .65$ one-tailed); Placement of services into Quadrant 2: Phone 20.1%, Online 25%, $p = .5$ (one-tailed).

agreement rate (41 out of 72) between the two survey methods in terms of placing services in concurrent quadrants. Although the 59% agreement rate may not seem to be a high one, we must keep in mind that much of the disagreement between the two methods was due to services that were classified as either falling into Quadrant 1 or Quadrant 4, both of which represent high levels of satisfaction but varying levels of importance to the respondent. In addition, we saw relatively stable results in the most critical region of the grid—Quadrant 2—with few services falling into the critical region using one survey method but not the other. To test the statistical relationship of the agreement between the results of the phone and online samples, we conducted McNemar tests of association. As each of the tests showed, there were no significant differences in the placement of services in Quadrants 2 and 4—the two quadrants considered the most important because of their implications for resource allocation. Therefore, we argue the two methods are only slightly-to-moderately likely to classify a service as "critical" using data from one sample but not the other.

As such, the results of this analysis provide evidence that online surveys relying on opt-in participation can produce fairly similar results as random phone surveys when quadrant analysis is used. This finding has implications for individuals or firms tasked with communicating citizen satisfaction data to policy makers and the public. Specifically, because point estimates are more likely to be biased when opt-in survey techniques are used, quadrant analysis allows analysts to present the results of online surveys with more confidence that the results of an opt-in online

survey are not necessarily biased due to the nonrandom nature of the participant selection method. Of course, analysts will need to be forthcoming about the weaknesses of the opt-in online survey approach, but quadrant analysis can at least provide some context with which to understand the results of the survey data.

Limitations

There are two primary limitations to our study. First, because the surveys being used in this study were developed for the purposes of informing the operations of a city government, respondents were asked about those services on which the city specifically wanted information about satisfaction or were those where the city wanted satisfaction data to serve as performance measures. Furthermore, a number of the services in the study are not actually services at all (e.g., "environmental quality") but are rather the outcomes of a number of services provided by the city. Thus, the services analyzed in this study limited our ability to examine a wider swath of services or to delve more deeply into specific service area; however, we were bound by the practicalities of the data needs of the city. Second, and related to the first point, the services that are included in the analysis therefore drive the results of the quadrant analysis as services are arrayed on the grid in an ordered nature across satisfaction and derived importance. Obviously, if some city services were added to the analysis and others were dropped, the results of quadrant analysis would change. Future studies in this area of research should strive to better understand how the selection of services might impact the results of quadrant analysis.

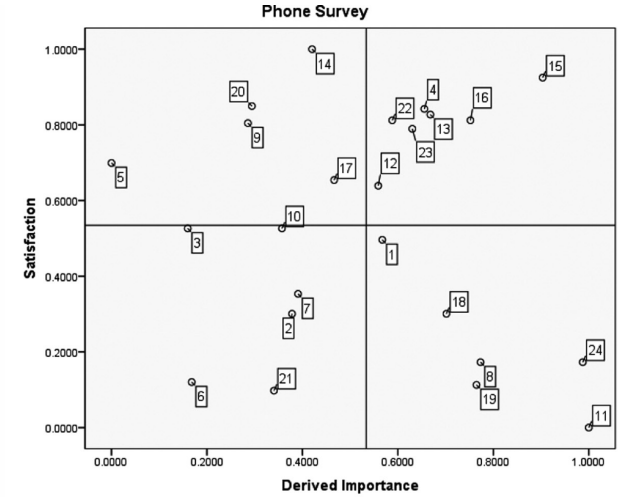
Conclusion

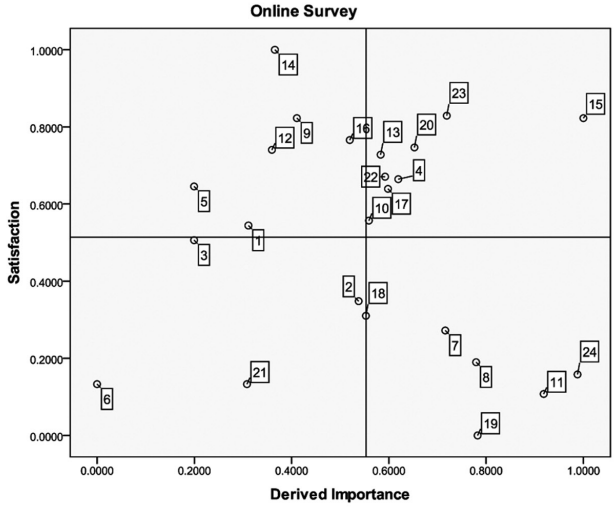
The results presented here provide preliminary evidence regarding the applicability of quadrant analysis to data collected through two distinct means. Clearly, the phone and online surveys produced considerably different results when we simply examined the mean satisfaction scores of the two samples. However, using quadrant analysis, we saw relatively similar and stable results when we analyzed the data. The results suggest that quadrant analysis and other simple, yet meaningful, multivariate techniques can be applied to satisfaction data collected through various means. Although this finding has very real implications for survey researchers, it is not surprising as we know from previous research that point estimates tend to be less stable and reliable in relation to estimates based on multivariate techniques, particularly in the context of citizen satisfaction data (Van Ryzin & Immerwahr, 2007).

