Analogical Product Attributes (APA) Model: Methodology for Business of Design Analysis

Gabriel Y. L. Tong

Industrial Design Department, Academy of Arts and Design, Tsinghua University, Beijing
Totex Design Limited, Hong Kong
gabriel@totexdesign.com

Abstract: A range of management theories, models and methodologies like 5W+H, SWOT, Value-chain Analysis, Lean Six Sigma..., etc are used in business, for problem analysis from daily operations to strategic considerations. They were typically developed in business-oriented situations and conditions, in which, design was considered as a part of the business operation. Design has become the fundamental of many business developments, and, the new businesses which are design-oriented can be termed as ‘Business-of-Design’. Design has become the strategic part of business today, but it was seldom treated as a core part in the business decision making processes. As the importance of design to business growth has uplifted to the business strategy and sustainable business development levels, a design-centric analytical theory or methodology becomes a very ad hoc topic to the business and design communities. The understanding of the relationship between design and business form a new perspective is essential to any business in the future.

The Analogical Product Attributes (APA) model is a design-centric analytical methodology developed from the practical experience in design and business innovation. In principle, it is to link People (Consumer) and Process (Production) by Design (Product and Service). In APA model, Design has its dimensions between the extremes of Utility and Style. Through APA analyses, users can link B2B (Business-to-Business) and B2C (Business-to-Consumer) activities so to understand the business chains, which is essential for innovation.

Key words: APA model, B2B, utility, style, design innovation.

The design discipline or profession has a very short history. It is generally thought to derive from the era of the Bauhaus (1919-1933), and, design in the modern concept has been evolving even since. In the 1970s, the America, Japan, Germany and other industrial countries began R&D in the new technologies, for consumer applications, such as semiconductor and software. The new technologies have later developed into innovative products such as personal computers and cellular phones. Many studies also find that the rapid expansion of design has happened in the 1970s. The growth of technology and design are interrelated. Today, the design discipline continues to grow both in academic and in practice, yet the notion of Design to the general public is still much broader. In Bonsiepe’s sense, the popularization of the term ‘design’ during the past decade, and its more or less inflationary usage, has turned the word ‘design’ into a commonplace term, but there are reasons for using the term ‘design’ more carefully. However, for the purpose of business, we need to reflect on the wider
concept of the ordinary consumers.

As technology continues to develop, the market continues to diversify, and product-life-cycle continues to shorten, hence rapid renewal or reinvention of product and service has become essential to the sustainability of many businesses. Product or service innovation is also the key to the startup of any new business. To the consumers, every first appearance of a product or service is derived from the process of design. Design has become the center of interest to the market. Anyone in business has to focus on constant generation of new designs. In the future, many businesses may be recognized as ‘Business-of-Design’. [2]

Future business is design-centric, but design has not been part of the core business operation in the conventional theories. The field of design has adapted many theories in which the relationship between business and design is looked at from the perspectives of economics, marketing and management but never design, and developed from the Porter’s Value-chain theory [3] to the very popular ‘OEM to ODM to OBM to OSM’ theory [4]. The intricateness of design, innovation and their functions in businesses has, however, gone beyond. [5] It is therefore significant for the development of a new design-centered operating theory for the future.

For further development of theory for Business-of-Design, the nature of business functions must be revisited from the perspective of design in the wider notion of the consumers. Therefore, a design-centered methodology is vital to the re-discovery of relationship between design and business.

1.0 Analogical Product Attributions (APA)

The Analogical Product Attributes (APA) model is a methodology where Design can be understood and considered as the heart of most businesses. The basic framework of the APA is simple. The centered Design has four attributes, namely; Commodity, Utility, Style and Concept (Fig 1).

Most of the terms of the attributes have their ordinary and broader meanings. But in the specialization world, the terms have developed into specificities in the various fields. The narrower meanings of the same term are in different or even in conflict sometimes. That is why the terms of the APA model have to be theoretically restated to reflect on the broader concept of the consumers and thus be able to cover all aspects of any design.

