

# Benefit as a Medium for Value Creation and Innovation

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Grounded theory is used to examine the relationship between benefit and innovation. The benefits of a broad array of products were considered, and a list of benefit and functionality categories was devised. 84 products were considered, with little (no) restriction on brand, industry, or time frame. From this 16 benefit categories and 17 functionality categories were listed. These benefit and functionality categories are seen as universal, and not product or industry or time specific. Benefit was equally examined and categorized from the vantage point of market entry and the replacement of existing or incumbent products. The notions of core benefit/functionality, as well as necessary and redundant benefit/functionality, were also used. Universal benefit and functionality categories should aid innovators and entrepreneurs, and bring greater coherency to their efforts. Also, benefit and functionality may equally reflect on customer satisfaction.

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# 1. Introduction

#### **1.1. Customer Perceived Value**

Sinha and DeSarbo (1998) note that the notion of value is central to economic exchange and endemic to marketing, in which ideally both the buyer and seller infer a value greater than each gives up. Both parties gain economically, because each receives something more useful than what was relinquished. Sheth et al. (1991) identify five consumption value types influencing consumer choice behavior: 1) functional value, 2) social value, 3) emotional value, 4) epistemic value, and 5) conditional value. Holbrook (1994) suggests customer value may be intrinsic or extrinsic to the product, and it may be self-oriented or other-oriented.

Sweeney and Soutar (2001) differentiate between perceived value and consumer satisfaction. While perceived value occurs at various stages of the purchase process, including the prepurchase stage, satisfaction is universally agreed to be a postpurchase and postuse evaluation. As a consequence, value perceptions can be generated without the product or service being bought or used, while satisfaction depends on experience of

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having used the product or service. Woodruff (1997) concurs: purchase means choosing, and that requires customers to distinguish between product offer alternatives and to evaluate which is preferred. In contrast, during or after use, customers are more concerned with performance of the chosen product in specific use situations.

Woodruff (1997) notes that customer value is something perceived by customers, rather than objectively determined by a seller. These perceptions typically involve a trade-off between what the customer receives and what he gives up to acquire and use a product. In differentiating between desired value and received value, it is noted that customers imagine what value they want – desired value – either prior to purchase, or later at the time of use. Customers think concretely about value in the form of preferred attributes, attribute performances, and consequences from using a product in a use situation. In addition, they form evaluative opinions or feelings about the actual value experience of using a product – received value. During the choice task, customers may predict received value, but during use they actually experience received value. Flint et al (1997) define desired value as the customers' perception of what they want to have happen - the consequences - in a specific kind of use situation, with the help of a product or service offering, in order to accomplish a desired purpose or goal. Desired value can take on two aspects: value in use or possession value. Value in use reflects the use of the product or service in a situation to achieve a certain goal or set of goals. Possession value reflects the inherent meaning of the product or service to the customer.

Patterson and Spreng (1997) note the most common definitions of value in marketing literature: 1) a ratio or trade-off of total benefits received to total sacrifices, 2) a comparison of weighted "get" attributes to "give" attributes, and 3) the functional definition – defining value in terms of performance (quality) and price. Chen and Quester (2005) note two primary thoughts on value: 1) the rational perspective of value, and 2) the experiential perspective of value. The rational perspective of value is a kind of return for paying for a commodity, and such return involves an assessment of the trade-off or a comparison of benefits and sacrifices (the monetary and non-monetary costs) in terms of the consumption experience. By contrast, the experiential perspective of value places an emphasis on the personal and subjective perception such as emotion or preference. This experiential perspective is phenomenological in spirit and regards consumption as a primarily subjective state of consciousness with a variety of symbolic meanings, hedonic responses, and esthetic criteria. Both perspectives are equally important to comprehend value in consumption experiences.

As part of a means-end model, Zeithaml (1988) defines perceived value in terms of perceived quality, perceived sacrifice, intrinsic and extrinsic attributes, and high-order abstractions.

Ravald and Grönroos (1996) note that customer-perceived value is defined as the ratio between perceived benefits and perceived sacrifice. The perceived sacrifice includes all the costs the buyer faces when making a purchase: purchase price, acquisition costs, transportation, installation, order handling, repairs and maintenance, risk of failure or poor performance. The perceived benefits are some combination of physical attributes, service attributes and technical support available in relation to the particular use of the product, as well as the purchase price and other indicators of perceived quality.

According to Yang and Peterson (2004), perceived value has its root in equity theory, which considers the ratio of the consumer's outcome/ input to that of the service provider's outcome/ input. The equity concept refers to customer evaluation of what is fair, right, or deserved for the perceived cost of the offering. Perceived costs include monetary payments and nonmonetary sacrifices such as time consumption, energy consumption, and stress experienced by consumers. In turn, customer perceived value results from an evaluation of the relative rewards and sacrifices associated with the offering. Customers are inclined to feel equitably treated if they perceive that the ratio of their outcome to inputs is comparable to the ratio of outcome to inputs experienced by the company. And customers often measure a company's ratio of outcome to inputs by making comparisons with its competitors' offerings.

Snoj et al (2004) note that the utility theory approach stresses that very often customers do not buy products for their own sake. They buy bundles of attributes which derive value according to the utility (benefits) provided by the combination of attributes less the disutility represented by their sacrifices in obtaining the product. In other words, the value is conceptualized as a customer's perceived net trade-off received from all relevant benefits and costs or sacrifices delivered by a product or service or supplier and its use. Perceived benefits are a combination of different attributes of products (tangible and intangible; intrinsic and extrinsic etc.), available in relation to a particular buy and use situation. Perceived sacrifices have a negative effect on perceived value of products, and involve not only the nominal price, but also the nonmonetary aspects of price – the monetary costs, opportune costs, energy costs and psychical cost. They also include perceived risk – consumer behavior involves risk in that any action of a consumer may produce consequences which he cannot anticipate with any approximating certainty, and some of those at least are

likely to be unpleasant. They define it to entail multiple types of risks, including financial, functional, physical, psychological, social and time risk.

Woodruff et al (1993) note the attribute concept of value: customer value is a trade-off between desireable attributes – that which is desired from the seller – compared to sacrifice attributes – that which is given up to buy and use the product. Price and most other cost dimensions, such as complexity of product operation, can be incorporated into attribute value as well. Further, even though there is merit in it, the attribute-based view of value has a distinctly product, rather than customer orientation. It assumes that customer value is largely determined by what is designed into products and services. Customers consider attributes, as well as use situations, benefits sought from those situations, and purposes for using the product. Attributes link to benefits, which in turn link to purpose, to form a value chain. They note that products may also have declining value – customers may actively accentuate negative aspects of the product to demonstrate how unsuitable it was for specific use situations. Also, the value that consumers associate with a product changes over time.