The preliminary nature of our findings prevent us from making any sweeping generalizations about our results, though we feel that the data presented here provide a starting point from which to replicate and retest such findings. In addition, we believe the results contained within this article can help contribute to researchers' understanding of the apparently distinct nature of phone survey respondents and online survey respondents when they are posed questions about their satisfaction with local city services. Finally, we return to the issue of costs in the context of measuring residents' satisfaction with local services: If cost is no objective, then perhaps the online survey should be avoided and the RDD telephone survey should be used. However, if costs matter, then we do not think there is a reason to eschew online surveys. Of course, RDD surveys may have more credibility because of the resulting ability to generalize results, but online surveys open up the survey to more residents and allow for greater participation in public input processes. Though it provides no conclusive recommendation regarding the use of RDD phone surveys or nonrandom online surveys, this research contributes to the general understanding of satisfaction surveys as they are employed at the local governmental level and provides some guidance for officials charged with choosing among survey modalities. In addition, we hope this work stimulates other researchers to conduct similar inquiries as local governmental units increasingly make use of the Internet to engage the public.

Appendix

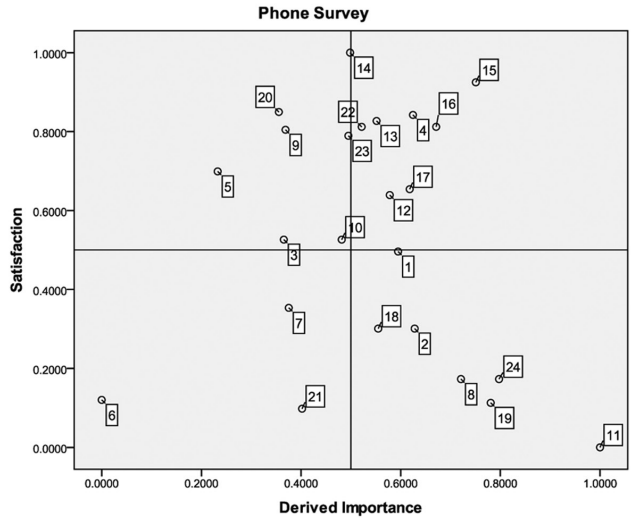
Quadrant Analysis: Phone Sample and Online Sample Comparison Using Overall Satisfaction With City Services as Determinant of Derived Importance

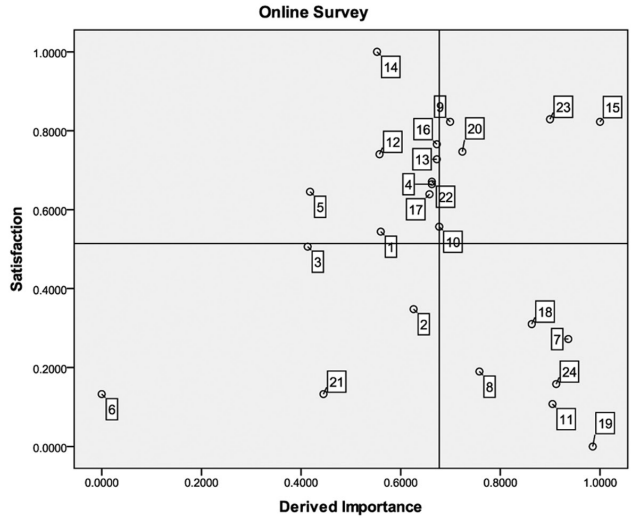




1. Availability of affordable quality housing
2. Building safety permits and inspections
3. City recycling and sustainability efforts
4. Community spirit of Lincoln's people
5. Ease of bike travel in the city
6. Ease of bus travel in the city
7. Ease of car travel in the city
8. Employment opportunities
9. Fire and ambulance services
10. Health department services
11. Job creation and economic development
12. Management of sewage and storm water
13. Overall natural environment
14. Overall quality of libraries
15. Overall quality of life in the city
16. Overall quality of parks
17. Recreational opportunities
18. Snowplowing of city streets
19. Street maintenance
20. The cleanliness of the city
21. The number of unsightly or blighted properties in the city
22. The overall appearance of the city
23. The safety and security of the city
24. Zoning and growth planning

Quadrant Analysis: Phone Sample and Online Sample Comparison Using Overall Value of Tax Dollars as Determinant of Derived Importance





