

Toolkit
Using Inventions in the Public Domain

# Tool 4
## Competitive Advantage

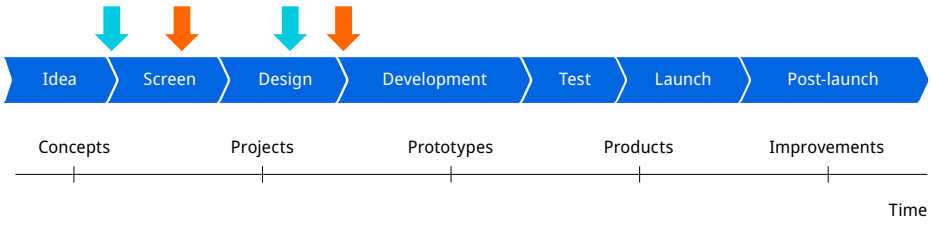
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# Tool 4/ Competitive Advantage

In this document we will explain how to use the Competitive Advantage tool and how to interpret the results. Competitive advantage is discussed in the WIPO publication *Using Inventions in the Public Domain: A Guide for Inventors and Entrepreneurs* (2020) in section 2.3 "Value chain analysis in an assessment of a firm's competitive environment" and in section 8.4 "Assessing competitive advantage through competitive intelligence." It is also mentioned in the discussion of market research, intellectual property (IP) and SWOT analysis.

In this Toolkit, we use the Competitive Advantage tool during the Screen stage as shown in Figure 1, as well as during the Design stage before entering the Development stage.

**Figure 1:** **The Competitive Advantage tool is used early during the Screen stage, before entering the Design stage. The blue and orange arrows indicate the beginning and end of the period in which the tool should be used. This allows for early eliminating of concepts which are unlikely to have market traction. The competitive advantage of the final design is checked before entering the Development stage.**




## What is competitive advantage?

Competitive advantage means your product or service meets customer and end-user needs and requirements better than any other substitute. Because of this, if the customers and end-users are rational, they will be more likely to buy and use your product or service over the competition. Identifying and measuring the competitive advantage(s) of your product or service should provide you with information you can use to address adoption risk associated with your new product development (NPD) initiative. On the other hand, if your product or service lacks a competitive advantage over other substitutable goods, your adoption risk may be high enough to make you reconsider your NPD initiative in its present form.

Three points are important here:

- First, competitive advantage is not simply a matter of tangible features. Augmented features may also be important. Identifying which features are important is a question for market research. The Voice of the Customer tool is one way to address this question. So are web research, visits to potential customers and end-users, surveys and a variety of other methods.
- Second, competitive advantage is often dependent on a combination of factors that can include technical features, design features, ease of use, the way the product or service is marketed, customer expectations, customer perceptions and so on. Further, buying behavior is not always rational, especially when it comes to adoption of innovations. Classic examples which failed due to factors such as bad marketing, customer indifference, displacement by new rivals or just customer tastes include the Ford Edsel, New Coke and the Sony Betamax video cassette.
- Third, markets are dynamic. The needs and requirements of your target customers and end-users can change over time. The products and services that are available for purchase and use can also change over time. Having a competitive advantage at time *t* does not mean you will have it at time *t+1*.

It helps to use a metaphor to think about gaining competitive advantage: imagine being a soccer player heading the ball. You must take actions that will put you in a position to intercept the moving ball. You do that by figuring out the trajectory of the ball and then positioning yourself at a point some distance along that trajectory. In the NPD process, market forces (drivers) and barriers are what affect the trajectory.