# **1.2.** Customer Satisfaction

Snoj et al (2004) note the tendency to concentrate customer value on product quality and nominal price. According to this thinking, bundles of attributes together represent a certain level of quality, which therefore provide utility to the customer. The benefits are measured through a perceived level of quality (level of working superiority), a bundle of attributes in comparison with the consumer's expectations. Perceived quality is defined as the consumers' judgement about overall excellence or superiority. It differs from objective quality, which involves an objective aspect or feature of a thing or event.

Oliver (1980) state that satisfaction is a function of an initial standard and some perceived discrepancy from the initial reference point. The effects of expectation and discrepancy perceptions may be additive. Specifically, expectations are thought to create a frame of reference about which one makes a comparative judgement. Thus, outcomes poorer than expected (a negative disconfirmation) are rated below this reference point, whereas those better than expected (a positive disconfirmation) are evaluated above this base. Expectations are influenced by 1) the product itself including one's prior experience, brand connotations, and symbolic elements, (2) the context including the content of communications from salespeople and social referents, and (3) individual characteristics including persuasibility and perceptual distortion. Postdecision deviations from the adaptation level are thought to be caused by the degree to which the product exceeds, meets, or falls short of one's expectations – positive, zero, or negative disconfirmation. Satisfaction interacts with other cognitions of an emotional nature. Revised postpurchase attitude is a function of prepurchase attitude, and immediate postpurchase satisfaction disconfirmation as a cognitive comparison between anticipated and received satisfaction. It is a disconfirmation at the more abstract affect level rather than at the more objective attribute level.

Fournier and Mick (1999) point out principal satisfaction models as: 1) the disconfirmation of preconsumption product expectations, 2) desires based on features and benefits that are considered ideal or aspirational in the product domain, 3) equity expectations, and 4) experience-based norms. Thus, in addition to the cognitive nature of satisfaction, the affective nature of satisfaction is also pointed out.

Woodruff et al (1993) note that, firstly, value and satisfaction tend to be interwoven in consumers' thoughts about product experiences. Satisfaction is an immediate reaction to how much value was received from using a product in specific use situations. Consumers can have varying degrees of satisfaction with attribute performance and/ or with benefits received from using the product in a situation. Secondly, consumers compare what value they received from a product to some kind of standard. Satisfaction is an evaluation feeling about this comparison. Types of standards may also include: promises made by the seller, performance received from another brand, the performance desired, the performance experienced by another person, and performance from another type of product. Also, consumers experience emotions of different intensity with satisfaction evaluation. Similarly, Anderson and Sullivan (1993) model satisfaction as a function of perceived quality and disconfirmation, with expectations influencing perceived quality.

In stressing the affective nature of satisfaction, Babin and Griffin (1998) note that consumer satisfaction can be described as an emotion resulting from appraisals (including disconfirmation, perceived performance, etc.) of a set of experiences. Bigné et al (2005) expand cognitive–affective theory further by noting the dimensional approach to explaining emotions. Two dimensions of emotions are introduced: arousal and pleasure. Pleasure refers to the degree to which a person feels good, joyful or happy in a situation; arousal refers to the extent to which a person feels stimulated and active.

Moliner et al (2007) reflect on the cognitive nature (comparing expectations and performance) and the affective nature (associated feeling of pleasure) of satisfaction. According to the disconfirmation paradigm, satisfaction is a comparison between performance and expectations. But this is a definition based on what the

consumer does, and not on its psychological meaning. It is therefore proposed that satisfaction is defined as pleasurable fulfillment. That is, the consumer senses that consumption fulfills some need, desire, goal, etc., and that this fulfillment is pleasurable. Thus, satisfaction is the consumer's sense that consumption provides outcomes against a standard of pleasure versus displeasure. Correspondingly, Xu et al (2007) describe customer satisfaction as a pleasurable level of consumption-related fulfillment. Customer satisfaction is generally conceptualized as an attitude-like judgement following a series of purchases or consumer-product interactions. It is understood as the customer's emotional reaction to the perceived difference between performance appraisal and expectation.

Szymanski and Henard (2001) and Halstead et al (2007) model the antecedents of customer satisfaction as expectations, disconfirmation of expectations, performance, affect, and equity. Consumer expectations as anticipation imply that expectations have a direct influence on satisfaction. Disconfirmation of expectations refer to the conceptualization of expectations as the standard against which performance outcomes are assessed. In addition to performance as a component of disconfirmation, performance is modelled as directly affecting satisfaction. Affect relays the possibility that satisfaction is not just cognitive, but includes an affective component. Equity is a fairness, rightness, or deservingness judgement that consumers make in reference to what others receive.

Spreng et al (1996) model satisfaction as a function of attribute satisfaction, perceived performance, as well as information satisfaction. Expectations and desires both impact expectation disconfirmation and desires disconfirmation, respectively. Expectation disconfirmation and desires disconfirmation in turn affect attribute and information satisfaction. Information satisfaction is defined as a subjective satisfaction judgement of the information used in choosing a product. Expectations are seen as beliefs about the likelihood that a product is associated with certain attributes, benefits, or outcomes, whereas desires are evaluations of the extent to which those attributes, benefits or outcomes lead to the attainment of a person's values.

Gardial et al (1994) further expand on evaluative criteria, product referents, comparison to standards, and evaluation outcomes and emotion responses, in the context of prepurchase and postpurchase evaluations.

According to Sweeney and Soutar (2001), satisfaction has been conceptualized as a unidimensional construct, largely due to the assumption that it varies along a hedonic continuum from unfavorable to favorable and to its conceptualization as a consequence, outcome or summary variable in comparison to value, which is antecedent to it. In contrast, value should be conceptualized as a multidimensional construct.

Homburg et al (2005) and Fournier and Mick (1999) differentiate between transaction-specific satisfaction and cumulative satisfaction. Transaction-specific satisfaction is a customer's evaluation of his or her experience with and reactions to a particular product transaction, episode, or service encounter, and cumulative satisfaction refers to the customer's overall evaluation of a product or service provider to date. Given that comparison standard are likely to change with consumer experience, satisfaction is unlikely a static evaluation derived from a lone-trial event, but a process extending across the entire consumption horizon.

#### 1.3. Benefit and Benefit Analysis

With regards to the link between benefit analysis and innovation, Gadrey et al (1995) note that observation and theorization of innovation in services may have much to offer to the analysis of industrial innovation. They examine five categories of innovation of the Schumpeterian topology in the context of services: product innovation (introduction of a new good); process innovation (introduction of a new production method); organizational innovation (constitution of a new organization); market innovation (conquest of a new market); and a new source of raw materials or semi-finished products.

Overall, the literature does not directly pursue the link between benefit and innovation, and predominantly considers benefit from the context of market segmentation. Green et al (1972) note that product or service benefits analysis may be useful in the development of marketing policy and new product or service designs. Product benefits can serve as the basis for market segmentation. Jang et al (2002) note that benefits sought by consumers are the fundamental reasons for the existence of true market segments. Benefit analysis can also identify motivations and the satisfaction of needs. Pesonen et al (2011) note that segmentation provides valuable information on customers and makes it possible to adjust an offering to better match customers' needs. Benefit segmentation, a method for grouping consumers based on their needs and wants, can be used to find target markets for a certain product. In benefit segmentation, it is important to know what kind of relative value people attach to different benefits. Li et al (2009) note the benefits people seek provide better determinants of behavior than do other variables.

