



The Engineering Design Cycle

Research the Need
Gathering Information

Despite convenient and plentiful electronic sources of information, gathering and sorting through information can be an arduous and time consuming process.

Gathering
Information
during the

*Research
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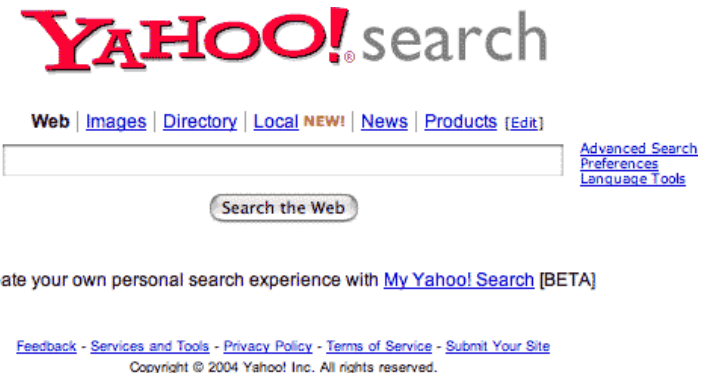
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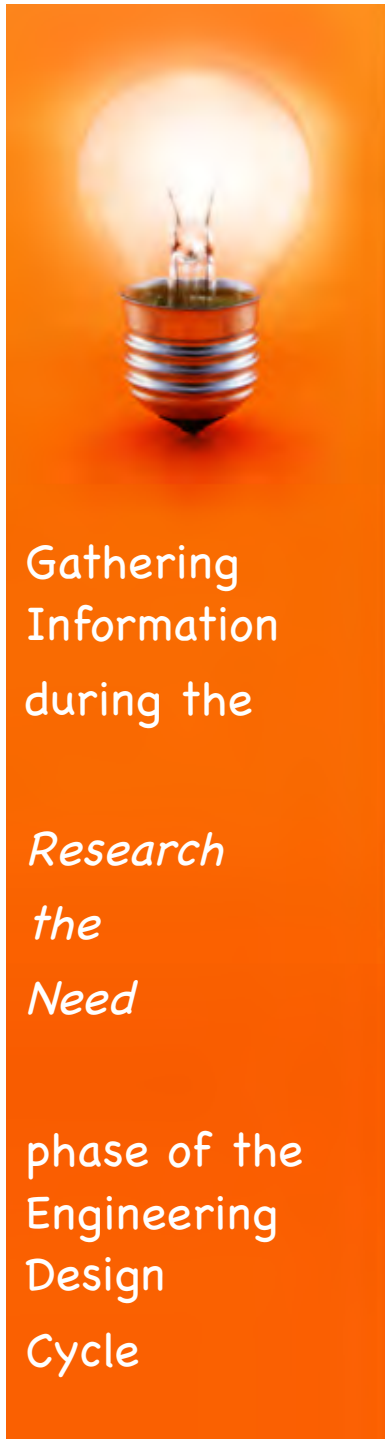
Web Searches: Good or Bad?

While the information on websites is often questionable and its credibility hard to establish, Google (and related) searches can be an excellent first step in:

- Identifying the kind of information that can justify "the need"
- Capturing and culling keywords that can be used in more consistent databases of information (such as the peer reviewed literature)
- Locating existing products that meet "the need" or identifying existing solutions to "the problem"



Google (and other web searches) can't be the only place used to Research the Need, but the web can be a great first place to look!



