Results of Search for Prior Studies on Methodologies, Methods, and Techniques for Identifying and Ranking Sustainable Transport Practices in Urban Regions

INTERIM REPORT 4

Transport Canada Project

Methodologies for Identifying and Ranking Sustainable Transport Practices in Urban Regions

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1. Background and Context

The purpose of the research undertaken for Interim Report 4 is contained in the following section from the project's first posted document, ***Methodologies for Identifying and Ranking Sustainable Transport Practices in Urban Regions: Synopsis Report* (Wellar, 2008d)**.

> The body of work proposed for the project entails several inter-related elements which are summarized as follows:
>
> A comprehensive literature search and review of the state of the art/science in the design and application of methodologies for identifying and ranking sustainable transport practices in urban regions.
>
> The literature search and review will be international in scope, and although additional literatures may be examined over the course of the project, the bodies of literature that appear most pertinent at this time are: the learned literature (journals and proceedings), professional literature (transportation, planning, engineering), interest group literature (public and vested for all modes of transport), popular literature (newspapers, magazines, newsletters, television and radio), and, in order to tap as many sources as finances and time permit, a keyword-based search of Internet websites.
>
> The partial list of issues is indicative of the project's scope and direction, and of the methodological concerns associated with the derivation of 'best practices'.
>
> - Establishing whether precedent inquiries similar to or related to this study have been done, and relate any such inquiries to the specifics of this project.
>
> - Consulting with experts and practitioners to prioritize the literatures to be searched and reviewed.
>
> - Designing an algorithm to optimize the keyword-based search and review procedure that will be applied to Internet websites.

A primary reason to search for and review prior studies is to ascertain whether an ***exploratory*** or a ***confirmatory*** research design is appropriate for a given project. To summarize the essential concern or objective about specifying the research design, there are major differences between the exploratory and confirmatory approaches, and many of those differences have their origins in the state of knowledge regarding the research question, issue, or problem under study.

This important topic is given detailed attention in a number of publications, as is the related distinction between *discovery* and *justification* as scientific contexts. The interested reader is referred to the texts by Babbie (1986), Bowler (1992), Hubbard (1973), Kaplan (1964), Miller

(1970), Nachmias and Nachmias (1987), Northrop (1959), Simon (1978), Walizer and Wienir (1978), Wellar (2005), and Wellar and Wilson (1994) for detailed discussions of the materials that follow.

The possible outcomes of the search and their implications for the design of this project include the following:

1. If no prior studies are located, then an exploratory (research) design is appropriate;

2. If exploratory studies have been undertaken, a further exploratory study could be appropriate;

3. If exploratory studies have been undertaken, a confirmatory (research) design could be appropriate;

4. If exploratory studies have been undertaken, a mixed exploratory-confirmatory design could be appropriate;

5. If confirmatory studies have been undertaken, an exploratory design could be appropriate;

6. If confirmatory studies have been undertaken, a confirmatory design could be appropriate;

7. If confirmatory studies have been undertaken, a mixed exploratory-confirmatory design could be appropriate.

In regard to how the search for precedent research and documentation is to be undertaken, the general guidelines are summarized by Task 2 in ***Methodologies for Identifying and Ranking Sustainable Transport Practices in Urban Regions: Synopsis Report*** **(Wellar, 2008d)**.

> ***Task 2 –*** By means of Internet searches and communications with experts and practitioners, ascertain whether precedent studies have been done, and, if so, reconcile that work with the work of this project.

The purpose of this element of the project, therefore, is to search for precedent work, and to design the research approach for this study accordingly.

2. Designing the Search for Precedent Studies

For this project, two means of inquiring about prior studies were proposed by the Principal Investigator and accepted by the client (Transport Canada):

1. Conduct a keyword-based, electronic search of pertinent literatures for articles and reports on precedent studies;

2. Contact experts and practitioners via conferences, association listserves, interest group listserves, general listserves, and personal and professional contact lists, and seek information on precedent studies that they have conducted, contributed to, or know about in conjunction with research, teaching, public policy, public programs, public plans, business initiatives, consulting, or other activities.

In the interests of explicitness, it is noted that the Principal Investigator and the client (Transport Canada) are aware that not all hard copy materials are accessible by electronic means; however, that avenue was not selected for this study due to the limit on time that the Principal Investigator could allocate to this project, and the large cost that would have to be borne by the client.