Olsen et al (2009) note the different bases of market segmentation: demographic and socio-economic characteristics, personality, values and lifestyle characteristics (psychographics), situation, product use and purchase patterns, attitudes toward products and their consumption, benefit sought in a product category, and

attitudes and behaviour responses toward different marketing variables such as product, price, promotion or distribution. Machauer and Morgner (2001) consider both psychographic and benefit segmentation. In psychographic segmentation, personality characteristics, values, beliefs, and lifestyle are considered. In benefit segmentation, potential customers are grouped according to their desired or expected utility from consuming a product. Olsen et al (2009) consider attitudes, perceived quality and value, ambivalence and morality as the main benefit constructs that form the basis of their segmentation. Benefit or need forms the core concept in attitude-based segmentation.

Kamakura (1988) notes the objective of benefit segmentation is to identify groups of consumers that have similar preferences that might be targeted more efficiently by specific marketing mixes. The dual goals are to 1) to form groups of consumers who share a common utility function, and 2) to estimate aggregate utility functions that would best explain the preferences stated by the members of each segment.

Market segmentation can be either a priori or a posteriori – commonsense or data-driven (Pesonen et al, 2011). Machauer and Morgner (2001) note that a priori segmentation presumes that a significant correlation between the external characteristics of customers and their needs exists. Green et al (1972) note two principal approaches to the measurement of benefit importance: 1) analysis of attitudinal responses regarding characteristics of the product class under study, and 2) direct questioning of the respondent regarding the relative importance of various product benefits. They note some of the disadvantages of both approaches. Attitudinal statements do not explicitly consider the trade-offs that consumers are willing to make regarding the inability of a single brand to provide high levels of all desired attributes. Also, importance are assigned to benefits individually. In contrast with this, benefit bundle analysis is concerned with evaluations of complete benefit bundles.

Similarly, Olsen et al (2009) note that attitudes as evaluative responses in attitude and behavioural research are defined by their valence and extremity. When consumers express their evaluations of products and services by positive or negative ratings of satisfaction, happiness, likeability, delight or perceived quality, they sometimes express no single dominant evaluative response but, rather, two strongly conflicting evaluations, each based on a consistent set of cognitions or feelings – they may have both positive and negative evaluations. The consumer may very well have mixed feelings – experience ambivalence. Moral obligation also proves to be an important predictor of motivation for consumption. Ailawadi et al (2014) differentiate between attitudinal loyalty and behavioral loyalty – or simply attitudes and behaviour. Consumers may be reluctant to trade off certain core attributes such as price and this reluctance is one of the main reasons why positive attitudes do not necessarily translate into greater purchase behavior.

Myers (1976) also shows how benefits – benefits wanted versus benefits received - can be used to determine and evaluate customer satisfaction. He also reiterates that both benefits and combinations of benefits are wanted. Benefits are also linked to product characteristics that produce the desired benefits.

#### 2. Methodology

In order to study the link between benefit and innovation, grounded theory is used to extract the product benefit and product functionality categories from a sample of products and inventions. 84 products are listed and considered. For a product to be considered, at some point, it must have a) been considered a radical innovation, or b) obtained significant market share, or c) became popular or broadly used. The products are selected to cover a broad time span, and are selected from diverse industries and geographical locations. Also, broad products are used, and specific brands are generally avoided. Thus, the products are generally not constrained in terms of time – the period in which the product was introduced or relevant. The products are also not constrained in terms of country of origin or application or industry. The products are also not constrained in terms of particular brand. A brief description of each product and its benefit – what likely contributed to the success of the product - is used to build the product benefit and product functionality categories from.

## 3. Analysis

Below, the list of products, with their descriptions are given. Table 1 and 2 list the resultant product benefit and functionality categories.

1. Industrial cleaning chemicals. Industrial cleaning chemicals are used to clean industrial plants and equipment. They may also provide a cost saving. Ecolab cleaning chemicals, for example, can reduce the downtime of a production line in bottling factories (e.g. Coca Cola) due to a product line switch (cleaning) from 3 hours to 1 hour.

2. The machine gun. The machine gun formed an alternative to hand guns and offered more rounds shot per minute. It can be argued that it formed a more effective and economical weapon that required less manpower (resources) and that was more efficient than hand guns.

3. The telephone. The telephone formed an alternative to the telegraph. It could be installed within houses. A principal reason for this is taken to be the fact that it was less complicated to use (operate) – it did not require the level of training to operate that telegraphs did. Also, it provided a better quality experience, in that communication could be faster, more efficient, and of better quality. Relative to a telegraph, a person could get a reply much faster, could continue a conversation much longer, could conclude a conversation much faster, and could get closer interaction with more detailed information (a person could all the sudden sense and interpret the emotions of the other party he converses with).

4. Quality clothes. An example of quality clothes may be a brand of pants that is known to last a number of months longer than other brands.

5. Iphone/ Steve Job's 1000 songs in your pocket. The concept of a 1000 songs in your pocket meant a longer listening experience, greater variety, greater ease of use, and perhaps a smaller device required to do so.

6. The typewriter. The typewriter formed an alternative to writing by hand. It formalized or standardized, and beautified writing, whilst maintaining writing speed and flexibility.

7. Printing press. The printing press made it much easier, faster and thus cheaper to copy books.

8. Solar energy. A core advantage of solar energy as renewable energy is a cut in operating costs, because it utilizes renewable sources. A core benefit of solar energy is reduced emissions.

9. The atom bomb and nuclear energy. The atom bomb was a much more powerful bomb. It could also decide the outcome of a war. Nuclear energy promised to be an alternative to coal, and perhaps to be cleaner than coal. Nuclear energy also benefitted countries with poor coal resource endowment.

10. The copier/ photostat/ fax machine. The photostat machine made it possible to duplicate documents and books. It became possible to quickly replicate or duplicate a document as information and content. It also became possible to transmit documents or information over long distances more effectively.

11. Overhead projector. Projectors made it possible to display and enlarge content as information.

12. Microscope. Microscopes made it possible to study objects generally not visible to the naked eye.

13. 3D printing. 3D printers aid with design and prototyping, and allow the rapid production of diverse and custom objects.

14. Camera and film. Cameras made it possible to capture and store images and scenes.

15. Hydraulics. Hydraulics make it possible to amplify power and force. Heavy objects can be lifted with more ease.

16. Computer numerical control (CNC) machine, robotics. Computer aided manufacturing permits greater accuracy precision, reputation, and speed. It forms an alternative to manual labor. It can also reduce risk and improve safety – robots can enter hazardous environments.

17. Refrigerators, air-conditioning. Air-conditioners allowed the control of room or environment temperature. Refrigerators permitted better storage and preservation of food.