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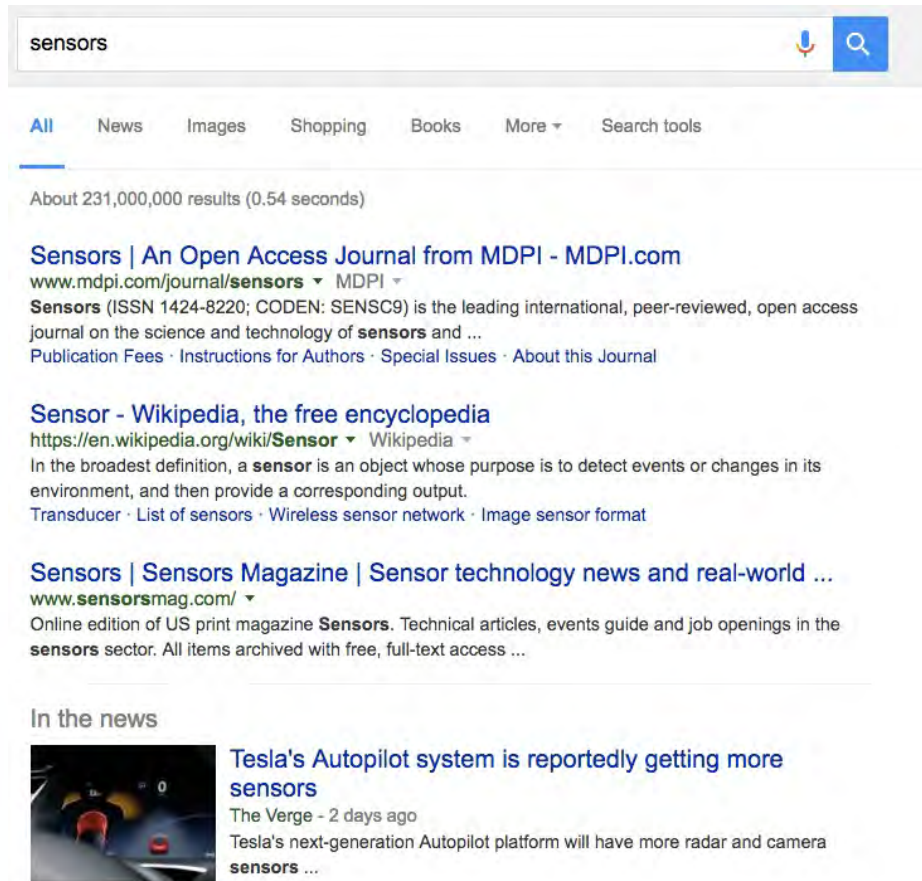
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Efficient Web Searches

More keywords are better!

Searching "sensors" gives broad results, many which are not relevant



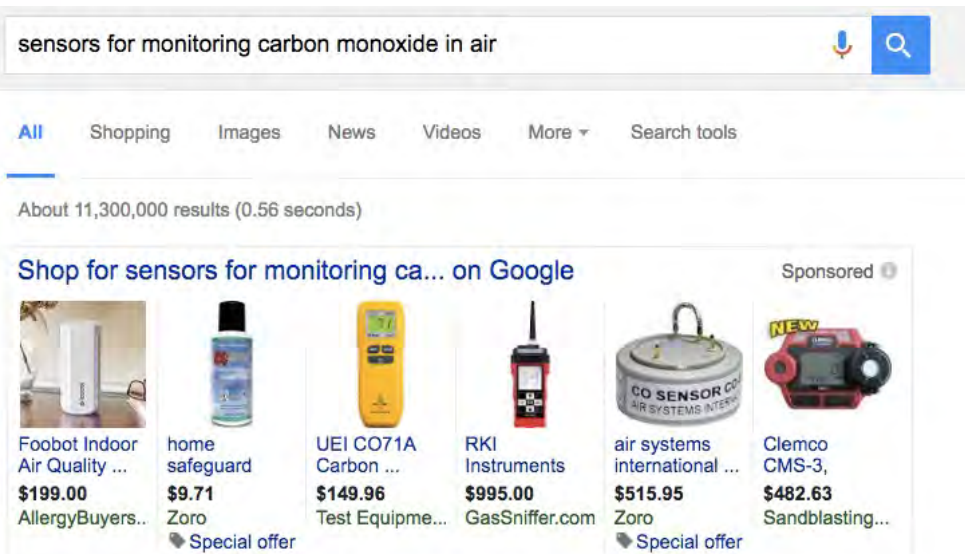
In general, when doing web searches, the more information provided for the search, the more relevant the results will be.

Efficient Web Searches

More keywords are better!

