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Park Visitation, Constraints, and Satisfaction: A Meta-Analysis

Hristos Doucouliagos and John Hall

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Park Visitation, Constraints, and Satisfaction: A Meta-Analysis[1]

Hristos Doucouliagos and John Hall, Deakin University

1. Introduction

Parks represent a very large investment of a community's resources which might otherwise be used for more commercially-oriented or productive purposes, in many instances. Hence, it is important to understand the various reasons for the existence of the diversity of parks, and to assess the degree to which the implicit and explicit objectives are being met appropriately by the responsible managing organisations. In Australia, most parks are owned by governments at various levels and managed by instrumentalities such as Parks Victoria (PV). PV is the custodian of a diverse estate of parks and the recreational management of Port Phillip Bay, Western Port and the Yarra and Maribyrnong Rivers. The total area of parks and reserves managed is approximately 3.96 million hectares (17 per cent of Victoria). In Victoria alone, approximately 76.1 million visits in 2006/07 were made to national, state, metropolitan and urban parks for a variety of reasons. Almost $7 million AUD was directed towards park conservation and management across Australia's States and territories during 1998/1999 (Williams, 2001), yet 40 percent of Australians never visit a park (Anon., 2004).

A key dimension related to park management is visitor satisfaction. Customer/Visitor satisfaction is not easy to define and there is diversity in the definitions. Etymologists view the term "satisfaction" as a derivation of the Latin "satis" (enough) and "facere" (to do or make). If the products and services have the capacity to deliver what is being sought to the point of being "enough", satisfaction results (Oliver, 1996). Research studies on satisfaction defined satisfaction as a post-choice evaluative judgement concerning a specific purchase decision (Oliver and DeSarbo, 1988; Bearden and Teel, 1983). The dominant conceptual

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1. Doucouliagos, School of Accounting, Economics and Finance, douc@deakin.edu.au
2. Hall, Deakin Business School, john.hall@deakin.edu.au

model used in the satisfaction literature is the disconfirmation of expectations paradigm. This paradigm postulates that customer satisfaction is related to the size and direction of disconfirmation, which is defined as the difference between an individual's pre-purchase expectations (or some other comparison standard) and post-purchase performance of the product or service (Oliver, 1996; Anderson, 1973). When expectations are not fulfilled, the level of satisfaction decreases. Although efforts have begun to accumulate important information regarding many of the variables that predict visitor satisfaction, much of the accumulated information lacks management implications and is often based on somewhat unsophisticated analytical approaches. It is especially important to identify the specific predictors of visitor satisfaction over which park managers can exert some degree of control (Chhetri, 2004; Fletcher, 2003; Manning, 1999; Ryan, 2000; Vitters, 2000). Fletcher (2003) highlights the fact that practitioners and researchers agree that the basic purpose of managing outdoor recreation is to provide satisfying experiences to visitors. However, many leisure and tourism organizations including publicly funded agencies struggle to maintain adequate levels of services and facilities within a limited budget. Therefore, one of the primary objectives of recreation resource management has become the maximization of user satisfaction within given constraints (Manning, 1999). This situation has resulted in park and recreation agencies looking for techniques to promote efficiency in service management as budget constraints are felt more strongly. In parks settings, satisfaction is influenced by various situational variables including resource settings, social settings and management settings, and these influences are further mediated by the subjective evaluations of individual visitors according to their socioeconomic characteristics, cultural characteristics, experience, norms, attitudes and preferences (Fletcher, 2003; Manning, 1999; Whisman and Hollenhorst, 1998). Williams (1989) suggested that visitor satisfaction is influenced by the settings provided by park and outdoor recreation managers, but that the ways in which these settings are perceived and evaluated by visitors may be equally as important. As Manning (1999) reported, the perceptions of park and recreation managers frequently differ from the perceptions of visitors. Therefore, obtaining objective information on visitor satisfaction is vital to informed park management. Floyd (1997) suggests that determining which aspects of visitors' outdoor recreation experiences are amenable to management efforts requires not only the identification of those predictors but also a determination of which of those predictors have the strongest relationship to visitor satisfaction.

It is evident that there is a growing pool of studies on the determinants of park visitation and of user satisfaction (see, for example, Corkery, 2007; Lee, 2004; Shores, 2007; Vitters, 2000). While these studies have already shed important light on the determinants of park visitation, the existing pool of empirical studies offers valuable information that has not yet been fully exploited. Instead of offering additional estimates, this study will apply meta-analytic techniques to the available estimates from Australia and overseas. Specifically, this research uses meta-analysis to inform on four key issues:

(Q1) What factors explain park visitation? What is the relative importance of each factor?

(Q2) Which factors explain park visitation satisfaction? What is the relative importance of each factor?

(Q3) Does park visitation experience vary by segment?

(Q4) What choice, economic, and social factors determine visitor bias, such that some groups are underrepresented whereas others are overrepresented?

The following section discusses the theoretical literature and issues related to meta-analysis. This is followed by the results of the meta-analysis of park usage constraints, the meta-analysis of park usage satisfaction and finally the conclusion.

2. Meta-Analysis Methodology

Meta-analysis is a set of techniques for combining results across studies, with the objective of drawing inferences about the overall relationships among variables (see Rosenthal, 1978 and 1987). Meta-analysis integrates numerous empirical studies into one study. Apart from narrative and vote counting reviews (comparisons of the number of significant and insignificant findings), meta-analysis is the only technique available for the quantitative synthesis of results from different studies. More importantly, meta-analysis offers several advantages beyond a simple narrative review, as it allows quantifiable assessment of the empirical literature, and allows for hypothesis testing of the relationships under investigation. For instance, meta-regression analysis can detect differences between countries, or over time (Stanley and Jarrell, 1989; Doucouliagos and Laroche, 2003). Narrative reviews and vote counting reviews are notorious for contributing to erroneous conclusions (Stanley, 2001; Hunter and Schmidt, 2004). Consequently, meta-analysis is well suited to test the universality of a relationship.

The meta-analysis undertaken in this project proceeds in three stages:

2.1 First Stage - Data Compilation

In order to integrate the findings from different park visitation studies, it is necessary to compile a comprehensive and comparable set of park visitation studies. Studies were considered for inclusion if they provided sufficient information on their data, methodology, and their findings.