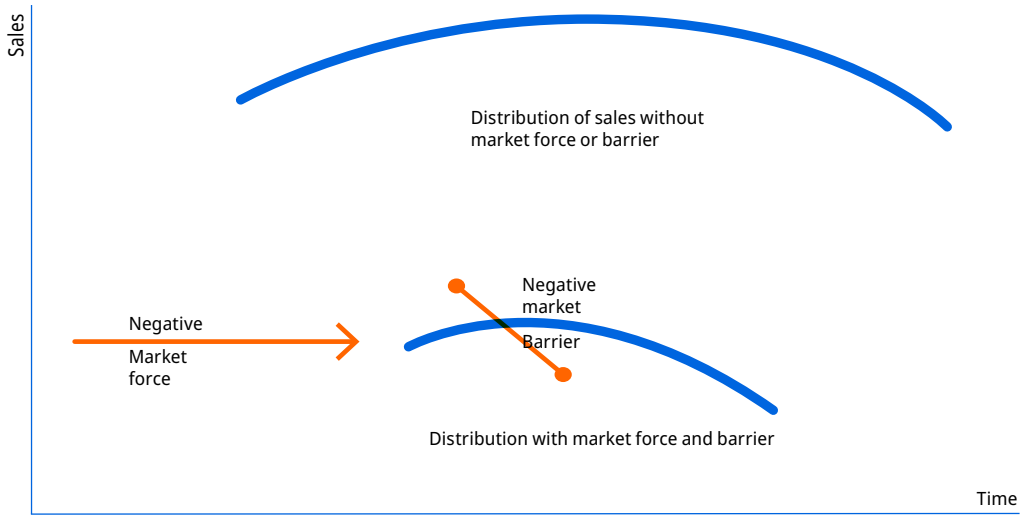
Forces are factors that can be statistically described, such as an aging population, inflation, climate change, immigration, rate of technology development and so on. These forces can shape customer needs, wants, requirements or preferences, which in turn affect what customers will buy and end-users deploy. Forces may also affect availability of raw materials, supplies and other factors of production, which in turn can affect what is – or will be – available in the market.

Barriers are different. A barrier stops an identifiable group of people from buying and/or using a product or service. Barriers can be short-term or long-term. Temporary component shortages which disrupt supply chains are likely short-term barriers. The absence of sufficient manufacturing capacity for computer chips due to the COVID-19 pandemic and the shortage of shipping containers to move chips around the globe are examples, as they prevented customers from buying those goods that require these chips no matter how much they were willing to pay. The automotive industry also suffered from this short-term chip availability barrier. Lack of regulatory approvals is an example of a longer-term barrier. For example, prescription drugs cannot be sold without regulatory approval from the appropriate government authority, and approval to use a product is typically given only for certain diseases and treatments and then after a process that includes successful in vitro testing, and phase I and II clinical trials. The US Food and Drug Administration (FDA) estimates that, on average, it takes eight-and-a-half years to study and test a new drug before the agency can approve it for the general public. That includes early laboratory and animal testing, as well as later clinical trials using human subjects.

Electric cars can be used to illustrate the difference between forces and barriers. If gas prices soar exponentially and the price of electric cars drops exponentially, market forces are at play. But if a government mandates that a certain percentage of an automotive manufacturer's products must be electric, that mandate is a market barrier to the expansion of gas vehicle sales.

Figure 2 illustrates how forces and barriers work.

**Figure 2:** **Market forces and barriers. The orange arrow indicates that sales are deferred and reduced by a negative market force but can continue over time. The orange blocking line indicates that the rest of any potential sales could be cut off when a negative market barrier takes effect. An example of this is where a product fails to achieve regulatory approval and can only be used for research purposes.**




Source: Courtesy of Foresight Science & Technology.

Because competitive advantage is so critical for market success, let us review it using an example. Suppose you want to buy a bicycle helmet. Your first concern is safety, but comfort and visibility are also important. So is price. As you compare helmets online, you find one helmet with a higher safety rating but without an LED light, and another with a slightly lower safety rating that is adequate for your needs, has a light and is a lower price. Because the second helmet meets more of your criteria, in this case the second helmet has the competitive advantage, so you buy it.

It is not enough to have a product or service that meets your customers' and end-users' needs. If there are substitutes available to choose instead of what you are offering, then your product or service must be more attractive than the competition. Meeting customer and end-user requirements better than any competitor is what makes a competitive advantage.

## How do you find data to use in the Competitive Advantage tool?

The data for this tool comes primarily from comparing your product or service with substitutes. These substitutes may have been mentioned in the voice of the customer interviews or in discussions with people in your company, organization or agency; during web research; or by other means. Web research should involve searching for both potential and actual substitutes. Potential substitutes can be found by searching related products offered for sale for other purposes, disclosures in published patent documents, and descriptions of research and development (R&D) on relevant topics and products. You can consider asking for follow-on interviews, if necessary, to clarify the quantitative performance (expressed as interval or cardinal rankings) on specifications and prices, and qualitative performance (ordinal rankings) related to other anticipated design requirements. For example, you may want to carry out research concerning the attractiveness of a warranty for your product or service.