Searching "sensors" gives broad results, many which are not relevant

Searching "sensors for monitoring carbon monoxide in air" – gives products and information much more relevant to a specific design



The screenshot shows a Google search interface. The search bar contains the text "sensors for monitoring carbon monoxide in air". Below the search bar, there are tabs for "All", "Shopping", "Images", "News", "Videos", "More", and "Search tools". The "All" tab is selected. Below the tabs, it says "About 11,300,000 results (0.56 seconds)". A section titled "Shop for sensors for monitoring ca... on Google" displays six sponsored product listings. Each listing includes an image of the product, its name, and its price. The products are: Foobot Indoor Air Quality (\$199.00), home safeguard (\$9.71), UEI CO71A Carbon (\$149.96), RKI Instruments (\$995.00), air systems international (\$515.95), and Clemco CMS-3 (\$482.63). Below the sponsored results, there is an advertisement for "Carbon Monoxide Sensors - rkiinstruments.com" which describes the company as a leading manufacturer of reliable and advanced gas detectors. The ad lists products like portable monitors, fixed systems, and calibration equipment, and mentions solutions for mining, biogas monitoring, marine, confined space, and fire/hazmat. Below the ad, there is a link to "CO2 Meter | Carbon Dioxide Meters, Sensors, Monitors, Data Loggers ..." from www.co2meter.com/.

Product	Price
Foobot Indoor Air Quality ...	\$199.00
home safeguard	\$9.71
UEI CO71A Carbon ...	\$149.96
RKI Instruments	\$995.00
air systems international ...	\$515.95
Clemco CMS-3,	\$482.63

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Efficient Web Searches

Search for either one word or another

Google automatically assumes there is an "and" between words and seeks results that contains all the words you specify.

Shop for carbon monoxide ethano... on Google Sponsored

		
Adafruit MiCS5524 CO, Alcohol and VOC Gas ... \$14.95 Adafruit Industries	Carbon Monoxide Sensor - MQ-7 \$7.25 Karlsson Robotics	First Alert SCO403 Carbon Monoxide and Smoke ... \$20.29 Walmart

Carbon Monoxide Sensors - Portable And Fixed Gas Detectors

Ad www.rkiinstruments.com/CO-Sensors/

70+ Year Gas Detection Tech Leader!

Technical Services · Long Lasting & Easy Use · Leader in Gas Detection · Monitor 6+ Gases

Products: Portable Monitors, Fixed Systems, Calibration Equipment, Specialty Instruments...

Can Alcohol vapors affect electrochemical CO sensors? | GfG ...

goodforgas.com/the-response-of-alcohol-vapors-on-electrochemical-co-sensors/

Jul 23, 2014 - I am wondering if **alcohol** vapor can trigger **CO sensors**? Answer: All electrochemical **CO sensors**, regardless of the brand or model, respond to ...

Why is hydrogen such a big issue for CO sensors? | GfG Instrumentation

goodforgas.com/why-is-hydrogen-such-a-big-issue-for-co-sensors/

Oct 27, 2014 - However, the hydrogen leak mostly affected the **CO**. ... For instance, **carbon monoxide sensors** that do not include a filter are sometimes **sensor** for the measurement of **CO** and H₂S to 5% volume (= 50,000 ppm) **ethanol**.

A search for "carbon monoxide ethanol sensors" looks only for sensors that do both!

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Efficient Web Searches

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Shop for carbon monoxide sensor on Google

Product	Price	Store
Nest - Protect - V2 - White - ...	\$99.00	Google Store
Honeywell E3Point ...	\$472.00	GasSniffer.com
USI Carbon Monoxide ...	\$20.99	Groupon.com
BW Honeywell GasAlert ...	\$244.00	GasSniffer.com
Nest - Protect - V2 - White - ...	\$99.00	Google Store
First Alert Battery ...	\$14.19	Target

Sponsored ⓘ

★★★★☆ (58)

Carbon Monoxide Sensors - rkiinstruments.com

Ad www.rkiinstruments.com/CO-Sensors

Leading Manufacturer of Reliable & Advanced Gas Detectors. Call Now!

Products: Portable Monitors, Fixed Systems, Calibration Equipment, Specialty Instruments

Solutions: Mining, Biogas Monitoring, Marine, Confined Space, Fire/Hazmat

Carbon Monoxide Sensor - dwyer-inst.com

Ad www.dwyer-inst.com/

Long Lasting, Industrial Sensor For Parking Garages & Loading Docks

Types: Model CDD, Series CDT, Series CDTR, Series CDW2...