1.1 Commodity Attribute

As the accountancy’s fundamental concern is of the financial transaction, the ‘commodity’ is therefore the ‘goods of commercial value’ to it, hence, any product or service that facilitates exchange or exploitation on a certain market is a ‘commodity’.

The definition of ‘commodity’ is more specific to the financial market than the accountancy; it is often referred to as the natural resources, precious metals or agricultural goods. When further processed, the ‘commodities’ will turn into the ‘utilities’ such as water and electricity supplies. Both the ‘commodity’ and ‘utility’ are very important tradable ‘products’ on the financial market, because of the transaction’s significance to the direct or indirect costs of the actual productions of any goods and services.
To the manufacturing industries of consumer electronics or technological products, the ‘commodity’ is the ‘mass produced unspecialized functional component’. Today, the array of technological goods or equipment types is vast. From wristwatches to automobiles, any equipment is an assembly of different parts and components. The components are known as the functional parts to the equipment. Many types of components, such as the IC chips and motor, are generic in functionality. A microprocessor, for instance, is the heart of a computer, but it can also be found in many other products ranging from watches to cars. The dedicated firmware has to be installed into the generic microprocessor before it will perform the specific function as the individual product requires. Hence the computers are called commodity products since it does not provide any utility function until the software program is loaded to it. The relationship of functionality between the unspecialized commodity and the specific product is similar to that of the ‘edible’ flour and oil to the ‘eatable’ noodle and pastry. This notion of the commodity is an extension to that of the accountants and investment bankers, and is in common throughout the manufacturing supply chain. Many designers are not used to dealing with the commodities but they should understand and adapt this common notion of the industry.

The four attributes of the APA model need to cover all the aspects in Design. The definition has to be more generalized from the concept of commodities to that of the Commodity Attribute. The Commodity Attribute can therefore be understood as of pure tangibility to its extreme, and that any goods or service for which there is a supply or repeatable production or business process. Efficiency is thus obvious as the core value of the Commodity Attribute as it is for any process and commodity functionality.

The examples shown are rechargeable battery packs manufactured by Totex (Fig 2). They are replacement parts for the power tools such as drills, screw-drivers, power saws…, etc that the professional builders use heavily at work. Every now and then, the batteries need to be replaced when they age, otherwise the efficiency of work will be affected. This range of product is one of Totex’s main businesses. The battery’s functionality is unspecialized, yet the performance of the power tool is highly dependent on it. The cost of the battery is always exceeds that of the tool, so therefore, the design of battery is typically of the Commodity Attribute.

1.2 Utility Attribute

‘Utility’ is not simply a term of the economics but also theories and calculations of complexity with a development lifeline traceable back to as early as Smith, A. (1776). To Smith and others after him, the value of product was thought to be determined by the usefulness, utility of it, so the exchangeability of the commodity is dependence upon its utility. But ‘general utility’, as the theory is known, does not solve an intractable problem of why the most useful things, like water, often cost little to nothing. After a century, attention shifted from the cost and supply as a determinant of price to the desire and demand as a determinant not only of price but also of productivity. This is sometimes termed as ‘marginal utility’. Hence, the old problem of the cost of utility is solved.

From ‘usefulness’ to ‘productivity’, the shift of attention continued. The development of utility function has become ‘interpersonal’ as Aleskerov, F. (2007) said - “This idea that a rational individual facing a choice
between various alternatives chooses the ones that maximize his utility function goes back at least to the eighteenth century theory with Bentham (1970), and this utility maximization paradigm is always central in the fields of social sciences concerned with questions of individual choice.” [8] Utility has developed into the measure of relative satisfaction form or desirability of the consumption of goods. As Edison, T. (1847-1931) said, “Anything that won’t sell, I don’t want to invent. Its sale is proof of utility, and utility is success.” In the ‘new classical economics’, as it becomes known, utility was ‘total consumer satisfaction’, and, satisfaction form has its spectrum between the ‘usefulness’ and ‘preference’.

Design, aesthetic in particular, had an inflationary expansion over the last decades. Design is seemingly satisfying, and ‘beauty’, ‘styles’ and ‘fashion’ are Design’s key answers to consumer ‘preference’, provoking the ‘usefulness’ notion of ‘utility’ to the consumers.