When searching for products or services on the market today, focus on searching trade and business publication sites, websites of likely competitors, and catalogues offering relevant products or services. Look for information about specific products and services as well as annual reviews of what is going on in the industries or economic sectors of interest. Lists of exhibitors at relevant trade shows can also be helpful because they allow you to identify companies whose offerings you should review.

The product or service data tells you what potential substitutes might offer a competitive advantage threat today. Patent documents give you both today's situation and a glimpse into the future. Free patent databases such as WIPO's PATENTSCOPE database and those offered by national and regional patent offices provide access to millions of patent documents. Begin with a search for granted patents and published patent applications that disclose information that is relevant to the product or service you want to develop in this NPD project. Then focus on the granted patents and published patent applications that give important insights into what potential substitutes are emerging.

When you read a patent document, always remember you are trying to figure out if the invention is a potential substitute for your product or service, and if so, how much of a threat it is. Focus on the abstract, the description of the invention and the claims (especially the first claim), and review the drawings. The background of the invention may also be helpful in identifying what is already known and what might be unique. The title of the patent and the abstract are usually only a starting point and, on rare occasions, may even be misleading. For more on how to read and use patent information, refer to the WIPO publication *WIPO Guide to Using Patent Information* (2022).

Patent documents also include a list of prior art references considered by the patent office that examined this patent document, which is helpful to look at should you decide the patent poses a potential threat. A patent document may also have subsequent citations; that is, later patent applications which cite this patent or patent application. So, if you find a relevant patent document, check the references to see if features of interest to you were previously disclosed in patents that are now expired. Also check the subsequent citations to see if a newer patented invention represents an even greater competitive advantage threat. Finally, note the patent classification symbols mentioned in the patent document. All patents have patent classification symbols associated with the invention that designate the areas of technology related to the invention. By skimming though the patents in relevant classes, especially using the International Patent Classification (IPC), you may find additional patent documents that disclose other potential substitutes.

Finally, search for reports of relevant research, which can give you an idea of what might emerge as competition in the future. There are three sets of literature to review when searching:

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The first set includes refereed publications published in refereed journals, and research papers posted on pre-publication repositories. There are a range of websites you can use to search for these reports, including Google Scholar, ScienceDirect, PubMed, GreyB, Evolve, arXiv and many others. While the patent databases mentioned are free, as are most trade and industry sites, private sector repositories of research reports usually charge a fee for access.

The second set is databases of research awards. Most government agencies, foundations and non-governmental organizations (NGOs) making R&D awards will have sites where you can search for information of the awards they have made. Such databases include the European Union's CORDIS site and the United States' SBIR.gov site, and similar websites exist for award programs in other countries. The information in these databases can include what the project is, who was awarded the grant and who performed the research. These databases may also provide technical reports, or links to reports, that describe the details and outcomes of the funded research.

The third set is sites containing information about technologies available for licensing. Almost every research university, research institute, hospital or laboratory will have a site listing technology it is licensing. Many government agencies also list technology that is available for licensing, and sometimes list patents they have put into the public domain. Look for entities that have ongoing research relevant to the product or service you are developing. Then look for their technology transfer, commercialization or knowledge-sharing page. For a wider search, the Association of University Technology Managers (AUTM) has a database called AIM (AUTM Innovation Marketplace). Likewise, WIPO GREEN is an online platform for technology exchange. If you find something relevant, search the website of the university or institution that posted the technology as there may be other technologies listed there.

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For follow-on interviews, think about who is likely to have the information you are seeking. If the product is sold through wholesalers, distributors or sales representatives, these people can be helpful as they often represent several different products and can clarify the differences between them. People who write annual industry reviews in trade journals will have similar crosscutting knowledge. People who track economic sectors which will use your products or services or who are in test laboratories may also be useful. If you asked your respondents if you could recontact them when doing your voice of the customer research, these individuals may be helpful here. Even if they cannot help directly, they might be able to tell you who can.