Catalog · Contact Us

Carbon Monoxide Alarms - Fire Safety - The Home Depot

www.homedepot.com/...Carbon-Monoxide-Alarms/N-5yc1vZbmngk The Home Depot

Kidde Plug In Carbon Monoxide Alarm with Battery Back-Up. ... Kidde Worry Free 10-Year Lithium Ion

Battery Operated Carbon Monoxide Alarm. ... Universal Security Instruments AC Hardwired Iophic

Smoke/Fire Carbon Monoxide and Natural Gas Alarm with Battery Backup.

Code One Battery Operated ... · Kidde · Battery · Carbon Monoxide

Carbon Monoxide Sensor - MQ-7 - SEN-09403 - SparkFun Electronics

<https://www.sparkfun.com/products/9403> SparkFun Electronics

Description: This is a simple-to-use Carbon Monoxide (CO) sensor, suitable for sensing CO concentrations in the air. The MQ-7 can detect CO-gas ...

A search for "carbon monoxide sensors" gives us what we are looking for. A separate search on ethanol sensors can complement this search to provide information on both types of sensors.

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Efficient Web Searches

Filter out distracting or irrelevant words

Use the – sign to indicate words that you don't want to include in a search. For example, if you want to look up "bass guitar" – you may find yourself in a sea of websites on fish.

Bass Pro Shops: The Best Hunting, Fishing, Camping & Outdoor Gear

www.basspro.com/ ▾ Bass Pro Shops ▾

Your Adventure Starts Here! Find gear for Fishing, Boating, Hunting, Camping, and much more at **Bass** Pro Shops.

[Fishing](#) · [Shooting](#) · [Boating](#) · [Clothing](#)

Images for bass

[Report images](#)



[More images for bass](#)

Bassmaster

<https://www.bassmaster.com/> ▾ Bassmaster Classic ▾

Small spots, low light, big **bass**. Recently I was asked about a couple of theories or ideas advanced in a new book by Josh Alwine titled, High Percentage ...

Bass - Wikipedia, the free encyclopedia


<https://en.wikipedia.org/wiki/Bass> ▾ Wikipedia ▾

Bass or Bases may refer to: Fish[edit]. **Bass** (fish), various freshwater and saltwater species; **Bass** Anglers Sportsman Society (**B.A.S.S.**). Music[edit].
[Bass \(fish\)](#) · [Bass \(sound\)](#) · [Bass \(instrument\)](#) · [Bass guitar](#)

Bass Guitars | Guitar Center

www.guitarcenter.com/Bass.gc ▾ Guitar Center ▾

Results 1 - 20 of 2456 - Enjoy the lowest prices and best selection of **Bass** at Guitar Center. Most orders are eligible for free shipping.



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Filter out distracting or irrelevant words

Use the – sign to indicate words that you don't want to include in a search. For example, if you want to look up "bass guitar" – but avoid fish, try "bass –fish"

G.H. Bass & Co. - Makers of Weejuns, the original penny loafer

<https://www.ghbass.com/> ▾

Shop G.H. **Bass** & Co. Men's Weejuns · Shop G.H. **Bass** & Co. Women's ... Men's Accessories · Shop G.H. **Bass** & Co. Weejuns · G.H. **Bass** Instagram · Weejuns.

Factory Outlet

Free shipping on orders of \$75+ at the G.H. Bass Factory Outlet ...

GH Bass

View All Shoes - Apparel - Men's Boaters - Sunjuns & Sandals - ...

G.H. Bass

View All Shoes - Sunjuns & Sandals - Oxfords & Flats - ...

[More results from ghbass.com »](#)

Men's Shoes On Clearance

... men's casual & dress shoes on sale at ... our men's shoe ...

Shoes

Shop G.H. Bass' collection of women's footwear & shoes for ...

Women's Shoes On Clearance

Shop classic women's shoes on clearance at the G.H. Bass ...

Bass Guitars | Guitar Center

www.guitarcenter.com/Bass.gc ▾ Guitar Center ▾

Results 1 - 20 of 2456 - 4 String Electric **Bass**. ... ESP LTD B-205SM 5-string Electric **Bass** Guitar Satin Natural NOW \$499. ... Ibanez SR370EF 4-String Fretless Electric **Bass** Brown Burst NOW \$400.

Un4seen Developments - 2MIDI / BASS / MID2XM / MO3 / XM-EXE ...

www.un4seen.com/ ▾

These pages are dedicated to bringing you some fine audio related software, with the focus on quality and efficiency. Including the XMPlay audio player, the ...