Studies will rarely be perfect replications and rarely will they use the same process, methodology and measures. Indeed, as Glass, McGaw and Smith (1981) note, a perfect replication is of limited use. Even when variables are defined and measured the same way, data quality will differ from study to study. In the case of park visitation, the groups of visitors analysed will differ, as will the parks visited. This sort of heterogeneity across studies is not limiting. Meta-regression analysis can detect whether results differ because of real economic, social and psychological factors or because of study design. Thus, during the data compilation stage, we collected information on all types of measures, data sources, sample compositions, and analytical methods used in the extant literature, and coded these into a spreadsheet.

The studies **were not limited to Australian studies:** information was also collected from studies undertaken internationally. Non-Australian studies are more numerous and offer valuable information on park visitation. They are of interest on their own. Moreover, meta-analysis can be used to draw inferences from this literature for Australia.

This study focused on the most cited studies, and studies that were published in leading journals. Australia has some similarities with the USA and Canada and other immigrant societies and there has been work here and abroad to try and understand the factors in play that create visitation biases in various groups.

2.2 Second Stage - Hypothesis Testing

The first step in this stage was to calculate effect sizes for each study. Effect sizes are comparable measures of a relationship, such as the visitation satisfaction. Several different effect size statistics are available (see Hunter and Schmidt, 2004). In this study, we used the partial correlation. Partial correlations offer a comparable effect size across all estimates included in the dataset. They measure the effect of one variable (e.g. park use visitation or park use satisfaction) while holding other variables constant. As such, they offer a statistical measure of the strength of the relationship of one variable on another, holding other variables constant (see Greene, 2000).

The second step was to combine the estimated effect sizes from *each* study, and to calculate an overall weighted average effect size statistic *across all* comparable studies (and estimates). Weighted averages are needed to compensate for differences in sample sizes and estimation accuracy across studies. The effect between two variables (holding other effects constant) established by a literature can be derived as a weighted average of the associated estimates:

$$\varepsilon = \sum [N_i \varepsilon_i] / \sum N_i \qquad (1)$$

where ε is the measure of the comparable effect from the i^th study and N is the weight attached to each estimate. We follow Hedges and Olkin (1985) and use the inverse of an estimate's variance as weights. The weighted average effect sizes can be compared: (a) across different segments; (b) over time; and (c) for different countries.The statistical significance of the weighted average was tested using confidence intervals. There are several ways to construct confidence intervals (see Hedges and Olkin, 1985; and Hunter and Schmidt, 2004). These include confidence intervals that are constructed using the bootstrap (Adams, Gurevitch and Rosenberg, 1997), as well as intervals that are constructed using Fixed Effects and Random Effects meta-analysis (Hunter and Schmidt, 2004).

2.3 Third Stage - Meta-Regression Analysis

The meta-regression model (known as MRA) was developed by Stanley and Jarrell (1989) to analyse the multi-dimensional nature of the research process. The impact of specification, data and methodological differences can be investigated by estimating an MRA of the following (linear) form:

$$\varepsilon_i = \alpha + \gamma_1 X_{i1} + \ldots + \gamma_k X_{ik} + \delta_1 K_{i1} + \ldots + \delta_n K_{in} + u_i \qquad (2)$$

where ε_i is the comparable effect size derived from the i^th study, α is the constant, *X* are dummy variables representing characteristics associated with the i^th study, *K* are continuous variables associated with the i^th study, γ and δ are the vectors of estimated (meta) regression coefficients for corresponding variables, and u_i is the disturbance term. Equation 2 can be estimated using OLS or weighted least squares (Lipsey and Wilson, 2001). Statistical techniques that can handle the interdependence of the observations include the use of the bootstrap (Doucouliagos, 2005) and the use of clustered data analysis (Hox, 2002).

The regression coefficients from equation 2 quantify the impact of specification, data and methodological differences on reported study effects (ε_i). Examples of explanatory variables that have been found to be important in past meta-analyses include: (1) data differences such as the type of data, the location of the site and the time period covered; (2) specification and control variables included; and (3) estimation differences. These and other variables were included in the estimation of equation 2.

One of the advantages of a meta-analysis of a group of studies over a single study is that measures of research quality and model adequacy, which cannot be used in the original research studies due to the absence of variation, are routinely used in meta-regression analysis to explain the observed excess variation in economic results (see Stanley, Doucouliagos and Jarrell 2007).

Through the meta-analysis it was possible to address the four research questions posed above. Specifically, the information contained in the existing studies on park visitation were used to evaluate what the literature has established and to draw inferences.

3. Park Use Constraints

3.1 Selection of studies and issues in meta-analysis

A comprehensive search of numerous databases, searching for any study that reported perceptions on park usage constraints and park usage satisfaction was undertaken. Numerous search engines were accessed. Surveys and reviews of the literature were also consulted. Further, all references cited within studies themselves were also gathered. Many studies that were identified by this search process were not appropriate for the meta-analysis, as they did not report sufficient information from which to calculate effect sizes. The search procedure resulted in the 32 studies listed in Appendix A. The studies are predominately published in journals, although a small number of unpublished studies are included.

From these studies, statistical information was collected to draw inferences on the links between ten socio-demographic characteristics and perceived park usage constraints. The ten constraints are listed in Table 1, together with the number of studies that explore the constraint, the number of estimates reported in the literature on that constraint, the total number of interviews covered by all studies, the median number of interviews for each literature and the median response rate.

Table 1: Description of Park Usage Constraints Studies

Constraint	Number of studies (number of estimates)	Total number of respondents	Median number of respondents	Median response rate
Transportation	11 (22)	33,712	1,300	60%
Cost	10 (14)	16,659	898	58%
Knowledge	7 (13)	4,876	534	83%
Time	11 (29)	17,565	536	60%
Partner	8 (13)	15,125	581	60%
Fear	10 (25)	8,613	575	68%
Health	8 (12)	16,247	687	58%
Interest	6 (14)	4,862	576	60%
Facilities	12 (96)	18,371	681	56%
Location of park	11 (57)	15,408	578	56%

Source: Authors' own calculations

3.2 Some Issues

3.2.1 Measurement Issues

Studies differ in the way they construct their data. For example, when defining gender, some studies assign a value of 1 to males and a value of 0 for females, while others do the reverse. A similar situation applies for race. Due diligence was used to ensure that the signs on the partial correlations were adjusted so that all estimates combined were measuring the same effect.