18. Geysers. Geysers allowed hot water and baths, and generally increased hygiene.

19. Transistor. Transistors form the building block of electronics, and helped to usher in the information age. Transistors permits the control - regulation, manipulation, and variation - of currents (electricity).

20. Sensor. Sensors transform a number of different type of inputs (light, sound, force, etc) to electrical current for measurement. Sensors permit a number of measurement and control applications.

21. Nike shoes. Nike became known for its innovation in the apparel industry. It can be argued that a lot of engineering goes into the shoes, such that it becomes a matter of style (aesthetics), comfort, and sophistication – specifically designed for their purpose; also to aid the athlete.

22. Antibiotics, vitamins, supplements, performance enhancers, Viagra. Antibiotics fight disease and restore health. Vitamins and supplements improve and maintain health. Performance enhancers increase the performance and abilities of the body. Viagra can be seen as an enhancer that also has a restorative or regenerative property.

23. Artificial body parts. In the case of human injury, disability, etc., artificial body parts aim to restore normal body function and to improve the well-being of the human.

24. Drugs, anesthetics, narcotics. Drugs normally bring psychological effect. Anesthetics bring insensitivity to pain, and narcotics impacts the mood and senses.

25. Biometric reader. Biometrics aid in accurate recognition and identification of humans.

26. Electronic signs, electronic books. Electronic books change the medium required to store text and

information. Electronic books are more compact and lightweight than books, and can be seen as more flexible and convenient than books, and easier to distribute. Electronic signs have the benefit over conventional signs that they are easier to update, and can convey current information.

27. CDs, DVDs. CDs and DVDs have greater capacity, and came with the desire to store and distribute greater quantities of information.

28. Hot tub, spa. Spas provide comfort and leisure.

29. Shower. Showers take less space than baths, and can be seen as more convenient too.

30. Computers, personal computers, laptops. Computers satisfied the need for complex and repetitive calculation and computation. A principal advantage of computers over humans are accuracy, repetition, and speed. Computers subsequently developed their artificial intelligence property – the ability to aid human thinking and intelligence. A benefit of computers is the ability to configure and program them, greatly increasing their application. Personal computers took computers into homes. Laptops increased the range and flexibility of personal computers.

31. Cars. Cars generally replaced horses and buggies, and are a faster, more convenient and a more reliable method of transport.

32. Universities. In general, it can be argued that universities increase intellectual capacity – knowledge and wisdom. Intellect is seen as a source of power. Thus, it can be argued that universities provide empowerment, power, authority, and dominance. Universities can also satisfy psychological needs, including perception, sense of being and sense of belonging.

33. Social media. The benefits of social media are seen much the same as that of universities: empowerment, and psychological needs (perception, sense of being, sense of belonging). Social media can also bring communities together and increase knowledge and information sharing.

34. Organic food. Organic food strives to improve the quality of food, compared to non-organic food. Given their higher quality, it can be argued that they restore and improve health, and reduce the risk of health-related complications.

35. Plastic. Plastics arguably offer flexibility, and extend ease of use. Plastics form an input material of many other products.

36. Submarines. Submarines permit transport under water. They can have covert, military application, or simply explorative civilian function.

37. Water purification, desalination. Water purification improves the quality of drinking water – it cleans the water. Water desalination generally converts saltwater into freshwater. Saltwater then has the same application as freshwater. It finds particular application in arid countries.

38. Radio. Radio broadcasts audio content to select or broad audiences over long distances. It also became popular because it could simultaneously reach large and dispersed populations. The content can be entertainment or information.

39. Television, Cable television, satellite television. Television extends radio by including a visual component. Cable television and satellite television extend the content range of television.

40. Newspapers, magazines. Newspapers and magazines provide general or custom content on general or specific topics. They can be informative or entertaining.

41. Satellite. Satellites form a cost-effective transmission medium, and has extended range, compared to other mediums.

42. Global positioning system (GPS). GPS improves navigation, and has a wide range of applications, ranging from commerce, military to civilian.

43. Swimming pool. Swimming pools offer a way of relaxation and entertainment. They can also have an aesthetical property.

44. Artificial insemination. In the case of humans, artificial insemination can offer certain biological and social benefits. Very basically, it may help couples that struggle to have children naturally; it may help couples that cannot naturally have children, to have children; or may extent the conditions or limitations of normal birth. In the case of animals, it may increase fertility and reproduction rates, and further opens up breeding.

45. Oven, stove, microwave. Ovens and stoves allow food preparation. Initial ovens and stoves were fire-based, and developed over time to being gas or electricity based. Microwaves offer a convenient and quick method to warm food.

46. X-rays, medical scans. X-rays and medical scans provides medical data that is not otherwise available. They generally improve diagnostic accuracy.

47. Fuel, combustion engine. Fuel is seen as crude oil in refined form. The combustion engine permitted fuel to be used as an energy source. Combustion engines are useful for machine work (power

generation and output) in mobile applications. A significant property of fuel is its energy density, providing transportation mediums with an efficient energy source, and enabling them to travel long distances.

48. Railways. Railways offer economic transport of both passengers and cargo over long distances.

49. Planes. Planes offer fast transport. It may also be more practical over long distances, cross-border and cross-continent, and to remote locations. Air as medium has the greatest travelling range.

50. Paper. Paper allows written communication. It is central to arts and design, and it permits a method to store content and information.

51. Stapler. Staplers are used in an administrative capacity to organize and collect documents.

52. Cement, adhesive, glue. Glue can be used to fasten things together. It can be used to build, attach or fix things. Cement is an adhesive specific to building.

53. Parachute. Parachutes permit objects to be dropped from the air without injury or damage. In a military sense, it permits soldiers and equipment, etc. to be dropped in strategic or remote locations. In a civilian sense, it provides protection to pilots. It may also provide a method of entertainment.

54. Bank cards, ATMs. Bank cards and ATMS increase the ease of banking transactions and payments. It also permits transactions outside normal banking hours.

55. Vacuum cleaners. Vacuum cleaners provide an effective method of cleaning.

56. Flushing toilets. Flusing toilets generally provided a way to install toilets indoors, rather than outdoors. They increase convenience, comfort, and may be seen as more aesthetic.

57. Space travel. Space travel arguably originated through the inquisitive nature of humans. Because of its rarity, it also has a strong aspirational component.

58. Dyes. Dyes permit the coloring of fabrics. It equally extended to other products, like hair products.

59. Lifts, elevators, conveyors. Lifts, elevators and conveyors increased the convenience of travel or movement within buildings with multiple floors or levels, or over extensive ranges.

60. Glass. Glass found application as containers and coverings. Its transparency is a primary attribute.

61. Cigarettes, cigars. Cigarettes arguably replaced pipes as a more convenient method to smoke. Cigars date back earlier than cigarettes, and may have a type of authentic property. Smoking is seen as a form of recreation.

62. Soft drinks. Carbonated drinks may have had medicinal origins, but soon became a popular beverage.

63. Artificial sweetener. Artificial sweetener provides the taste of sugar, but without the actual sugar content. It is useful for people with sugar-related diseases and people who wish to diet or limit their sugar intake, for health reasons.