That said, the involvement of experts and practitioners is an aspect of research design that is intended to increase the likelihood that important precedent works are not missed. In brief, information about the search for precedent studies has been made known in Canada and internationally to many hundreds of government agencies, private corporations, associations, professional groups, and research interests, and to many thousands of individuals engaged in sustainable transport activities. It therefore seems highly likely that if there have been prior studies on methodologies, methods and techniques for identifying and ranking sustainable transport practices in urban regions, someone amongst all those contacted would bring the study or studies and the documentation to my attention.

3. Electronic, Keyword-Based Search for Prior Studies

A prior sustainable transport study conducted by the Principal Investigator (Wellar, 2006) included a keyword-based, Google search, and a selection of pages from the project report are included here because the design of Interim Report 4 builds on lessons learned from the prior experience.

In the prior study, care was taken to ensure that when the Google search was completed, popularity would not be confused with substance. The following excerpts of text and Table 1 (Table 2 in the original report) summarize how the distinction between popularity and substance was achieved, and why the prior report (Wellar, 2006) concluded that insofar as actually achieving sustainable transport practices is concerned, exhortation overwhelms demonstration in Canada.

> For this Google search…about 75 terms are combined with “sustainable transport” to achieve a sense of their relative popularity when used as keywords. Several aspects of Table 1 require clarification, however, to ensure that popularity is not confused with substance.

First, it has become commonplace for researchers, elected officials, members of the media, and ordinary citizens to "drop" high-sounding terms into statements that get published, but which do not include instructions or information on how to apply the terms in non-trivial, sustainable transport situations. Particularly troublesome is the widespread use of such terms as impact assessment, multivariate, index, performance indicators, and optimize, which are among those shown in italics in Table 1.

All the italicized terms necessitate sophisticated research methods, techniques and operations in order for their application in real-world situations to satisfy conditions of robustness, validity, and reproducibility. In the vast majority of Google results, the words are not accompanied by explanations of how they contribute to achieving sustainable transport practices.

Second, linking the bolded terms in Table 1 reveals that there is considerable superficiality or "inflation" in much of the proclaiming about sustainable transport initiatives. As shown in Table 1, the results for the individual, bold-face keywords show a seeming abundance of pertinent pages. That is, when combined with "sustainable transport" the search results are 1,020,000 for impact assessment; 539,000 for results; 323,000 for application; 23,000 for modal shift; and 12,000 for multivariate.

The utility of the Google search procedure for this project, however, is not its capacity to generate hits simply because a keyword appears on a page. Rather, its value resides in the functionality of creating strings of keywords that get past the popularity factor, and allow the analysis to probe the materials in a search for substance.

This point is demonstrated by the last entry in Table 1. When the individual, bolded terms are combined into a string of keywords, the net result is a very short list of just 139 pages -- pages, not reports -- that are likely to have even potential pertinence for a report on the state of sustainable transport practices in Canada.

To return to the exhortation and demonstration classes to which the results are assigned for this paper, the message from the Google search is clear.

That is, while the topic of sustainable transport is popular in Canada, in excess of 99.9 per cent of the references electronically accessed by Google are of the exhortation variety. Seemingly, only a small proportion of the webpages identified by the selected keywords actually have even the potential to demonstrate the achievement of real-world, sustainable transport practices in Canada.

Table 1. Results from a Keyword-Based Google Search to Ascertain the Popularity of Selected Topics Associated with "Sustainable Transport in Canada"*

Search Keywords and Domain (The Google searches are limited to 'pages from Canada')	Number of Pages Containing Search Keywords (Searches done in March, 2006)
Sustainable transport	1,610,000
+ programs	1,280,000
+ issues	1,070,000
+ impact assessment	***1,020,000***
+ policy	701,000
+ measurement tools	658,000
+ infrastructure	611,000
+ adoption rates	538,000
+ reviews	614,000
+ practices	**592,000**
+ action	586,000
+ groups	560,000
+ **results**	**539,000**
+ organizations	524,000
+ plans	522,000
+ cause	500,000
+ analysis	472,000
+ strategy	471,000
+ implementation	448,000
+ *statistics*	*432,000*
+ relationship(s)	414,000
+ budget	408,000
+ objectives	393,000
+ rail	383,000
+ *index*	*359,000*
+ evaluation	329,000
+ application	**323,000**
+ methods	311,000
+ priorities	311,000
+ improvements	310,000
+ test	302,000
+ conflicts	270,000
+ indicators	256,000
+ transit	249,000
+ solution	247,000
+ evidence + achieved adoption rates	246,000
+ cycle	229,000
+ models	229,000
+ findings	223,000
+ geographic	214,000