Discount Bass Shoes, Sandals, Oxfords on Sale | 6pm.com

www.6pm.com/bass ▾ 6pm.com ▾

Bass® is a leading provider of classic footwear for men and women that work with their contemporary lifestyle. ... Enjoy their timeless appeal by making **Bass** classics an integral part of your shoe wardrobe. **Bass** shoes - classic yet contemporary footwear.



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Efficient Web Searches

Forage for the best keywords

Use similar words to describe what you are searching for and identify those keywords that are more productive than others. Here a search for sustainability yields results that are too broad!

About 3,030,000 results (0.05 sec)

Asset stock accumulation and **sustainability of competitive advantage**
I Dierickx, K Cool - Management science, 1989 - pubsonline.informs.org
Given incomplete factor markets, appropriate time paths of flow variables must be chosen to build required stocks of assets. That is, critical resources are accumulated rather than acquired in "strategic factor markets"(Barney (Barney, J. 1986. Strategic factor markets: ...
Cited by 9513 Related articles All 25 versions Cite Save More

[HTML] **Towards life cycle **sustainability** assessment**
M Finkbeiner, EM Schau, A Lehmann, M Traverso - Sustainability, 2010 - mdpi.com
Abstract: **Sustainability** is nowadays accepted by all stakeholders as a guiding principle for both public policy making and corporate strategies. However, the biggest challenge for most organizations remains in the real and substantial implementation of the **sustainability** ...
Cited by 197 Related articles All 16 versions Cite Save More

[book] **Ecological economics: the science and management of **sustainability****
R Costanza - 1992 - books.google.com
In the 1930s a band of smart and able young men, some still in their twenties, helped Franklin D. Roosevelt transform an American nation in crisis. They were the junior officers of the New Deal. Thomas G. Corcoran, Benjamin V. Cohen, William O. Douglas, Abe Fortas, ...
Cited by 2030 Related articles All 19 versions Cite Save More

Sustainability science
RW Kates, WC Clark, R Corell, JM Hall... - ..., 2001 - science.sciencemag.org
Summary Meeting fundamental human needs while preserving Earth's life support systems will require an accelerated transition toward **sustainability**. A new field of **sustainability** science is emerging that seeks to understand the fundamental character of interactions ...
Cited by 2261 Related articles All 26 versions Cite Save More

Agricultural **sustainability and intensive production practices**
D Tilman, KG Cassman, PA Matson, R Naylor... - Nature, 2002 - nature.com
Abstract A doubling in global food demand projected for the next 50 years poses huge challenges for the **sustainability** both of food production and of terrestrial and aquatic ecosystems and the services they provide to society. Agriculturalists are the principal ...
Cited by 3385 Related articles All 53 versions Cite Save

[CITATION] **Sustainability** marketing: A global perspective
FM Belz, K Peattie - 2009 - Wiley
Cited by 480 Related articles Cite Save More

[PDF] **Productivity and **sustainability** influenced by biodiversity in grassland ecosystems**
D Tilman, D Wedin, J Knops - Nature, 1996 - zhijuan.sjtu.edu.cn
THE functioning and **sustainability** of ecosystems may depend on their biological diversity"



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Efficient Web Searches

Forage for the best
keywords

Use similar words to
describe what you are
searching for and
identify those
keywords that are
more productive than
others. Here
narrowing the search
to sustainable
development gives us
more of what we
want.

Sustainable technology development

[P Weaver](#) - 2000 - [ethics.iit.edu](#)

... Abstract, The author describes a Dutch program on **sustainable technology** development that was carried out in the early 1990s that started out by asking the question, "what would it take for the Netherlands to have an **environmentally sustainable** economy in a world that was ...

Cited by 443 Related articles All 2 versions Cite Save More

Information systems and **environmentally sustainable** development: energy informatics and new directions for the IS community

[RT Watson](#), [MC Boudreau](#), [AJ Chen](#) - MIS quarterly, 2010 - JSTOR

... **Environmentally sustainable** development is the foremost ... has world opinion been so united on a single goal as it is on achieving **sustainable** development" (Amy ... IS leaders took heed, and CIOs recently singled out "Green IT" as the most important strategic **technology** for 2008 ...

Cited by 620 Related articles All 12 versions Cite Save

[CITATION] Transforming **technology**: an agenda for **environmentally sustainable** growth in the 21st century.