64. Recycling. Recycling has the benefit of reducing waste and pollution. It may also be mandatory in the case of limited land for purposes of dumping.

65. Mail delivery, postal service, couriers. Postal services became a convenient and reliable method of mail delivery, when mail was a dominant method of communication. Couriers increased the speed of sending parcels.

66. (Electric) kettle, toaster. An electric kettle forms a convenient way to boil water for hot beverages. A toaster is a convenient way to increase the taste of bread.

67. Mouse, touch screens. A mouse and touch screen allow easier and more complex and sophisticated interaction between the user and a computer as electronic device.

68. Shaver, razor blades. Shavers and razor blades increase the ease and convenience of shaving.

69. Caravan. A caravan provides a home away from home. It provides temporary or mobile accommodation with a greater level of comfort and luxury, also in remote locations.

70. The desktop calculator. The calculator permits accurate arithmetic and mathematical calculations.

71. Cutlery. Cutlery generally means it is not necessary to eat and handle food with your hands. It may also make it easier to handle food. This can imply a convenience, hygienic or an aesthetic aspect.

72. Wheelbarrow, tools. Wheelbarrows permit the transport of objects that are heavy or voluminous. Tools permit working on (fixing, altering, installing, etc.) objects.

73. Washing machine. Washing machines are more convenient and faster than washing clothing, etc by hand.

74. Infra-red (IR)/ Night vision. Infra-red vision permits visualizing infra-red. Its most common application is perhaps night vision. It also permits the visualization of heat, for instance.

75. Briefcase, case. A briefcase and case permit easy transportation of personal objects, such as luggage, documents, etc.

76. Containers. Containers improve the efficiency with which maritime cargo is transported.

77. 4x4 vehicle. Offroad vehicles like 4x4 vehicles extend vehicles to rough, extreme and adverse

terrain and weather conditions. These vehicles are generally more rugged.

78. Firelighter, lighter. Lighters enables quick and easy fire, mostly to light something.

79. (Battery) torch. A torch provides light, and is particularly useful in remote locations – locations without fixed sources of lighting.

80. Batteries. Batteries provide an energy source for equipment in mobile or remote locations.

81. The skyscraper. Skyscrapers originated due to land-strapped locations with high land cost, and they minimize the cost of the land per the total floor area of a building. There may also be some aspiration aspect to skyscrapers – seeing who can build the tallest building.

82. The supermarket. Supermarkets replaced conventional grocery stores with self-service and generally has greater range and variety. They also have more efficient distribution channels. They are generally cheaper and offer economies of scale.

83. Internet. The internet facilitates and improves communication and information sharing between abstract communities, at a global level.