3.2.2 Missing Data

There is an unfortunate tendency in this literature for many authors to report the results for only those variables that were found to be statistically significant. This results in the loss of valuable information for reviewers. Instead of discarding the studies that report that they found a variable to be statistically insignificant, our approach was to follow Greenberg, Michalopoulos and Robins (2003) by assuming a probability-value of 0.3 for estimates that would have been reported in these studies.[2]

3.3 Socio-Demographic Characteristics and Perceived Park Usage Constraints

The aim here is to identify which, if any, socio-demographic characteristics were associated with perceived park use constraints. Five key factors have been explored in the literature: education, gender, age, income, and race.

3.3.1 Transportation as a Constraint

Table 2 presents the meta-analysis (MA) results for transportation as a park use constraint. Column 1 lists the socio-demographic factor. Column 2 presents the weighted average partial

[2] In so doing, we acknowledge that we are trading off loss of information with measurement error.

correlation, using the inverse variance as weights. Column 3 presents the associated 95% confidence intervals. The conclusions that can conservatively be drawn from the literature are presented in column 4. It is apparent that: Higher levels of education make transportation less of a constraint to park use. As income rises, transportation becomes less of a constraint to park use. Older people find transportation more of a constraint to park use. 'Non-white' people are more likely to cite transportation as a constraint to park use; and females are more likely to cite transportation as a constraint to park use.

It appears that income has the largest effect in absolute magnitude (0.073). The confidence intervals for income and education overlap only slightly. The effect of income is larger than education. The confidence intervals for age, gender and race overlap significantly. Hence, it can be concluded that age, race and gender are equally important to transportation as a constraint.

Table 2: Transportation as a Park Use Constraint

Socio-demographic Factor (1)	Weighted Average r (2)	95% Confidence Interval (3)	Conclusion (4)
Education	-0.040	-0.018 to -0.062	Less of a constraint
Income	-0.073	-0.055 to -0.092	Less of a constraint
Age	+0.035	+0.018 to +0.052	More of a constraint
Race	+0.037	+0.021 to +0.052	More of a constraint
Gender	+0.031	+0.013 to +0.049	More of a constraint

Notes: Education refers to more education. Income refers to more income. Age refers to older people. Race refers to non-white. Gender refers to female.

3.3.2 Cost as a Constraint

Table 3 presents the MA results for cost as a park use constraint. It can be concluded from table 3 that: The more educated are less constrained by cost. Those with more income are less constrained by cost. Older users are also less constrained by cost. Females are more constrained by cost, though both the size of the correlation and the statistical significance of this is low. Non-whites are more likely to cite cost as a factor.

It appears that income has the largest effect in absolute magnitude (0.113). Education and age both have similar sized adverse effects. The confidence intervals for gender and race do not overlap: Cost is clearly more of a constraint for non-whites than it is for females.

Table 3: Cost as a Park Use Constraint

Socio-demographic Factor (1)	Weighted Average r (2)	95% Confidence Interval (3)	Conclusion (4)
Education	-0.063	-0.030 to -0.096	Less of a constraint
Income	-0.113	-0.089 to -0.137	Less of a constraint
Age	-0.045	-0.023 to -0.066	Less of a constraint
Race	+0.057	+0.037 to +0.078	More of a constraint
Gender	+0.011	+0.001 to +0.034	More of a constraint

Notes: Education refers to more education. Income refers to more income. Age refers to older people. Race refers to non-white. Gender refers to female.

3.3.3 Knowledge as a Constraint

Table 4 presents the MA results for knowledge as a park use constraint. We conclude from table 4 that: The more educated are less constrained by knowledge (understandably, they are less likely to cite lack of knowledge as a park use constraint). Those with more income are less constrained by knowledge. Older users are also less constrained by knowledge. Females are more constrained by knowledge. Non-whites are more constrained by knowledge, though the statistical significance of this is low.

It appears that age has the largest effect in absolute magnitude (0.101). While age has a larger average correlation, both education and age have overlapping confidence intervals, so that their effect might be similar.

Table 4: Knowledge as a Park Use Constraint

Socio-demographic Factor (1)	Weighted Average r (2)	95% Confidence Interval (3)	Conclusion (4)
Education	-0.069	-0.037 to -0.100	Less of a constraint
Income	-0.035	-0.007 to -0.063	Less of a constraint
Age	-0.101	-0.074 to -0.127	Less of a constraint
Race	+0.028	+0.006 to 0.049	More of a constraint
Gender	+0.042	+0.016 to 0.068	More of a constraint

Notes: Education refers to more education. Income refers to more income. Age refers to older people. Race refers to non-white. Gender refers to female.

3.3.4 Time as a Constraint

Table 5 presents the MA results for time as a park use constraint. Education is not a factor here. Income is more of a constraint: People with more income are more likely to cite time as a constraint. This obviously reflects the opportunity cost of their time. As expected, older people however are less likely to cite time as a constraint. Again, this relates to the opportunity cost of time. Females are more likely to cite time as a constraint, while non-whites are less likely to do so. The confidence intervals for gender and income do not overlap. Hence, we conclude that Income is more of a constraint than gender. The confidence intervals for age and race do not overlap. Hence, it can be concluded that age is less of a constraint than race.

Table 5: Time as a Park Use Constraint

Socio-demographic Factor (1)	Weighted Average r (2)	95% Confidence Interval (3)	Conclusion (4)
Education	+0.021	-0.003 to +0.045	Not a constraint
Income	+0.123	+0.103 to +0.143	More of a constraint
Age	-0.133	-0.117 to -0.149	Less of a constraint
Race	-0.026	-0.010 to -0.042	Less of a constraint
Gender	+0.031	+0.017 to +0.046	More of a constraint

Notes: Education refers to more education. Income refers to more income. Age refers to older people. Race refers to non-white. Gender refers to female.

3.3.5 Partner as a Constraint

Table 6 presents the MA results for lack of a partner as a park use constraint. There were insufficient observations from which to assess the links between education and partners as a constraint. Income has a negative correlation. That means that income is less of a constraint to users who lack a partner: The more income users have, the less they are constrained by lack of a partner. In contrast, both age and gender are more of a constraint. Older people and females (and, hence, by implication older females) are more constrained in their usage of parks when they lack a partner. Race does not appear to be a factor.