Table 1. (Continued) Results from a Keyword-Based Google Search to Ascertain the Popularity of Selected Topics Associated with "Sustainable Transport in Canada"*

Search Keywords and Domain (The Google searches are limited to 'pages from Canada')	Number of Pages Containing Search Keywords (Searches done in March, 2006)
Sustainable transport	
+ *performance indicators*	*208,000*
+ facts	206,000
+ measurement	185,000
+ modes	170,000
+ budget	170,000
+ *parameters*	*162,000*
+ demonstration project	153,000
+ measurement	151,000
+ *theories*	*147,000*
+ walk	141,000
+ *methodology*	*139,000*
+ definition	131,000
+ demonstration	130,000
+ variables	125,000
+ achievements	119,000
+ spatial	118,000
+ automobile	111,000
+ *lifecycle cost*	*108,000*
+ lifecycle benefit	102,000
+ empirical evidence	88,000
+ *optimize*	*83,000*
+ correlation	66,000
+ dependency	64,000
+ validation	59,400
+ truck	53,000
+ externalities	29,000
+ modal shift	**23,000**
+ propensity	22,000
+ impact assessment + multivariate	**16,000**
+ achieved modal shift	**15,000**
+ **multivariate**	**12,000**
+ comparative analysis + modal shift + achieved	964
+ impact assessment + multivariate + applied practice + achieved results	862
+ confirmed modal shift	655
+ modal split shifts	531
+ cause-effect	521
+ **impact assessment + modal shift + multivariate + applied practice + achieved results**	**139**

* Entries in italics are among those frequently "dropped" into materials, and those in bold illustrate how large numbers of hits for individual terms can be drastically reduced when the keywords are combined in a directive procedure.

The prior Google search seems to have left few stones unturned when it came to the bounty of materials produced in the name of sustainable transport, and Google obviously provided access to a multiplicity of sources. The first lesson learned, therefore, is that in regard to becoming apprised about materials in digital form, it is appropriate to look to the Google search capability to inquire about individuals and agencies producing documents on sustainable transport topics, and on the topic of sustainable transport practices in particular.

As for the second lesson, the results shown reveal that Google can paint with an extremely broad brush. Consequently, diligence is required to move beyond the merely popular results to those that are substantively pertinent. Using strings of terms is one way to "fine tune" the search.

The present project builds on the lessons learned from the prior study, including the re-use of some of the terms to be used in the Google searches. It is emphasized, however, that this Google search is much more directive with its emphasis on finding reports on previous studies that provide information about the methodologies, methods, and techniques used in identifying, adopting, and implementing sustainable transport practices. Or, to re-state, and bearing in mind that the earlier search revealed a great deal of talk and very little action in Canada when it comes to achieving sustainable transport practices, the bar is being raised for this Google search because the quest is expanded to locate materials from previous studies done anywhere that document the bases for identifying, adopting and implementing sustainable transport practices, and which are reported on a webpage.

Table 2 contains the phrases used in the keyword search, and the results for the respective phrases. A two-fold approach is used. For the first approach, the phrase consists of a set of terms which are combined to locate webpages in which all the terms appear, regardless of order or overall meaning. For the second approach the same phrases are used, but the search engine locates only webpages in which the phrase appears exactly as it is specified. While the primary interest of this project is in the results from the second approach, the results from the first approach provide useful context information, and also serve an indicative purpose should there be a follow-on study to examine these findings using different numbers of terms.

The search activity commenced in September, 2008 based on the possibility that pertinent studies could be quickly located, and could provide instruction as to whether an exploratory, confirmatory, or mixed research design would be appropriate for this project. No such studies were located, and the final search using all the keyword phrases was executed November 21 and 22, 2008. Due to the emphasis in Interim Report 4 on the process of achieving practices (identifying, adopting, implementing), a similar style is applied for the Google search by using corresponding verb forms, that is, gerundives. Further, a noun format rather than a verb format is used for cases where prior research suggests that the verb-noun variation approach could produce a different finding.