Because the market is always changing, you must constantly repeat and update your competitive advantage analysis as you approach subsequent gates in NPD. Never rely on old data. Always check what you find with your team to get their read on actual or potential threats.

An honest assessment of the competition may force you to reevaluate the core benefits and features of your product or service. That has consequences for whether or not you continue the NPD initiative, and what modifications must be made to the project charter and action plan should you decide to move forward. A strong competitive advantage at the time of launch helps to protect the project investment.

## How do you enter data in the Competitive Advantage tool?

The first three tabs of the Competitive Advantage tool are where you enter the results of your research on potentially substitutable products or services (see Figure 3, using the biofuels example).

Note that for each item you found, you must specify why it is relevant. For patent documents, you need to know the priority date as this could affect freedom to operate (FTO), which is the focus of another tool. If you found a published patent application in your search, try to determine if a patent was ever granted for that application, as that could also affect FTO. You do not need to enter a website for a patent or patent application, as you can easily find it again by searching for the patent number or patent application number.

**Figure 3:** **Extracts from the first three tabs of the Competitive Advantage workbook, showing where you enter the potential substitutes you have located; from the workbook using the biofuels example.**

**Examples of relevant products/services identified**

| Product name | Manufacturer | Relevance | Website |
|---|---|---|---|
| DRANCO | Organic Waste Systems (OWS) | Anaerobic digestion technology for treating organics derived from municipal solid waste. | http://www.ows.be/ |
| Anaerobic digesters for solid waste streams | Anaergia, Inc. | The solutions recover 90 percent of organics without limitations on in-feed contamination levels. Plastics, paper, and metals are recovered and recycled before extracting biodegradable organic material for conversion into energy and fertilizer. A small portion of the reject material is transformed into sustainable refuse-derived fuel. | http://www.anaergia.com/ |
| Plasma Enhanced Melter® (PEM®) | InEnTec Inc. | This technology transforms virtually any type of waste into ultra-clean energy. The process generates energy and also produces glass, recoverable metals, and chemicals from the syngas. | http://www.inentec.com/ |
| Targeted fuel extraction process | Fiberight, LLC | Fiberight recovers discrete material streams with consistent composition, regardless of the source and composition of the incoming waste. The platform employs robust enzyme catalysts developed by the biotechnology company Novozymes to convert waste material into usable fuels. | http://www.fiberight.com |
| Organic waste collection | Organic Disposal, LLC | The company contracts with residents to collect municipal solid waste and organic waste, which is then composted. | http://www.organicdisposal.net |

## Examples of relevant patents and patent applications identified

| Patent number, publication number, or application number | Title | Assignee | Relevance | Priority date and notes on legal status |
|---|---|---|---|---|
| KR1020180029825 | Method for manufacturing liquid biofuel using waste solid organic matter and liquid biofuel manufactured thereby | Seong Goo Kim | A new method for manufacturing liquid biofuel from solid organic waste. The solid organic waste is liquefied, combined with a liquid fuel, and processed into a liquid biofuel in an economical and eco-friendly manner. | Priority date 11/04/2017 Application rejected: decision to refuse a patent issued 29/11/2018 |
| US20120192482 | Techniques for processing waste materials into useful products | Thomas Asher | Municipal solid waste or source-separated organic waste undergoes a separation treatment that segregates organic and inorganic components. The resulting organic slurry is then subjected to a second separation treatment, which "separates the wastewater, oil/grease, and organic material in the organic slurry from one another. The wastewater, oil/grease, and organic material are further processed to produce useful products, including animal feed additives, and raw materials for cosmetics, fertilizers/composts, and renewable fuels for generating renewable energy." | Priority date 30/01/2012 Application abandoned as of 30/06/2014 |
| US20130228623 | Systems and methods for incentivizing food waste recycling | VIRELLA E O | A collection machine for gathering food waste and waste cooking oil. It is unclear whether the apparatus processes the waste. | Priority date 04/03/2013 Now U.S. patent no. US 9,117,205 granted 25/08/2015 |
| US20110165639 | Refinery process to produce biofuels and bioenergy products from home and municipal solid waste | BriJen Biotech, LLC | A method for generating one or more biofuels or bioenergy products using home or municipal solid waste as raw materials. This method includes physicochemical processes, and the treated solid biomass is used as a source for biofuel synthesis by fermentative and/or methanogenic microorganisms. | Priority date 17/08/2009 Application abandoned as of 10/01/2015 |
| US20130084159 | Waste container | Kirk Warren and others | A waste container for the collection, storage, and transport of waste and refuse material, particularly useful for organic waste. | Priority date 06/08/2012 Now US patent no. US 9,481,513 granted 01/11/2016 |