84. Airbags. Airbags reduce the risk of injury or fatality during (car) accidents.

<ul> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product the same output.</li> <li>3. Simplicity, ease of use, convenience is the product the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience is the product the product the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience is the product the product the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience is the product the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience is the product the training and skills or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience is the product the training and skills or effort required, to obtain the same output.</li> <li>4. Simplifies utility, the training the trequired the training the training the trainin</li></ul>	saving or economy improvement. The same output costs	Industrial cleaning chemicals (1); printing press (7); atom homb (9); conjer photostat fax machine (10); computers
<ul> <li>2. Capacity, efficiency, throughput, speed: The product realizes an improvement in efficiency, throughput, or speed. The same output can be obtained more efficiently, in greater quantity, or faster. Or, the product has a greater capacity.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product signs, electronic books (26); shower (29); personal computer, laptop (30); cars (31), plastics (35); global positioning system (GPS) (42); oven, stove, microwave (45); planes (49); stapler (51); bank cards, ATMs (54);</li> </ul>	cheaper or less is required to obtain the same output	(30): the skyscraper (81): the supermarket (82)
<ul> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> </ul>	2. <b>Capacity, efficiency, throughput, speed:</b> The product	Industrial cleaning chemicals $(1)$ : machine gun $(2)$ :
The same output can be obtained more efficiently, in greater quantity, or faster. Or, the product has a greater capacity. DVDs (27); computers (30); cars (31); radio (38); satellite (41); artificial insemination (44); oven, stove, microwave (45); fuel, combustion engine (47); railways (48); planes (49); lifts, elevators, conveyors (59); mail delivery, postal service, couriers (65); wheelbarrow, tools (72); washing machine (73), containers (76); the supermarket (82); internet (83) 3. <b>Simplicity, ease of use, convenience:</b> the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.	realizes an improvement in efficiency, throughput, or speed.	telephone (3); printing press (7); atom bomb (9); copier,
<ul> <li>quantity, or faster. Or, the product has a greater capacity.</li> <li>numerical control (CNC) machine, robotics (16); CDs, DVDs (27); computers (30); cars (31); radio (38); satellite (41); artificial insemination (44); oven, stove, microwave (45); fuel, combustion engine (47); railways (48); planes (49); lifts, elevators, conveyors (59); mail delivery, postal service, couriers (65); wheelbarrow, tools (72); washing machine (73), containers (76); the supermarket (82); internet (83)</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience the product signs, electronic books (26); shower (29); personal computer, laptop (30); cars (31), plastics (35); global positioning system (GPS) (42); oven, stove, microwave (45); planes (49); stapler (51); bank cards, ATMs (54);</li> </ul>	The same output can be obtained more efficiently, in greater	photostat, fax machine (10); hydraulics (15); computer
<ul> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> </ul>	quantity, or faster. Or, the product has a greater capacity.	numerical control (CNC) machine, robotics (16); CDs,
<ul> <li>(41); artificial insemination (44); oven, stove, microwave (45); fuel, combustion engine (47); railways (48); planes (49); lifts, elevators, conveyors (59); mail delivery, postal service, couriers (65); wheelbarrow, tools (72); washing machine (73), containers (76); the supermarket (82); internet (83)</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience is the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience is the product signs, electronic books (26); shower (29); personal computer, laptop (30); cars (31), plastics (35); global positioning system (GPS) (42); oven, stove, microwave (45); planes (49); stapler (51); bank cards, ATMs (54);</li> </ul>		DVDs (27); computers (30); cars (31); radio (38); satellite
<ul> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience is product to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience is product to obtain the same output.</li> <li>4. Simplicity, ease of use, convenience is product to obtain the same output.</li> <li>5. Simplicity, ease of use, convenience is product to obtain the same output.</li> <li>5. Simplicity, ease of use, convenience is product to obtain the same output.</li> <li>5. Simplicity, ease of use, convenience is product to obtain the same output.</li> <li>5. Simplicity, ease of use, convenience is product to obtain the same output.</li> <li>5. Simplicity, ease of use, convenience is product to obtain the same output.</li> <li>5. Simplicity, ease of use, convenience is product to obtain the same output.</li> <li>5. Simplicity, ease of use, convenience is product to obtain the same output.</li> <li>5. Simplicity, ease of use, convenience is product to obtain the same output.</li> <li>5. Simplicity, ease of use, convenience is product to obtain the same output.</li> <li>5. Simplicity, ease of use, convenience is product to obtain the same output.</li> <li>5. Simplicity, ease of use, convenience is product to obtain the same output.</li> <li>5. Simplicity, ease of use, convenience is product to o</li></ul>		(41); artificial insemination (44); oven, stove, microwave
<ul> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> </ul>		(45); fuel, combustion engine (47); railways (48); planes
<ul> <li>3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.</li> <li>Telephone (3); Iphone/ Steve Job's 1000 songs in your pocket (5); copier, photostat, fax machine (10); electronic signs, electronic books (26); shower (29); personal computer, laptop (30); cars (31), plastics (35); global positioning system (GPS) (42); oven, stove, microwave (45); planes (49); stapler (51); bank cards, ATMs (54);</li> </ul>		(49); lifts, elevators, conveyors (59); mail delivery, postal
3. Simplicity, ease of use, convenience: the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output.Telephone (3); Iphone/ Steve Job's 1000 songs in your pocket (5); copier, photostat, fax machine (10); electronic signs, electronic books (26); shower (29); personal computer, laptop (30); cars (31), plastics (35); global positioning system (GPS) (42); oven, stove, microwave (45); planes (49); stapler (51); bank cards, ATMs (54);		service, couriers (65); wheelbarrow, tools (72); washing
3. <b>Simplicity, ease of use, convenience:</b> the product simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output. Telephone (3); Iphone/ Steve Job's 1000 songs in your pocket (5); copier, photostat, fax machine (10); electronic signs, electronic books (26); shower (29); personal computer, laptop (30); cars (31), plastics (35); global positioning system (GPS) (42); oven, stove, microwave (45); planes (49); stapler (51); bank cards, ATMs (54);		(83)
simplifies utility, or increases convenience. It reduces the training and skills, or effort required, to obtain the same output. output. (45); copier, photostat, fax machine (10); electronic signs, electronic books (26); shower (29); personal computer, laptop (30); cars (31), plastics (35); global positioning system (GPS) (42); oven, stove, microwave (45); planes (49); stapler (51); bank cards, ATMs (54);	3. Simplicity, ease of use, convenience: the product	Telephone (3); Iphone/ Steve Job's 1000 songs in your
training and skills, or effort required, to obtain the same output. signs, electronic books (26); shower (29); personal computer, laptop (30); cars (31), plastics (35); global positioning system (GPS) (42); oven, stove, microwave (45); planes (49); stapler (51); bank cards, ATMs (54);	simplifies utility, or increases convenience. It reduces the	pocket (5); copier, photostat, fax machine (10); electronic
output. computer, laptop (30); cars (31), plastics (35); global positioning system (GPS) (42); oven, stove, microwave (45); planes (49); stapler (51); bank cards, ATMs (54);	training and skills, or effort required, to obtain the same	signs, electronic books (26); shower (29); personal
(45); planes (49); stapler (51); bank cards, ATMs (54);	output.	computer, laptop (30); cars (31), plastics (35); global
(43), Dialles (49), Stablet (31), Dalik Calus, ATIVIS (34).		positioning system (GPS) (42); oven, stove, microwave $(45)$ ; planes $(40)$ ; stepler $(51)$ ; bank cords ATMs $(54)$ ;
vacuum cleaners (55): flushing toilets (56): lifts elevators		(45), planes (49), staplet (51), bank cards, ATWS (54), vacuum cleaners (55): flushing toilets (56): lifts elevators
conveyors (59): cigarettes (61): mail delivery, postal		conveyors (59): cigarettes (61): mail delivery postal
service, couriers (65); kettle, toaster (66); mouse, touch		service, couriers (65); kettle, toaster (66); mouse, touch
screens (67); shaver, razor blades (68); caravan (69); the		screens (67); shaver, razor blades (68); caravan (69); the
desktop calculator (70); cutlery (71); wheelbarrow (72);		desktop calculator (70); cutlery (71); wheelbarrow (72);
washing machine (73); briefcase, case (75); firelighter,		washing machine (73); briefcase, case (75); firelighter,
lighter (78); (battery) torch (79); the supermarket (82);		lighter (78); (battery) torch (79); the supermarket (82);
Internet (83)	4 Fritant anon durations the medicat mesones of	Internet (83)
4. <b>Extend, span, duration:</b> the product preserves of Quanty ciones (4); camera and min (14); reingerators (17);	4. <b>Extent, span, duration:</b> the product preserves of improves lifetime. The product lasts longer, or extends the	Quality clothes (4); callera and fifth (14); felligerators (17); artificial insemination (44): $4x4$ vahiele (77)
lifetime of something else	lifetime of something else	artificial inschildation $(44)$ , $4x4$ vehicle $(77)$
5. Flexibility, variation, variety: the product increases Iphone/ Steve Job's 1000 songs in your pocket (5): 3D	5. Flexibility, variation, variety: the product increases	Iphone/ Steve Job's 1000 songs in your pocket (5): 3D
flexibility, variation, or variety. It allows different printers (13); electronic signs, electronic books (26);	flexibility, variation, or variety. It allows different	printers (13); electronic signs, electronic books (26);
configurations and applications, or it allows greater computers (30); plastics (35); radio (38); television (39);	configurations and applications, or it allows greater	computers (30); plastics (35); radio (38); television (39);
flexibility, variation or variety. newspapers, magazines (40); global positioning system	flexibility, variation or variety.	newspapers, magazines (40); global positioning system
(GPS) (42); paper (50); space travel (57); dyes (58); glass		(GPS) (42); paper (50); space travel (57); dyes (58); glass
(60); toaster (66); mouse, touch screens (67); caravan (69);		(60); toaster (66); mouse, touch screens (67); caravan (69);
4x4 vehicle (77); (battery) torch (79); batteries (80); the		4x4 vehicle (77); (battery) torch (79); batteries (80); the
supermarket (82); internet (83)		supermarket (82); internet (83)
6. <b>Reliability, dependability:</b> the product reduces error, Typewriter (6); computer numerical control (CNC)	6. <b>Reliability, dependability:</b> the product reduces error,	Typewriter (6); computer numerical control (CNC)
and increases accuracy, precision, and consistency. Or, the machine, robotics (16); sensors (20); biometric reader (25); product is more reliable	and increases accuracy, precision, and consistency. Or, the	machine, robotics (10); sensors (20); biometric reader (25); computers (20); cars (21); global positioning system (CDS)
product is more remained. (12): x-rays medical scans (16): mail delivery postal	product is more reliable.	(42), a roug modical score (46), mail delivery mostal
service, couriers (65): the deskton calculator (70): airhags		$(47)$ $x_{rank}$ memical scans there man hereery every
(84)		service, couriers (65): the desktop calculator (70): airbags

Table 1. Benefit types of products.