It is emphasized as a final context point that the Google search procedure used here is designed for this project. I suggest that the keyword phrases could be the basis of very significant thesis topics, and graduate students are invited to consider how the keywords could be used as the basis of thesis research problems.

Table 2. Results from a Keyword-Based Google Search for Prior Studies on Methodologies, Methods and Techniques for Identifying and Ranking Sustainable Transport Practices in Urban Regions
(Results from Google searches on November 21 and 22, 2008)

Keyword Phrase	Results ('Hits')
sustainable transport practices	5, 340, 000
"sustainable transport practices"	156
sustainable transport evidence	438,000
"sustainable transport evidence"	1
sustainable transport measures	660,000
"sustainable transport measures"	7,300
sustainable transport practice evidence	2, 800,000
"sustainable transport practice evidence"	**No results**
sustainable transport practices evidence	452,000
"sustainable transport practices evidence"	**No results**
identifying sustainable transport practices	523,000
"identifying sustainable transport practices"	3
adopting sustainable transport practices	451,000
"adopting sustainable transport practices"	2
implementing sustainable transport practices	402, 000
"implementing sustainable transport practices"	22
analyzing sustainable transport practices	521, 000
"analyzing sustainable transport practices"	**No results**
sustainable transport practice analysis	554, 000
"sustainable transport practice analysis"	**No results**
approving sustainable transport practices	413,000
"approving sustainable transport practices"	**No results**
sustainable transport practices approval	468,000
"sustainable transport practices approval"	**No results**
assessing sustainable transport practices	580,00
"assessing sustainable transport practices"	**No results**
sustainable transport practices assessment	374,000
"sustainable transport practices assessment"	**No results**

Table 2. (Continued) Results from a Keyword-Based Google Search for Prior Studies on Methodologies, Methods and Techniques for Identifying and Ranking Sustainable Transport Practices in Urban Regions
(Results from Google searches on November 21 and 22, 2008)

Keyword Phrase	Results ('Hits')
comparing sustainable transport practices	3, 150,000
"comparing sustainable transport practices"	**No results**
sustainable transport practices comparison	379,000
"sustainable transport practices comparison"	**No results**
costing sustainable transport practices	3,500,000
"costing sustainable transport practices"	**No results**
defining sustainable transport practices	3, 060, 000
"defining sustainable transport practices"	**No results**
designing sustainable transport practices	3,730,000
"designing sustainable transport practices"	**No results**
sustainable transport practices design	643,000
"sustainable transport practices design"	**No results**
deriving sustainable transport practices	228,000
"deriving sustainable transport practices"	**No results**
evaluating sustainable transport practices	3, 320,000
"evaluating sustainable transport practices"	**No results**
sustainable transport practices evaluation	457,000
"sustainable transport practices evaluation"	**No results**
indexing sustainable transport practices	3, 430, 000
"indexing sustainable transport practices"	**No results**
sustainable transport practices index	547,000
"sustainable transport practices index"	**No results**
indicating sustainable transport practices	365,000
"indicating sustainable transport practices"	**No results**
sustainable transport practice indicators	348,00
"sustainable transport practice indicators"	**No results**
sustainable transport practices indicators	442,000
"sustainable transport practices indicators"	**No results**
measuring sustainable transport practices	2, 460, 000
"measuring sustainable transport practices"	3
sustainable transport practices measures	674,000
"sustainable transport practices measures"	**No results**

Table 2. (Continued) Results from a Keyword-Based Google Search for Prior Studies on Methodologies, Methods and Techniques for Identifying and Ranking Sustainable Transport Practices in Urban Regions
(Results from Google searches on November 21 and 22, 2008)