Table 6: Partner as a Park Use Constraint

Socio-demographic Factor (1)	Weighted Average r (2)	95% Confidence Interval (3)	Conclusion (4)
Education	na	na	na
Income	-0.055	-0.025 to -0.085	Less of a constraint
Age	+0.035	+0.015 to +0.054	More of a constraint
Race	+0.012	-0.010 to +0.035	Not a constraint
Gender	+0.051	+0.035 to +0.067	More of a constraint

Notes: na denotes insufficient estimates. Income refers to more income. Age refers to older people. Race refers to non-white. Gender refers to female.

3.3.6 Fear as a Constraint

Table 7 presents the MA results for fear as a park use constraint. More educated people are less likely to cite fear as a constraint. Similarly, as income rises, fear is not as important as a constraint. Age and race appear not to be major factors, with the confidence interval for race including the possibility of a near zero correlation. Gender however is important. Females are significantly more likely to cite fear as a constraint on the use of parks.

Table 7: Fear as a Park Use Constraint

Socio-demographic Factor (1)	Weighted Average r (2)	95% Confidence Interval (3)	Conclusion (4)
Education	-0.046	-0.016 to -0.077	Less of a constraint
Income	-0.083	-0.059 to -0.106	Less of a constraint
Age	+0.034	+0.012 to +0.055	More of a constraint
Race	+0.017	+0.001 to +0.033	More of a constraint
Gender	+0.080	+0.057 to +0.103	More of a constraint

Notes: Education refers to more education. Income refers to more income. Age refers to older people. Race refers to non-white. Gender refers to female.

3.3.7 Health as a Constraint

Table 8 presents the MA results for health as a park use constraint. Education and race do not appear to be factors here. Income is less of a factor: People with more income are less likely to cite health as a park use constraint. Age and gender are both important constraints. Females and older people in particular are more likely to cite health as a park use constraint. Age has the largest effect, in absolute terms.

Table 8: Health as a Park Use Constraint

Socio-demographic Factor (1)	Weighted Average r (2)	95% Confidence Interval (3)	Conclusion (4)
Education	-0.025	-0.058 to +0.008	Not a constraint
Income	-0.066	-0.037 to -0.095	Less of a constraint
Age	+0.099	+0.074 to +0.124	More of a constraint
Race	+0.013	-0.009 to +0.035	Not a constraint
Gender	+0.032	+0.016 to +0.047	More of a constraint

Notes: Education refers to more education. Income refers to more income. Age refers to older people. Race refers to non-white. Gender refers to female.

3.3.8 Interest as a Constraint

Table 9 presents the MA results for interest as a park use constraint. There were insufficient observations from which to assess the links between education and interest as a constraint. Income, age and race are not constraints. In contrast, females are more likely to cite lack of interest as a park use constraint.

Table 9: Interest as a Park Use Constraint

Socio-demographic Factor (1)	Weighted Average r (2)	95% Confidence Interval (3)	Conclusion (4)
Education	na	na	na
Income	-0.001	-0.029 to +0.026	Not a constraint
Age	-0.011	-0.033 to +0.011	Not a constraint
Race	+0.021	-0.001 to +0.043	Not a constraint
Gender	+0.051	+0.026 to +0.076	More of a constraint

Notes: na denotes insufficient estimates. Income refers to more income. Age refers to older people. Race refers to non-white. Gender refers to female.

3.3.9 Facilities as a Constraint

Table 10 presents the MA results for facilities as a park use constraint. Income and race are not constraints for this dimension. More educated and older users are less likely to report facilities as a park use constraint. However, females are more likely to cite facilities as a park use constraint. Interestingly, all the correlations are small and the confidence intervals suggest near zero effects.

Table 10: Facilities as a Park Use Constraint

Socio-demographic Factor (1)	Weighted Average r (2)	95% Confidence Interval (3)	Conclusion (4)
Education	-0.035	-0.001 to -0.069	Less of a constraint
Income	-0.012	-0.034 to +0.009	Not a constraint
Age	-0.026	-0.006 to -0.045	Less of a constraint
Race	-0.006	-0.022 to +0.009	Not a constraint
Gender	+0.023	+0.011 to +0.036	More of a constraint

Notes: Education refers to more education. Income refers to more income. Age refers to older people. Race refers to non-white. Gender refers to female.

3.3.10 Location as a Constraint

Table 11 presents the MA results for location as a park use constraint. We are unable to assess education as a factor because of insufficient observations. Both race and gender are not an issue in the identification of location as a park use constraint: While the coefficient for gender is technically statistically significant, the confidence intervals suggest the possibility of a near zero effect. Income is less of a constraint: Users with more income are less likely to cite location as a constraint. Similarly, older users are more likely to cite location as a constraint. Income appears to be the most important factor, in absolute terms.

Table 11: Location as a Park Use Constraint

Socio-demographic Factor (1)	Weighted Average r (2)	95% Confidence Interval (3)	Conclusion (4)
Education	na	na	na
Income	-0.086	-0.057 to -0.115	Less of a constraint
Age	-0.042	-0.017 to -0.067	Less of a constraint
Race	+0.029	-0.001 to +0.059	Not a constraint
Gender	+0.023	+0.005 to +0.040	More of a constraint

Notes: na denotes insufficient estimates. Income refers to more income. Age refers to older people. Race refers to non-white. Gender refers to female.

Table 12 summarises the findings from tables 2 through to 11. Education is not reported to be an important inhibiting factor for any of the 10 constraints. Indeed, education appears to be an important factor in making park use easier (see column 3). Income is more of a constraint only for time: As income rises, time becomes more important as a park use constraint. In contrast, income eases most of the other constraints. Gender appears to be a major issue. Females found nine of the ten factors to be important constraints to be park usage. This an important finding that requires attention. What strategies can park management develop to overcome the constraints associated with females?