[G Heaton](#), [R Repetto](#), [R Sobin](#) - 1991 - [sidalc.net](#)

... Autor: Heaton, G.; Repetto, R.; Sobin, R. Aut.Corporativo: World Resources Inst., Washington, DC (EUA). Título: Transforming **technology**: an agenda for **environmentally sustainable** growth in the 21st century. Idioma: En. P. imprenta: Washington, DC (EUA). 1991. 39 p.. ...

Cited by 70 Related articles All 4 versions Cite Save More

Wood/polymer/nanoclay composites, **environmentally** friendly **sustainable technology**: A review

[M Hetzer](#), [D De Kee](#) - Chemical engineering research and design, 2008 - Elsevier

Thermoplastic composites play an important role in our society, as uses of such composites range from cookware to components of the space shuttle. In the early 1990s, Toyota researchers produced a new group of polymer-clay composites which were termed polymer-layered silicate ...

Cited by 65 Related articles All 6 versions Cite Save

[PDF] Dimensions of **environmentally sustainable** innovation: the structure of eco-innovation concepts

[T Hellstrom](#) - **SUSTAINABLE DEVELOPMENT**-BRADFORD-, 2007 - [researchgate.net](#)

... ABSTRACT The present study analyses **environmentally sustainable** innovation, or eco-innovation for short, from the perspective of extant theories of ... radical-architectural modes of eco-innovation, eg the tendency to combine 'hard- ware' and 'software', or **technology** and social ...

Cited by 165 Related articles All 6 versions Cite Save More

Determinants of market competitiveness in an **environmentally sustainable** tourism industry

[SS Hassan](#) - Journal of travel research, 2000 - [jtr.sagepub.com](#)



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Efficient Web Searches

Search for similar web pages:

By using the related query

related:http://www.nationalgeographic.com

related: http://www.analog.com

All Videos News Images Shopping More Search tools

About 29,100,000 results (0.78 seconds)

Showing results for related: <http://www.analog.com>
Search instead for related: <http://www.analog.com>

Analog Devices: Mixed-signal and digital signal processing ICs
www.analog.com/ ▾ Analog Devices ▾
Analog Devices is a world leader in the design and manufacture of **analog**, mixed-signal, and DSP integrated circuits used in all types of electronic equipment.

Careers | Analog Devices
www.analog.com/en/about-adi/careers.html ▾ Analog Devices ▾
Thank you for your interest in **Analog** Devices, Inc. (ADI). At ADI, we consider our employees to be our greatest competitive advantage. For nearly 50 year.

A/D Converters | Analog Devices
www.analog.com/en/products/analog-to-digital.../ad-converters.html ▾ Analog Devices ▾
Analog Devices A/D converters feature a variety of breakthrough capabilities enabling new system architectures that meet customer needs. Compact design, lo.

Sales and Distribution | Analog Devices
www.analog.com/en/about-adi/corporate.../sales-distribution.html ▾ Analog Devices ▾
Browser Compatibility Issue: **Analog** Devices no longer supports this version of Internet Explorer. ...
High Speed/Broadband CODECs and **Analog** Front Ends.

ADIsimSRD Design Studio | Design Center | Analog Devices
www.analog.com/en/design-center/.../adisimsrd-design-studio.html ▾ Analog Devices ▾
Browser Compatibility Issue: **Analog** Devices no longer supports this version of Internet Explorer. ...



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Efficient Web Searches

Search by exact phrase

If your keywords are generating pages that are not relevant to your search, try using an exact phrase using double quotation marks. For example: "carbon monoxide sensors"

Use the Advanced Search page (if available)

Google and many other search engines have an advanced search page that helps in including or excluding information in order to streamline the search and eliminate useless links.

Search within a Search

Use other search sites (for example, within Google)

- Google News – to search current news articles
- Google Patent Search
- Google Scholar – to search peer reviewed literature
- Google Images – good for finding graphs or images to support presentations
- Google Videos – good for finding tutorials on certain topics



Gathering Information

The Web Search

Research the Need

The Web Search is a great first step in foraging for tutorials, products, patents, performance, overviews, opinions, and other information regarding the problem that your design will address.

The next steps involve delving deeper and becoming more focused on the web, and in other sources of information, to **Establish the Relevance** of the design in a credible and convincing way!