Keyword Phrase	Results ('Hits')
prioritizing sustainable transport practices	1, 480, 000
"prioritizing sustainable transport practices"	**No results**
sustainable transport practices priority	23
"sustainable transport practices priority"	**No results**
ranking sustainable transport practices	2,500,000
"ranking sustainable transport practices"	55
sustainable transport practices rank	293,00
"sustainable transport practices rank"	**No results**
rating sustainable transport practices	5, 460,000
"rating sustainable transport practices"	**No results**
sustainable transport practices rating	5,740,000
"sustainable transport practices rating"	**No results**
reviewing sustainable transport practices	577,000
"reviewing sustainable transport practices"	**No results**
scaling sustainable transport practices	494,000
"scaling sustainable transport practices"	**No results**
scoring sustainable transport practices	243,000
"scoring sustainable transport practices"	**No results**
sustainable transport practices score	2,170,000
"sustainable transport practices score"	1
selecting sustainable transport practices	3,310,000
"selecting sustainable transport practices"	**No results**
testing sustainable transport practices	495,000
"testing sustainable transport practices"	**No results**
valuing sustainable transport practices	3, 450,000
"valuing sustainable transport practices"	**No results**
weighting sustainable transport practices	380,000
"weighting sustainable transport practices"	**No results**
sustainable transport practices weight	401,000
"sustainable transport practices weight"	**No results**

Examination of the results from what appears to be a thorough search procedure leads me to conclude that the results do not provide even an indicative, much less a well-worn research path to follow. A key point of information about the limited utility of the results is provided by the hits for the two formats. That is, when the unspecified format (first approach) is used, the results of the Google search in all cases number in the hundreds of thousands up to the millions. However, when the specified format (second approach) is used, the most common outcome is **No results**. This is a revealing and instructive difference for a methodology-based inquiry, and the implications of the difference can be summarized as follows.

With regard to the unspecified search format, many webpages contain various arrangements of the terms contained in the keyword phrases. However, for this client-driven project, the objective is to locate studies that directly and immediately lend themselves to the design of a body of directed research. No studies of that nature were located, although I hasten to note that it is possible that a search employing more resources (and having more time) could find such materials.

I therefore invite others who may be curious about using term variations to look for materials that I missed, and I also invite the author(s) of such materials to bring the pertinent webpage(s) and website(s) to my attention.

As for the specified formats (identified by quotation marks), they represent the terms and the order of terms which in the opinion of the Principal Investigator are most likely to locate prior studies which are directly and immediately pertinent to this project. Consequently, this part of the search is of primary importance for the reasons given above; that is, there is neither time nor resources to review many thousands of webpages in the search for one, two, a dozen, or several dozen that might be useful to the design of this study, and the project outcome. Hence, there is deep interest in locating pertinent materials via the specified keyword phrases, because the phrases represent fundamental, generic features of research design, and any located materials could most likely be readily incorporated into the design of the project, and into the tasks and outcomes of the research process.

Perhaps the most striking feature of Table 2 is the frequent appearance of **No results** in the second column. The specified format (identified by the quotation marks) is used for 45 keyword phrases, and on 36 occasions the search yielded No Results**.** Again, it is possible that Google searching was not thorough, and that pertinent materials were missed.

Consequently, for the No results entries, the same invitation presented above is repeated, and the author(s) of materials that have been assigned to the No results bin are requested to bring the pertinent webpage(s) and website(s) to my attention.

For the keyword phrases which did yield Google search procedure results, they appear to fall into four categories.

A. The phrases are used in webpage texts, but they do not actually involve presenting or discussing methodologies, methods, or techniques. Simply put, they apparently just happen to be there, sometimes seemingly as filler, and

sometimes seemingly as "bait" or "hooks" to have items receive search engine attention, but they have no contribution to make to this project.

B. The phrases are used in an exhortative rather than a demonstrative manner, whereby the author or originator calls for or wishes for something to occur; however, the materials do not contain evidence of anything actually having been done, or of any lessons learned, and as a consequence do not provide substantive advice which can be used with confidence in this project.

C. Some results locate webpages which report on materials that contain bits-and-pieces or segments of the research that is being undertaken in this project, but I did not locate any prior study that could serve as a precedent or a guide for the research design of this project. I hasten to add, however, that the webpages located by the Google search could be useful in discussions of particular methodologies, methods, or techniques.

D. Some of the results refer to webpages containing materials associated with this Transport Canada project, including posted documents, association announcements, organization announcements, and listserve communications.

Those webpages are useful as means of disseminating information about the project, and in particular the nature of the research agenda, but they do not directly contribute to making an informed decision about pertinent, precedent studies that could be the basis for a confirmatory research design.

The general finding from the Google search, therefore, is that because no precedent study was located, an exploratory research design rather than a confirmatory research design is appropriate for this project.