Table 12: Summary of Socio-Demographic Variables as Constraints

Factor	Not a constraint on: (1)	More of a constraint on: (2)	Less of a constraint on: (3)
Education	Time & Health	None	Transportation, Cost, Fear, Knowledge, Facilities
Income	Interest & Facilities	Time	Transportation, Cost, Partner, Fear, Health, Knowledge & Location
Age	Interest	Transportation, Partner, Fear & Health	Cost, Time, Location, Knowledge & Facilities
Gender	Location	All other factors	None
Race	Partner, Health, Interest, Facilities & Location	Transportation, Cost, Fear & Knowledge	Time

3.4 Time Variation

In this section we explore whether the average value of the park usage constraints changes over time. That is, do the factors that are deemed to be constraints on park usage change over time, or are they time invariant? To do this we grouped together all estimates relating to income as a constraint, all estimates relating to education, and so forth. The partial correlations were then converted into absolute values to enable comparability: We are interested in changes in the absolute value over time. These results are presented in Table 13. There appears to be no trend in education, gender, and race. However, both income and age have a declining trend. That is, respondents are stating that income and age are less of a constraint over time.

Table 13: Time Variation in Park Use Constraints

Factor	Coefficient on time trend (t-statistic)	Conclusion
Income	-.0035 (-1.86)	Income becoming less of a constraint over time
Education	-.0013 (-1.40)	No trend
Age	-.0025 (-2.82)	Age becoming less of a constraint over time
Gender	-.0009 (-0.97)	No trend
Race	.0001 (0.03)	No trend

3.5 Summary of Park Use Constraints Correlations

Table 14 summarises the results from the previous tables. Not surprisingly, the biggest effect education has is on knowledge and cost. Educated people are less likely to cite knowledge as a constraint to park visitation and, since education is linked to income, they are also less likely to cite cost as a constraint. Again not surprisingly, income has its greatest effect on easing cost as a constraint, while time is more of a constraint. For age, health is the more important factor limiting usage, while time and knowledge are the greatest factors easing constraints to park visitation. For non-whites, cost is the major factor limiting usage, while time is the least important. For females, fear is the most important factor limiting usage.

The largest correlation occurs with respect to time, with time being the most important factor in terms of income and the least important factor in terms of age.

Table 14: Summary of Park Use Constraints Correlations

Socio-demographic Factor	Education (1)	Income (2)	Age (3)	Non-White (4)	Female (5)
Transportation	-0.040	-0.073	+0.035	+0.037	+0.031
Cost	-0.063	-0.113	-0.045	+0.057	+0.011
Knowledge	-0.069	-0.035	-0.101	+0.028	+0.042
Time	+0.021	+0.123	-0.133	-0.026	+0.031
Partner	na	-0.055	+0.035	+0.012	+0.051
Fear	-0.046	-0.083	+0.034	+0.017	+0.080
Health	-0.025	-0.066	+0.099	+0.013	+0.032
Interest	na	-0.001	-0.011	+0.021	+0.051
Facilities	-0.035	-0.012	-0.026	-0.006	+0.023
Location	na	-0.086	-0.042	+0.029	+0.023

4 Park Management and Visitor Satisfaction

4.1 The Studies

As was the case for park use constraints, a comprehensive search for studies was conducted, using numerous search engines, as well as searching through likely journals and following up on references cited in papers. This search produced a large number of studies. Most of these, however, did not report the necessary information needed to be included in the meta-analysis. Many studies simply did not report the necessary statistical information, while others used techniques that could not be combined into a common pool of comparable estimates. There are many studies that collect information on visitor satisfaction, but most of these do not then attempt to link satisfaction to park management. We are interested only in those estimates relating to visitor satisfaction with park management. Hence, we ignore all other dimensions of visitor satisfaction. By park management, we mean aspects of parks that are within the influence of parks administrators. This includes facilities, information, maintenance, and service quality.

In the end, it was possible to combine the results from 20 studies that provide a total of 133 estimates of the correlation between park management and park visitor satisfaction. The studies included in the meta-analysis are listed in Table 15. We are interested in applying meta-analysis to these studies in order to provide answers to two questions:

(1) Have the extant studies established a link between park management and park visitor satisfaction?

(2) Which aspects of park management do respondents find more satisfying?

We wished to collect four pieces of information from the studies. First, we are obviously interested in measures that link satisfaction with park facilities. All 20 studies report such measures. The studies either report coefficients from multiple regression (or Structural Equation Models), or from a performance gap analysis. Second, we would like information on the respondents, such as the proportion that are female, the proportion with a university degree, and average age and income level. We had hoped to be able to use this information in order to explain some of the differences in the results between studies. Unfortunately, this information was not consistently reported by the studies, and we are consequently unable to explore this important dimension of satisfaction. Third, we collected information on the sampling procedure used, such as whether the respondents were surveyed on-site and the year the survey was conducted. Fourth, we would like information on the parks themselves. This information was either reported in the studies, or we collected it from independent external sources. This includes information on the type of park, the size of the park (in hectares) and the main activities pursued. All of these might be important contextual factors that moderate the relationship between facilities and satisfaction.

Table 15: Studies Included in the Park Satisfaction Meta-Analysis

Author(s)	Country	Sample size
Akama and Kieti (2003)	Kenya	104
Burns *et al.* (1997)	USA	415
Demir *et al.* (2010)	Turkey	300
Ditton *et al.* (1981)	USA	805
Ellis and Vogelsong (2002)	USA	315
Fletcher and Fletcher (2003)	USA	8,247
Herrick and McDonald (1992)	USA	682
Huang *et al.* (2008)	Taiwan	427
Leberman and Holland (2005)	South Africa	401
Lee *et al.* (2004 & 2007)	USA	359
Li *et al*. (2007)	Hong Kong	639
Moyle and Croy (2009)	Australia	182
Naidoo *et al*. (2009)	Mauritius	557
Okello and Yerian (2009)	Tanzania	54
Pan and Ryan (2007)	New Zealand	205
Shelby (1980)	USA	1,009
Tian-Cole *et al.* (2002)	USA	282
Tonge and Moore (2007)	Australia	125
Vaske *et al.* (2009)	Vietnam	368
Webb and Hassall (2002)	Australia	525

There are 20 studies, with 133 estimates, using a total of 16,001 observations.

4.2 The Correlations

From each of the 20 studies listed in Table 15, we either calculated the correlation between satisfaction and park facilities, or were able to record it directly from the reported results. The resulting 133 correlations are plotted in the form of a funnel plot in Figure 1. The funnel plot shows the association between the reported correlations and their associated precision, measured as the inverse of the standard error (Stanley and Doucouliagos, 2010). The thick vertical line shows the position of a zero correlation. As can be seen from Figure 1, there is a wide range of results reported, with the vast majority of correlations being positive. Below we use meta-regression analysis to identify the sources of this variation (heterogeneity). One of the studies, Fletcher and Flectcher (2003), uses a very large number of observations, compared to all the other studies. These can be seen in Figure 1 as the cluster of observations reported with a relative high level of precision. Figure 2 presents the funnel plot without the correlations from this study.