7. <b>Health, longevity, safety, risk-reduction (human):</b> the benefit is human-centred. The product improves health, well-being, longevity, or safety. Or, it reduces risk or uncertainty.	Robotics (16); geysers (18); nike shoes (21); antibiotics, vitamins, supplements (22); anesthetics (24); organic food (34); water purification (37); x-rays, medical scans (46); parachute (53); flushing toilets (56); artificial sweetner (63); cutlery (71); airbags (84)
8. <b>Sensation (human):</b> the benefit is human-centred. The product provides pleasure and satisfaction through the senses (taste, smell, sight, sound, touch).	Hottub, spa (28); radio (38); television (39); newspapers, magazines (40); parachute (53); soft drinks (62); toaster (66)
9. <b>Psychological (elementary) – comfort, leisure,</b> <b>luxury, indulgence (human):</b> the benefit is human-centred. The product provides more elementary psychological benefits, like comfort, etc.	Air-conditioning (17); geysers (18); nike shoes (21); Viagra (22); drugs, anesthetics, narcotics (24); hottub, spa (28); radio (38); television (39); newspapers, magazines (40); swimming pool (43); flushing toilets (56); lifts, elevators, conveyors (59); cigarettes, cigars (61); caravan (69)
10. Psychological (advanced) – aesthetics, sentiment, perception, sense of being, sense of belonging (human): the benefit is human-centred. The product has psychological benefits, generally of a more advanced or higher-order level.	Telephone (3); camera and film (14); nike shoes (21); artificial body parts (23); universities (32); social media (33); radio (38); television (39); newspapers, magazines (40); swimming pool (43); space travel (57); dyes (58); cutlery (71); internet (83)
11. <b>Power, authority, dominance (human):</b> the benefit is human-centred. The human is equipped and empowered, and as a result can exert greater power over his environment.	Machine gun (2); atom bomb (9); computers (30); universities (32); social media (33); submarines (36); radio (38); television (39); newspapers, magazines (40); parachute (53); space travel (57); internet (83)
12. Alteration, adaptation, modification, conversion: the product allows a change in certain physical properties. In general, the physical properties of the object or environment that the product works in on, are changed, in a way that is more beneficial to the user. Or, the product allows a change in the physical properties of the environment it is placed in. Emphasis is on the (utility of the) output. With the product, the circumstances or environment is no longer the same as the circumstances or environment without the product.	Overhead projector (11); microscope (12); hydraulics (15); refrigerators, air-conditioning (17); performance enhancers (22); submarines (36); water purification, desalination (37); x-rays, medical scans (46); stapler (51); cement, adhesive, glue (52); parachute (53); space travel (57); dyes (58); glass (60); artificial sweetner (63); caravan (69); wheelbarrow, tools (72); infra-red (IR)/ night vision (74); briefcase, case (75); containers (76); 4x4 vehicle (77); firelighter, lighter (78); (battery) torch (79); airbags (84)
13. <b>Restoration, regeneration:</b> the product makes it possible to restore, repair or regenerate something.	Industrial cleaning chemicals (1); artificial body parts (23); organic food (34); artificial insemination (44); cement, adhesive, glue (52); vacuum cleaners (55); tools (72); washing machine (73)
14. <b>Negation (waste, side-effects, complications):</b> the product reduces or eliminates waste, side-effects or complications.	Solar energy (8), vitamins, supplements, Viagra (22); organic food (34); water purification (37); parachute (53); flushing toilets (56); artificial sweetner (63); recycling (64); airbags (84)
15. Elimination: the product reduces, changes or eliminates certain requirements or dependencies.	Solar energy (8); nuclear energy (9); robotics (16); electronic books (26); CDs, DVDs (27); shower (29); water desalination (37); fuel (47); bank cards, ATMs (54); 4x4 vehicle (77); batteries (80); the skyscraper (81)
16. <b>Input, raw material:</b> the product generally forms an input that enables other products.	Transistor (19), plastics (35); water desalination (37); satellite (41); fuel, combustion engine (47); paper (50); cement, adhesive, glue (52); internet (83)

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Factor	Example
1. <b>Production (produces, builds, manufactures):</b> the	3D printers (13); computer numerical control (CNC)
product can produce something. The output is a composite	machine, robotics (16)
of the inputs.	
2. <b>Replication, duplication (replicates, duplicates):</b> the	Printing press (7); copier, photostat (10); artificial sweetner
product can replicate or duplicate something. The output is	(63);
a copy of the input.	
3. Transformation (transforms, changes, converts):	Machine gun (2); overhead projector (11); microscope (12);
the product can change something. The output is an	solar energy (8); atom bomb, nuclear energy (9); hydraulics
alteration of the input.	(15); refrigerator, air-conditioning (17); geysers (18);
	sensors (20); hottub, spa (28); water purification,
	desalination (37); swimming pool (43); oven, stove,
	microwave (45); x-rays, medical scans (46); combustion