## Examples of relevant R&D identified

| Project title | Performing company or institution | Relevance | Website |
|---|---|---|---|
| Rare algae enzyme to convert waste cooking oil into biofuel ready for use | Aarhus University, Denmark | An unusual light-dependent enzyme in a photo-biocatalytic continuous flow system to generate drop-in biofuels from waste oils and fats. | https://www.sciencedaily.com/releases/2019/12/191213115453.htm |
| Turning sewage sludge into fuels and hydrogen | TO-SYN-FUEL | A project for the production of synthetic fuels and green hydrogen from organic waste biomass, particularly sewage sludge. | http://www.tosynfuel.eu/ |
| Development of a catalytically green route from diverse lignocellulosic biomasses to high-density cycloalkanes for jet fuels | Washington State University (WSU), USA | Manufacture high-density cycloalkanes for jet fuels from diverse lignocellulosic biomasses using catalytic microwave-induced pyrolysis and hydrogenation in the presence of a RANEY® nickel catalyst. | https://pubs.rsc.org/en/content/articlelanding/2016/cy/c5cy01623a#!divAbstract |
| Optimization of thermochemical hydrolysis of kitchen waste | University of Patras (U. Patras), Greece | Thermochemical pretreatment of kitchen-generated organic waste to increase the available soluble sugars for further processing into biofuels. | https://www.sciencedirect.com/science/article/abs/pii/S0956053X12003121 |
| Life cycle greenhouse gas (GHG) impacts of a novel process for converting food waste into ethanol and co-products | Rochester Institute of Technology and others | Conversion of food processing waste into ethanol, along with co-products such as compost and animal feed. | https://www.sciencedirect.com/science/article/abs/pii/S0306261914004620 |

On the next tab, "Inputs," you assess how much of a threat these substitutes might be. To do that, you may need supplemental web research or interviews. You are assessing these substitutes against the customer requirements (i.e., the desired benefits and features) identified in the Voice of the Customer tool or obtained through other market research. Only use criteria that you are confident are important to buyers and end-users.

Rank each substitute on a scale of 1 (low) to 10 (high) on how well they meet the customer requirement. Be aware that this will be a judgment call, no matter how much or what kind of market research you do. The only way to know how competitive a product or service is will be to see what sells in the marketplace when they compete against each other. So for this tool, just make your best estimate, given the data you have time and budget to gather.

Figure 4 presents the rankings found in the biofuels example using this tool.

**Figure 4:** Rankings on the "Inputs" tab of the Competitive Advantage workbook using the biofuels example.

**Closeness of good on a scale of 1 to 10**

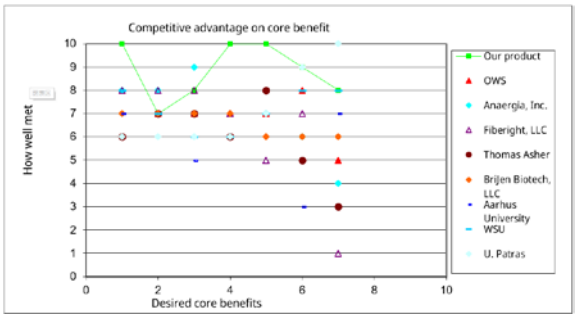
| Desired core benefits and features (customer requirements) | Ease of use | Efficiency | Applicability | Environment-friendly | Affordability | Scalability | Delivery anywhere | Average |
|---|---|---|---|---|---|---|---|---|
| Our product | 10 | 7 | 8 | 10 | 10 | 9 | 8 | 8.9 |
| OWS | 8 | 7 | 7 | 7 | 7 | 8 | 5 | 7.0 |
| Anaergia, Inc. | 8 | 8 | 9 | 6 | 7 | 6 | 4 | 6.9 |
| Fiberight, LLC | 8 | 8 | 8 | 7 | 5 | 7 | 1 | 6.3 |
| Thomas Asher | 6 | 7 | 7 | 6 | 8 | 5 | 3 | 6.0 |
| Brijen Biotech, LLC | 7 | 7 | 7 | 7 | 6 | 6 | 6 | 6.6 |
| Aarhus University | 7 | 7 | 5 | 6 | 7 | 3 | 7 | 6.0 |
| WSU | 8 | 7 | 6 | 6 | 7 | 8 | 8 | 7.1 |
| U. Patras | 6 | 6 | 6 | 6 | 7 | 9 | 10 | 7.1 |