Figure 1: Funnel Plot of Correlations of Park Visitor Satisfaction and Park Management, All 133 estimates

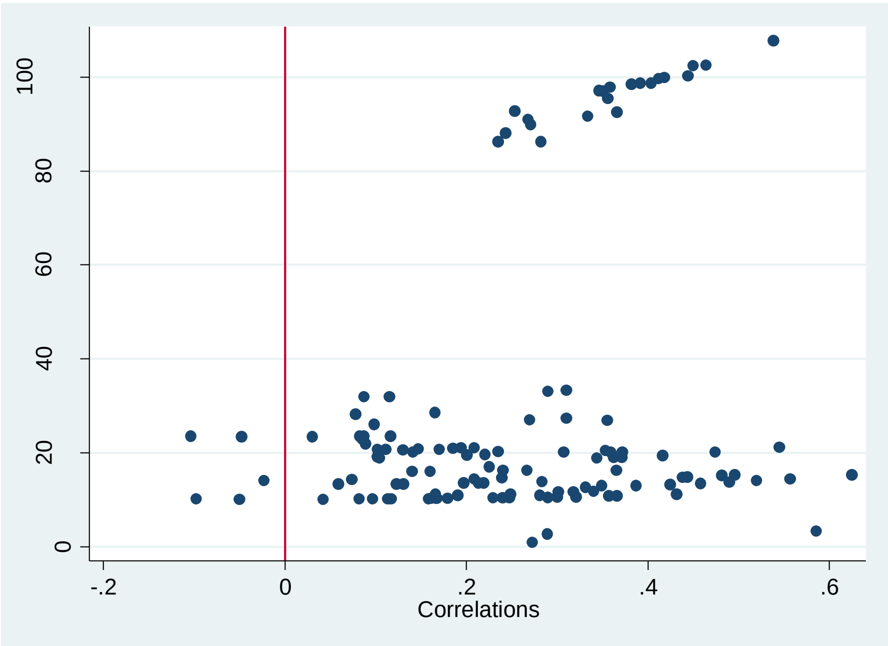


Figure 2: Funnel Plot of Correlations of Park Visitor Satisfaction and Park Management, without Fletcher and Fletcher (2003)

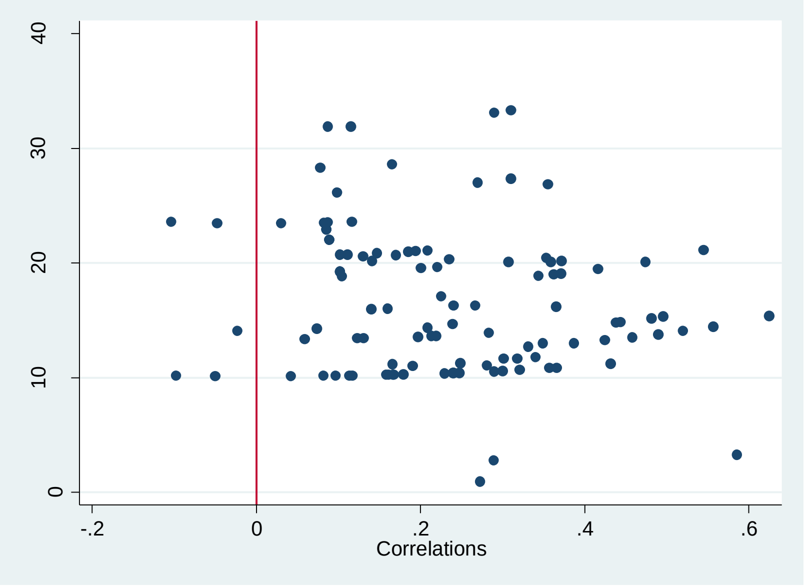


Figure 3 shows the correlations in chorological order, according to the year in which the surveys were conducted. There is a slight upward trend in the reported correlations, as well growing variation in the correlations (the spread in the correlations appears to be growing larger over time).

Figure 3: Park Visitor Correlations in Chronological Order

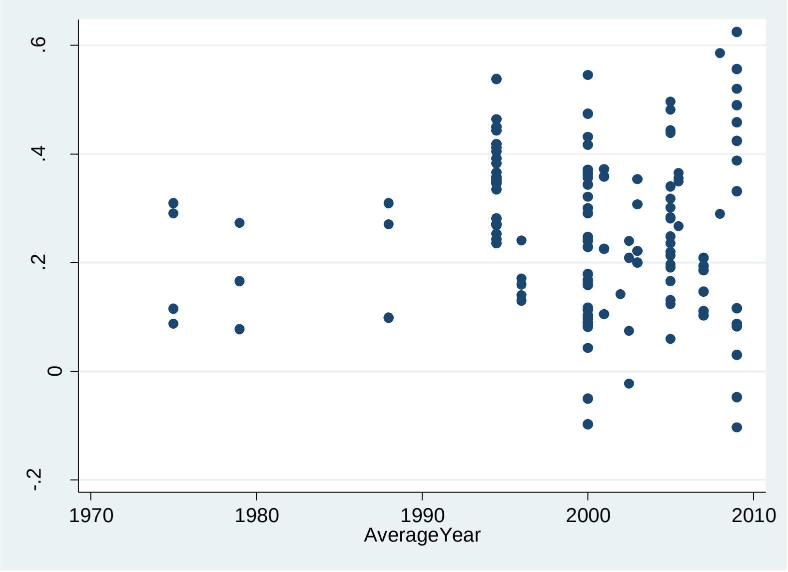
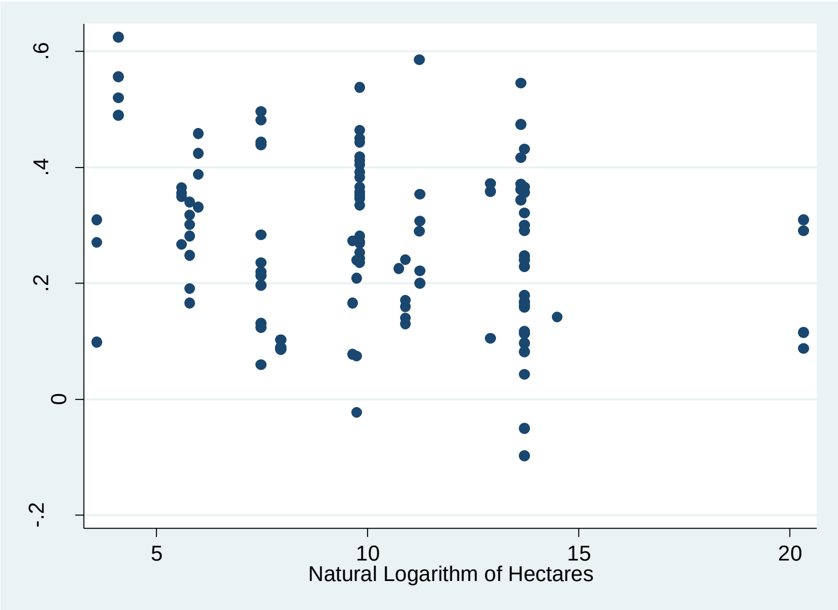