1. Availability of affordable quality housing
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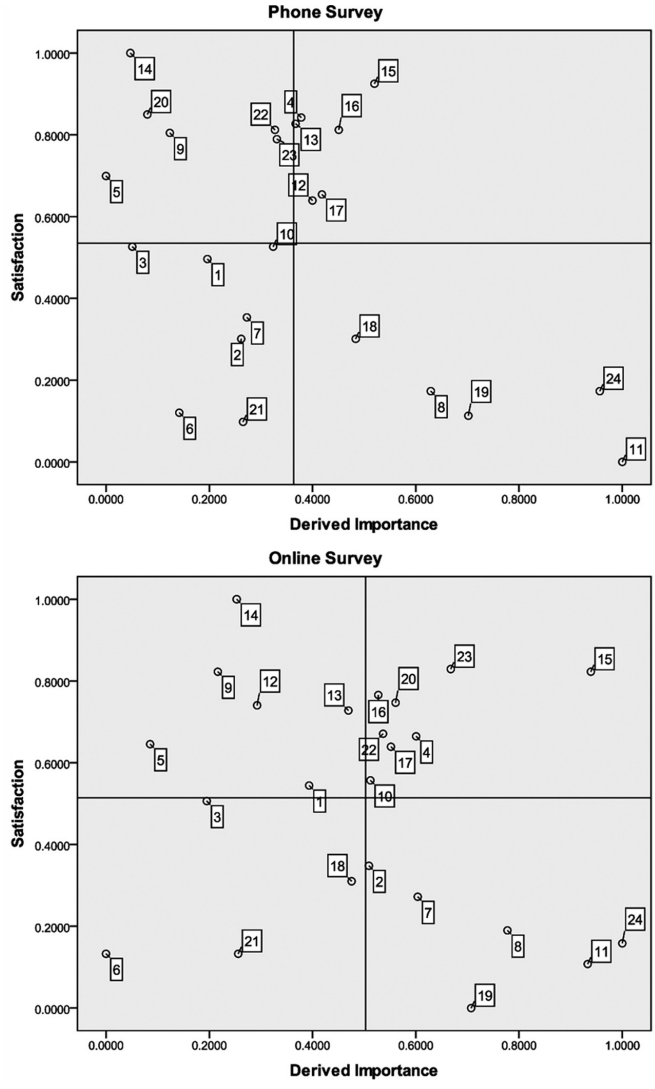
18. Snowplowing of city streets
19. Street maintenance
20. The cleanliness of the city
21. The number of unsightly or blighted properties in the city
22. The overall appearance of the city
23. The safety and security of the city
24. Zoning and growth planning

(continued)

Appendix (continued)

Quadrant Analysis: Phone Sample and Online Sample Comparison Using Trust and Confidence as Determinant of Derived Importance



1. Availability of affordable quality housing
2. Building safety permits and inspections
3. City recycling and sustainability efforts
4. Community spirit of Lincoln's people
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24. Zoning and growth planning

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Notes

1. There are, of course, methodological issues related to the recent emergence of cell phones and the bias of various demographic groups toward the exclusive use of cell phones; however, it continues to be common practice to use random digit dial (RDD) samples as the basis of most citizen satisfaction inquiries at the local level. Recent advances have allowed researchers to supplement RDD samples with cell phone samples, though this approach involves considerable costs.
2. Participants can be drawn from previously developed lists such as registered voter rolls or jury roles (though laws vary on the extent to which such lists can be used for polling purposes), can be targeted through various marketing techniques, or surveys can be publicized either by the local government or through local media outlets to encourage participation. Each of these approaches involves selection bias.
3. As is evident from the data presented in Table 2, a number of "services" rated by residents are not services provided by the city per se. For example, "overall quality of life" is not a singular service provided by the city but is rather a broad conceptualization of the city's overall handling of services and issues that contribute to overall quality of life in the city. In addition, services vary in terms of their breadth. For instance, "ease of bike travel in the city" is a much narrower service than the "overall natural environment." The implications of this situation will be discussed in the Discussion section of the article.
4. In this article, we use correlation coefficients as our measure of derived importance. In the literature, researchers commonly use standardized regression coefficients as the measure of derived importance. We did examine the data in this way, and initially we expected to see problems related to multi collinearity in our OLS regression models because of the strong correlations between the independent variables. However, multicollinearity diagnostics showed that this was not the case. Nonetheless, we chose to present the results of the correlational approach in this article for ease of presentation and interpretation.
5. The Percent to Maximum (PTM) Scale is computed: $PTM = (X - min) / (max - min)$. This same computation is used for both the correlations (importance) and for the means (performance). For example, on the phone survey, the service with the lowest mean score is job creation and economic development ($M = 3.02$) and the highest mean is overall quality of the libraries ($M = 4.35$). Thus, the PTM satisfaction score for job creation and economic development is "0": $(3.02 - 3.02) / (4.35 - 3.02) = 0$.

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