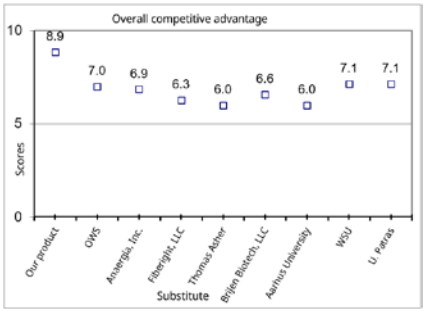
Note that in this figure the names of some competitors have been abbreviated, so that the "Results" tables on the next tab are more readable. If you abbreviate names, use the last tab of the workbook, labelled "Key for inputs," to document what the abbreviations stand for.

Figure 5 presents the two charts on the "Results" tab. These charts are automatically generated by formulas embedded in the spreadsheet, using data you entered in the "Inputs" tab.

**Figure 5:** Charts on the "Results" tab of the Competitive Advantage workbook using the biofuels example.

**Competitive advantage charts**



The left-hand chart should be examined first. It displays the ranking of each competitor on each customer requirement. It is easy to compare the competitors to your product or service, as the rankings for your product or service are connected by the green line.

As in this example, it is unusual for a product or service to outperform all substitutes on every requirement. That is because there are usually trade-offs that must be made between the requirements. A high ranking on one requirement may lead to a lower ranking on another. In the bicycle helmet example above, we saw that in the trade-off between safety rating and price. In general, the goal is to rank highest on those requirements that are most important to buyers and end-users, and if trade-offs need to be made, make them to stay in the acceptable range for requirements that are less important.

One way to evaluate the "Results" tab is to weight the requirements. In the biofuels example, suppose the ability to use multiple types of waste and affordability are the most important criteria, and being environmentally friendly is less important so long as all applicable standards and regulations are met. You could multiply the ranking for most important requirements by some number (1.5, 2, etc.) to reflect that greater importance. Alternatively, you could multiply by a number from 0.1 to 0.9 to lower the ranking of less important requirements. If you do use weighting, be sure to weight the rankings for all competitors the same way. Should you do that, record what you have done on the "Notes and references" tab.

## How do you interpret the data in the Competitive Advantage tool and use it in your NPD process?

The right-hand chart on the "Results" tab, entitled "Overall competitive advantage," averages all the rankings to give an overview of which product or service is likely to be most competitive.

See Figure 5 for an illustration from the biofuels example. If your product or service does not have the highest average ranking, re-examine your design requirements to determine how you can increase your overall competitive advantage. Do not simply revise the rankings entered. If your product or service does not have the highest average ranking, you have a substantive problem that must be addressed. That said, if you are sure that some requirements are more important that others, or some are less important than others, you can weight the entries on the "Input" table and the tool will automatically recalculate the overall competitive advantage using those weighted values.

It makes no sense to move forward with NPD on a product or service that does not have a competitive advantage. If you cannot figure out how to give your product or service a competitive advantage in the relevant market, you may need to halt NPD and reconsider.

Be aware that even if you have determined that your product or service has a competitive advantage, that is no guarantee of market success. As we shall see in later modules, lack of FTO, a poor value chain or a poor market entry strategy can derail a product or service which appears to have a solid competitive advantage.

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