Figure 4 shows a slight downward pattern relating to park size (measured as the natural logarithm on the number of hectares).

Figure 4: Park Visitor Correlations and Park Size



4.3 Meta-Regression Analysis

Table 16 presents bivariate meta-regression analysis (MRA).[3] Column 1 presents the OLS results, with standard errors robust to heteroscedasticity. This is the equivalent of the simple unweighted average. In column 2, the standard errors are corrected for data clustering that might arise as a result of including multiple estimates from each study. In column 3, restricted maximum likelihood (REML) is used to handle data clustering. Robust regression is used in column 4 to correct for the effects of any outliers. Column 5 uses weighted least squares and corrects standard errors for data clustering. We use precision (the inverse of the individual correlation's standard error) as weights. Hedges and Olkin (1985) show that

[3] This involves a simple MRA of correlations regressed on a constant.

weighting each estimate by the inverse of variance produces optimal weights. Finally, column 6 repeats column 5 but without the observations from Fletcher and Fletcher (2003).

Table 16: Unconditional Averages of Park User Satisfaction

(Dependent variable is correlations)

	OLS Robust (1)	CDA (2)	REML (3)	Robust (4)	WLS CDA (5)	WLS CDA, without Fletcher & Fletcher (2003) (6)
Constant	0.251 (19.47)***	0.251 (7.93)***	0.242 (8.87)***	0.250 (18.56)***	0.390 (33.24)***	0.130 (2.21)**
K	133	133	133	133	133	111
N	20	20	20	20	20	19

Notes: N is the number of studies. K is the number of estimates. ***, ** denote statistical significance at the 1% and 5% levels, respectively. Figures in brackets are t-statistics. In column 1, standard errors are robust to heteroscedasticity. In column 2, standard errors are robust to data clustering. Column 3 reports estimates using restricted maximum likelihood. Column 4 uses robust regression. Column 5 uses both clustered data analysis and weights estimates according to their precision. Column 6 repeats column 5 without the larger Fletcher and Fletcher (2003) study.

The results from columns 1 to 4 are all fairly similar, indicating that the overall average correlation between park management and visitor satisfaction is about 0.25. Column 5 assigns different weights to the observations, according to their relative precision. This produces a larger correlation because of the influence of the Fletcher and Fletcher (2003) study. There is, however, no theoretical reason to remove this study from the dataset. Hence, we take column 5 to represent our preferred set of estimates. Using Cohen's (1988) guidelines, it can be concluded that an average correlation of 0.39 represents a moderate correlation.[4] The average correlation from all estimates combined is positive and statistically significant (the confidence intervals do not include a zero value). It is concluded from this that the available evidence is conclusive and robust. It shows clearly that the management of park facilities

[4] According to Cohen, a correlation of 0.2 is a small effect, 0.50 is a medium effect and anything larger than 0.8 is large.

increases user satisfaction. It is clear from figures 1 and 2, however, that there is significant variation in the correlations between and within studies. The average correlations reported in Table 16 are unconditional in the sense that they do not condition for any aspect of study design. This can be easily accommodated within MRA by modelling the heterogeneity between studies.

Table 17 presents the multivariate MRA results. In column 1, we add five variables that might explain some of the variation in the reported correlations. *Standard Error* is included to capture any effects that might arise from sample selection or publication bias. Stanley (2001 and 2008) shows that selection bias might distort inferences drawn from meta-analysis if reported estimates are chosen on the basis of their statistical significance.[5] *Average Year* measures the year that the samples were taken. This variable is included to control for the time dimension: Does satisfaction vary over time? Figure 3 hints that there might be something to such an effect and it is thus important to control for this in the MRA. *Australasia*, *Africa* and *Asia* are binary variables, taking the value of 1 if the park was located in Australia (or New Zealand), Africa, or Asia, respectively. These variables are included to control for country and culture differences: Does visitor satisfaction vary between regions? The base in this case is respondents from the USA. Hence, these variables help to compare visitor satisfaction differences relative to the US. With the exception of *Standard Error*, all these variables are statistically significant in column 1.

In column 2 we add four variables that control for differences in park management dimensions: satisfaction with park information; park facilities (infrastructure); parking; and natural setting. The base in all cases is park maintenance and service quality. These variables were actually not that easy to code. Unfortunately, there is no universal standard adopted in the studies for defining these dimensions of park management. Thus, while some studies report separate estimates for park facilities and park service quality, others combine the two together. Similarly, while some studies report estimates for park information, others combine it with park facilities. Hence, the binary variables we have created for the meta-analysis are not entirely pure classification categories. This needs to be borne in mind when interpreting

[5] If estimates are not reported on the basis of their statistical significance, then there should be no link at all between an estimate and its associated standard error. Note that the standard error used here is not the standard error for the regression coefficient but for the associate correlation.

the MRA results. In column 2 we also control for the size of the park, measured as the natural logarithm of the number of hectares.