4. Communications with Government and Non-Government Experts and Practitioners about Prior Studies

Not all published documents are available in digital form, which means that they are not candidates to be located during a Google search. Further, not all reports on research projects become part of the extant literature. As a result, government and non-government experts, and government and non-government practitioners, are a means of supplementing, complementing, and to some degree validating the Google search capability that was employed in developing Interim Report 4.

Efforts made to generate feedback from experts and practitioners on the research design, and to invite contributions to different parts of the project's body of work, included the following initiatives and activities:

- Contacting dozens of experts and practitioners from Canada and other countries by email. A list of contacted individuals is contained in an earlier report (Wellar, 2008) to illustrate the international scope of the feedback effort;

- Organizing and participating in sustainable transport sessions at international conferences (Association of American Geographers, 2008; Joint Congress, American Collegiate Schools of Planning-Association of European Schools of Planning, 2008);

- Keynote presentation at National TravelWise Association Conference in Belfast (Wellar, 2007), and presentations at the Walkabilty Seminar and Workshop, organized by the Region of Waterloo Pedestrian Charter Steering Committee (Wellar, 2008a, 2008c);

- Disseminating information about the project through listserves of academic, planning, and public interest groups, including: Canadian Association of Geographers; Planning Educators Electronic Mail Network; Transport 2000; and provincial planners' networks.

- Posting project materials and providing project materials to be posted on websites in Canada and abroad, including materials that specifically invite viewers to send information about their own prior studies, or studies that they are aware of, which deal with the topic of "methodologies, methods and techniques for identifying and ranking sustainable transport practices in urban regions".

As of this date (November 23, 2008), no materials have been received from experts or practitioners establishing that precedent studies have been undertaken. However, communications have been received from experts and practitioners attesting that they have not done and are not aware of a similar, precedent study which could provide a basis for considering a confirmatory research design as the appropriate approach for this project.

Communications will continue with experts and practitioners to the conclusion of the project, and the possibility remains that one or more of these individuals will recall or come upon a precedent study, and will bring it to my attention. However, until that information is brought to my attention, the study is proceeding on the understanding that the results of the Google search are not contradicted by experts and practitioners.

5. CONCLUSION

The reason for ascertaining whether precedent studies have been undertaken was stated in Section 1 as follows:

1. If no prior studies are located, then an exploratory (research) design is appropriate;

2. If exploratory studies have been undertaken, a further exploratory study could be appropriate;

3. If exploratory studies have been undertaken, a confirmatory (research) design could be appropriate;

4. If exploratory studies have been undertaken, a mixed exploratory-confirmatory design could be appropriate;

5. If confirmatory studies have been undertaken, an exploratory design could be appropriate;

6. If confirmatory studies have been undertaken, a confirmatory design could be appropriate;

7. If confirmatory studies have been undertaken, a mixed exploratory-confirmatory design could be appropriate.

Two means are used to learn whether precedent studies have been undertaken; that is, a Google search, and consultations and communications with experts and practitioners. Neither the Google search nor the communications with experts and practitioners yielded evidence of prior studies, and as a result the appropriate research design for this project is exploratory.

The project body of work also includes the following task, which was intended to provide direction should the Google search and communications with experts and practitioners reveal that a confirmatory research design is appropriate for the project:

> Consultation with experts and practitioners on the strengths and weaknesses of current methodologies for identifying and ranking or prioritizing sustainable transport practices in urban regions.

However, no current methodologies that are pertinent to this study were located via the Google search, or were suggested or proposed through communications with experts and practitioners. Consequently, since no information about precedent studies was obtained, the confirmatory research design is not appropriate. The project will therefore continue using the exploratory research design approach that was adopted in order to launch the study.

Finally, the body of work project anticipated that the Google search would yield a substantial number of results from the use of keyword phrases in the specified format. That is, the search identifies webpages containing the phrases exactly as they are specified for the search engine. The project task is as follows

> Designing an algorithm to optimize the keyword-based search and review procedure that will be applied to Internet websites.

This anticipated task became unnecessary because of the facts that: for most of the specified phrases (36 of 45) the Google search yielded no results; and, where results do appear they tend to number in the single-digits, or refer to materials of the Principal Investigator. That said, this task would likely be an instructive activity in Google search projects where the terms are used in an unspecified order, and the results are in the hundreds of thousands to millions.

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