Table 2. Functionality (functions) of products

	-
	engine (47); stapler (51); dyes (58); kettle, toaster (66); shaver, razor blades (68); tools (72); infra-red (IR)/ night vision (74); firelighter, lighter (78); (battery) torch (79)
4. Regulation, organization, configuration (regulates,	Transistor (19); drugs, anesthetics, narcotics (24); biometric
organizes, configures, shapes): the product can regulate,	reader (25); computers (30); universities (32); social media
organize, configure or shape something. The output is an	(33); newspapers, magazines (40); bank cards, ATMs (54);
adjustment, enhancement or improvement of the input.	cigarettes, cigars (61); mouse, touch screens (67); the
	desktop calculator (70); cutlery (71); tools (72); internet (83)
5. Preservation, sustenance (preserves, stores, keeps,	Camera and film (14); refrigerators (17); CDs, DVDs (27);
sustains): the product can preserve or sustain something. It	plastic (35); fuel (47); paper (50); briefcase, case (75);
can also imply an increase in lifetime.	containers (76); batteries (80); airbags (84)
6. Regeneration (regenerates, restores): the product	Industrial cleaning chemicals (1); antibiotics, vitamins,
can regenerate or restore something.	supplements, Viagra (22); artificial body parts (23); organic
	food (34); artificial insemination (44); adhesive, glue (52);
	vacuum cleaners (55); tools (72); washing machine (73)
7. Transmission, extension (transmits, extends): the	Telephone (3); fax machine (10); laptops (30); cars (31);
product can transmit or extend something. It may be	social media (33): submarines (36): radio (38): television
location-specific (i.e. relocation). It may also be context- or	(39): newspapers, magazines (40): satellite (41): railways
application-specific (e.g. extending the application).	(48); planes (49); parachute (53); bank cards, ATMs (54);
	space travel (57): lifts, elevators, conveyors (59): mail
	delivery, postal service, couriers (65); caravan (69);
	wheelbarrow (72); 4x4 vehicle (77); internet (83)
8. <b>Reconfiguration (transitions, adapts, reconfigures):</b>	Iphone/ Steve Job's 1000 songs in your pocket (5); 3D
the product can reconfigure, or allows reconfiguration. It	printers (13); electronic signs, electronic books (26);
can transition, adapt, etc.	computers (30); plastic (35); radio (38); television (39);
	newspapers, magazines (40); global positioning system
	(GPS) (42); space travel (57); dyes (58); glass (60); toaster
	(66); mouse, touch screens (67); caravan (69); 4x4 vehicle
	(77); internet (83)
9. Durability, continuity (endures, repeats): the	Quality clothes (4); computer numerical control (CNC)
product can endure. It generally maintains its output over an	machine, robotics (16); 4x4 vehicle (77)
extended period.	
10. Conformity, standardization (formalizes,	Typewriter (6); computer numerical control (CNC)
standardizes, conforms, secures, maintains): the product	machine, robotics (16); sensors (20); biometric reader (25);
formalizes, standardizes, conforms, and maintains the	computers (30); global positioning system (GPS) (42); x-
output.	rays, medical scans (46); mail delivery, postal service,
11 <b>Dhysical amnowarmant (anables avtands)</b> ; the	Hydraulies (15); raika shoas (21); performance onhancers
product physically approvers the user. It extends the	(22): cars (31): submarines (36): parachute (53):
product physically empowers the user. It extends the	(22), cars (51), submarines (50), parachule (53), wheelbarrow tools (72); infra red (ID)/ night vision (74);
capabilities of the user.	wheeldaflow, tools $(72)$ , hilfa-red (IK)/ hight vision $(74)$ , briefcase case (75): (battery) torch (79)
12 Sensation (pleasures): the product focuses on and	Hottub spa (28): radio (38): talevision (30): newspapers
delivers emotional or psychological benefits mainly	magazines (40): parachute (53): soft drinks (62): tooster (66)
through the senses. It appeals to the senses (taste smell	$\frac{1}{1000}$
sight sound touch)	
13 Aesthetic (beautifies, decorates): the product	Nike shoes (21): artificial body parts (23): swimming pool
beautifies or decorates something. It is human perception	(43): flushing toilets (56): dves (58): glass (60): cutlery (71)
based.	()
14. Emotional, psychological (pleases, reminds,	Telephone (3), camera and film (14), air-conditioning (17),
comforts, eases, reliefs, appeases, fulfills): the product	geysers (18); Hottub, spa (28); social media (33); drugs,
focuses on and delivers emotional or psychological benefits.	anesthetics, narcotics (24); radio (38); television (39);
It strives to improve emotional and psychological states or	newspapers, magazines (40); swimming pool (43); flushing
moods.	toilets (56); space travel (57); lifts, elevators, conveyors
	(59); cigarettes, cigars (61); artificial sweetner (63); mail
	delivery, postal service, couriers (65); caravan (69)
15. Abstract Empowerment (empowers, informs): the	Machine gun (2); telephone (3); atom bomb (9); fax machine
product empowers the user in an abstract sense. The product	(10); overhead projector (11); microscope (12); sensors
informs the user.	(20); electronic signs, electronic books (26); computers
	(30); universities $(32)$ ; social media $(33)$ ; submarines $(36)$ ;
	radio (38); television (39); newspapers, magazines (40);

	calculator (70); infra-red (IR)/ night vision (74); internet
	(83)
16. Replacement, elimination (replaces, reduces,	Solar energy (8); nuclear energy (9); robotics (16);
eliminates): the product replaces, reduces or elimates an	electronic books (26); CDs, DVDs (27); shower (29);
input, condition or effect, so that it is not longer required or	organic food (34); water purification, desalination (37); fuel,
present.	combustion engine (47); parachute (53); bank cards, ATMs
	(54); flushing toilets (56); artificial sweetner (63); recycling
	(64); 4x4 vehicle (77); batteries (80); the skyscraper (81);
	the supermarket (82); airbags (84)
17. Extension (builds, enriches): the product makes it	Transistor (19); plastic (35); water desalination (37);
possible to extent or enrich something. It forms a building	satellite (41); combustion engine (47); paper (50); cement,
block.	adhesive, glue (52); dyes (58); internet (83)

## 4. Conclusion

To examine the relationship between benefit and innovation, the benefits of a broad array of products were considered, and a list of benefit and functionality categories was devised. 16 benefit categories and 17 functionality categories were listed. These benefit and functionality categories are seen as universal, and not product or industry or time specific.

Both product benefits and product functions were considered. Benefits are seen as the benefits a product provides. Functions are seen as the functions a product provides. Benefits were also examined and categorized from the vantage point of market entry and the replacement of existing or incumbent products. For example, the benefit of cars were also considered from the vantage point of cars replacing horses and buggies as the incumbent product. The notion of core benefit or core function was also used. A cost, economy (benefit 1) benefit may be engineered into cars, but it is not seen as the core benefit that enabled cars to compete with and replace horses and buggies. Even when mass-produced, cars were more expensive than horses and buggies. Similarly, recycling may have health benefits (benefit 7), but it is not seen as its core benefit. It is also possible to distinguish between necessary and redundant benefits and functionality. Necessary benefits and functionality enable value creation, and are required for value creation. Redundant benefits and functionality do not essentially contribute to value and are generally excessive. For example, cars do not necessarily require flexibility, variety, or variation (benefit 5) to offer better value.

Of course, products may very well transition and extend in terms of their benefits and functions. A product may enter the scene because of a certain benefit, but may mature other benefits and functions with time. For example, the 4x4 or off-road vehicle can perhaps be seen as an extension or spin-off of the car that only entered the scene later on.

A number of products extend over multiple categories. Few products have a single benefit or function. Although the target market plays a role, there also seems to be some correlation between the number of benefits of a product, and its success or potential. Cars and the internet both have a range of benefits.

Seemingly, there are also historical patterns that emerge in the benefits and functions realized through products over time – periods or eras. For example, the information age arguably saw an increase in products that target comfort, accuracy, control or elimination of waste or side-effects.

It is noted that convenience is seen as a benefit only, and not a function. In a functional context, convenience is seen as a product and consequence of other functions (functionality). There is no direct means to produce or obtain convenience.

Evidently, products have distinct benefits and functionality that permit their success and form the basis why the product is valued. Analyzing the benefit and functionality types of existing products, and knowing the benefit and functionality types that they can build into products, should aid innovators and entrepreneurs, and bring greater coherency to their efforts. With universal benefit and functionality categories, it may indeed be possible to correctly ask customers what they want or desire. Benefit may be a medium for both incremental and radical innovation.

Benefit, functionality, core benefits/ functions and necessary benefits/ functions can equally reflect on customer satisfaction. Delivery on core benefits/ functions and necessary benefits/ functions can explain levels of customer satisfaction. It may also extent the dimensions against which customer satisfaction is measured. Benefits and functions may also explain customer frustration and missing value. It can also help to contextualize present and future customer expectations as ideals and aspirations.

The study can be further extended by consulting patent data or (the products of) entrepreneurs at innovation hubs, to certify the benefit and function categories against modern products.

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