In column 3 we add several other variables to the MRA. First, we categorize parks as: (a) rivers and lakes; (b) coastal parks; and (c) urban parks and forests. Accordingly, in the MRA we add two variables – *River or Lake* and *Coastal* - to capture any differences in visitor satisfaction with park management across these different types of parks, with urban parks and forests as the base. Second, some studies use visitor responses from several sites. Hence, we add the variable *Multi-site* to capture any differences between these estimates and those from a single site. Third, as already noted, we have included two broad groups of empirical approaches in our database: estimates from regression based models and estimates from t-tests. We expect that estimates from regression based models will differ because they control for the effects of other variables – they are actually partial correlations. Hence, we include the variable *Not Regression Based* to capture any differences between these groups of studies.[6] Fourth, the variable *Mailback* is included to capture any differences between responses collected on-site compared to those received via mail.[7] Finally, while most of the estimates have been published in academic journals, some are unpublished conference papers. The variable *Published* is included to capture any differences in the results between studies that are published compared to those that are not.[8]

The final column of Table 17 reports the results of a general-to-specific modelling strategy, where we sequentially removed statistically insignificant variables, until the remaining variables are all statistically significant at least at the 10% level of significance. Note that the final model (column 4) explains about 45% of the variation in reported results, which is actually a high degree of explanation, given the existence of some degree of randomness in satisfaction responses.

[6] *A priori*, it is not evident whether the partial correlations will be smaller than the first order correlations.

[7] While on-site might solicit a higher response rate, there is no reason to expect that it will produce different satisfaction responses.

[8] Note that this is not included to capture publication bias. Rather, it is meant to detect any differences in the satisfaction responses.

Table 17: Meta-Regression Analysis of Park User Satisfaction,

(Dependent variable is correlations)

	With country and time differences (1)	With park management dimensions (2)	All variables (3)	Reduced (specific) model (4)
Constant	0.42 (25.37)***	0.41 (11.81)***	0.37 (2.76)**	0.47 (27.65)***
Standard Error	-0.75 (0.82)	-1.73 (2.07)*	-1.90 (0.90)	-1.72 (1.90)*
Average Year	0.008 (5.03)***	0.011 (5.36)***	0.011 (1.75)*	0.01 (5.67)***
Australasia	-0.22 (3.25)***	-0.17 (2.20)**	-0.22 (2.52)**	-0.25 (5.29)***
Africa	-0.31 (2.95)***	-0.12 (1.48)	-0.23 (1.40)	-0.36 (4.15)***
Asia	-0.19 (2.96)***	-0.10 (2.12)**	-0.18 (1.66)	-0.29 (2.90)***
Park Information	-	-0.02 (3.33)***	-0.02 (4.19)***	-0.02 (3.00)***
Park Facilities	-	-0.08 (5.89)***	-0.08 (10.76)***	-0.08 (6.36)***
Parking	-	-0.05 (6.72)***	-0.06 (7.09)***	-0.07 (3.71)***
Natural Setting	-	-0.04 (2.88)***	-0.06 (6.75)***	-0.06 (4.53)***
Size of Park	-	0.006 (1.92)*	0.005 (0.87)	-
River or Lake	-	-	-0.01 (0.04)	-
Coastal	-	-	0.03 (0.33)	-
Multi-site	-	-	0.02 (0.23)	-
Not Regression based	-	-	0.14 (2.96)***	0.16 (3.32)***
Mailback	-	-	-0.02 (0.39)	-
Published	-	-	0.07 (1.11)	-
Adjusted R-squared	0.32	0.37	0.40	0.45
N	20	18	18	20
K	133	121	121	133

Notes: N is the number of studies. K is the number of estimates. ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Figures in brackets are *absolute* values of t-statistics, derived using standard errors adjusted for data clustering. All estimation done with weighted least squares, using precision as weights.

Note that the MRA coefficients should all be compared to the constant or base. Several interesting results emerge from the model presented in column 4. The constant here is park visitor satisfaction with park management in the US, using regression analysis. The correlation is positive (+0.47) and strongly statistically significant. The size of this effect is lower when regression based models are not used (0.31 = 0.47-0.16). In either case, the results indicate that there is a moderate degree of correlation between visitor satisfaction and park management in the US.

The coefficient on Average Year is positive and always statistically significant, suggesting that satisfaction with park management has been increasing gradually over time. The coefficients on Australasia, Africa and Asia are all negative. This means that the correlation between visitor satisfaction and park maintenance is much larger in the US than it is in the rest of the world.

The coefficient on park information, park facilities, parking and natural setting are all negative and statistically significant. This means that visitor satisfaction is more strongly correlated with park maintenance than it is with park information, park facilities, parking, and the natural setting of parks. The size of the park does not appear to be important to visitor satisfaction with park management.

Visitor's satisfaction with park management is not a function of the type of park: The correlations are the same whether the park is a river, lake, coastal, or forest. Responses collected at multiple sites yield similar results to those collected at a single site. Moreover, there is no difference between on-site surveys and mailback surveys.

5 Conclusion

This study applied meta-analysis to 32 empirical studies on park usage constraints and 20 empirical studies on park usage satisfaction. The studies are diverse, surveying people from different park settings, time periods, and different countries. From this analysis, we can reach several robust conclusions.

First, the literature has identified ten key constraints on park visitation: Time; health; transportation; cost; fear; knowledge; interest; facilities; partner; and location. There is potential for park agencies to be able to develop strategies that can overcome these constraints.

Second, the literature has identified five socio-demographic variables as playing an important role in park use constraints: Education; income; race; gender; and age.

Third, socio-demographic variables influence the degree to which the ten key constraints affect park usage. Specifically, education is an important factor in facilitating park use: Education relaxes park usage constraints. Income becomes more of a constraint only in terms of time, while it eases all other constraints. In contrast, females found nine of the ten factors to be important constraints to park usage. Age is an important factor in terms of health, fear, transportation and location, and partner, while race is important in terms of transportation, cost, fear, and knowledge.

Fourth, the most important factor in terms of park visitation appears to be time, with time being the most important factor in terms of income and the least important factor in terms of age.

Finally the analysis clearly shows that the management of park facilities increases user satisfaction and satisfaction with park management appears to have been increasing gradually over time. It has also been noted that visitor satisfaction is more strongly correlated with park maintenance than it is with park information, park facilities, parking, and the natural setting of parks. The size of the park does not appear to be important to visitor satisfaction with park management. Nor is visitor's satisfaction with park management a function of the type of park: The correlations are the same whether the park is a river, lake, coastal, or forest. There is a significant correlation between visitor satisfaction and park management in the US and this is larger in the US than it is in the rest of the world.

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Appendix B: Studies Included in the Satisfaction Meta-Analysis

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