The concerns of the utility and invention patents are also merely about the ‘usefulness’ of the invention. The two basic requirements regarding the utility of patent in general are: ‘general utility’ being the requirement of functionality, and ‘specific utility’ being the requirement that the invention actually performs the function. [9]

Hence, functionality and usefulness of product and service designs are categorized Utility Attribute in the APA model. As seen (Fig 3), are the utility aspects of Totex’s Arm-Wrestler-Light which was designed to operate with its commodity batteries (Fig 2). When Totex wanted to expand the sales of its power tool batteries, Totex took aim at the consumer market and come up with some utility designs, as the generic ‘functionality’ of a commodity part alone has little value to the layman consumers.

![Fig 3 Utility Attribute of Design](image)

1.3 Style Attribute

As utility to style or usefulness to preference forms the spectrum of Design, design happens between the extremes but never at the extremes. In other words, the utility and style contents will vary from design to design but never in deficient. Otherwise the subject matter is not a design. Thus, Design is uniquely Utility in Style.

The historical development of styles was built in a category mixed with complexity and incongruity. The meaning of the term ‘style’ was, in the beginning, aristocratic, which in contrast to manners, was considered to be learned. Style was something inborn and natural. The manifestation of style began to develop at the end of the
nineteenth century. Although the aim of the movement was to rebel against the established aristocratic style, it practically began with partial imitation of appearance. Consequently, new rules of requisite routines such as dressing for sensation, respect, protest, and identity in ‘styling’ were developed. The term ‘styling’, on one hand incarnates ‘lifestyle’ and manners, and on the other hand, such as to German design, notarizes decorative and specificity. [10]

After the Second World War, product styling started to bloom on the richer American domestic market. The role of styling was to stimulate customer interest, arouse desire and boost sales. Design as a very young profession then, was directed to focus on the add-on shell aesthetic of product. Styling characteristically applied existing formal elements from other areas without developing the relevant object in its own essential formal language or productivity. For instance, aerodynamic qualities and slim-line forms were transferred from jet-planes to cars, locomotives, and household and office applications like toasters and pencil sharpeners to connote speed therefore modernity. It was not until the 1960s that manipulating consumers with product aesthetics attracted heavy criticism, which changed the meaning of styling from being a positive association to a negative connotation for artificial formalism. [11]

As communication technology advances, consumer individualism aroused, style and consumer preference became diverse. This may be demonstrated by the frequently used verbal expressions of, ‘in-style’ (being trendy or fashionable) and ‘in style’ (being unique or characteristic in way of doing or showing). The words are spelt the same, but both harmony and incongruity exist in the meanings. Nonetheless, any design aesthetic between styling and way of doing can be satisfying and may exploit its share in the diverse consumer market.

The Style Attribute of APA model can also be understood in two ways, as in the concept of the utility patents: being the ‘general style’ requirement of aesthetical design, and the ‘specific style’ requirement which the design aesthetics has to actually satisfy. This will be further explained in the later part of the paper.

The aesthetic design of the Arm-Wrestler-Light is being shown off disjointedly (Fig 4) from the design’s other aspects. Aesthetical design expressions are direct to the perceiving of the consumers. In the contrary, utility design takes time to understand. Hence style design is important to facilitate the sales of product.

1.4 Concept Attribute

Broadly speaking, there is a distinctive concept behind every word and thing. A concept is vague, blurred and broad in nature. Being an attribution of the APA model however, the Concept Attribute needed to be more specific and is defined as the representational concept of the design. The Concept Attribute is still distinctive but not isolated form the principles of the other Attributes of the APA model.

The conceptual attribution of the Arm-Wrestler-Light is ostensible in (Fig 5). Also perceptible is that the conceptual aspect is often more interesting than the functional and aesthetic aspects of a design. Therefore, every successful Design must have a Sound Concept behind. Sound conceptual representation is not always obvious or exists in every design, and, the non-conceptual designs are unlikely to win in any design competition. The
salability of product is a different story.

What is conceptual design? “Conceptual designs speculate with form in ways that ‘push the boundaries’ of what is understood to be acceptable in design.” said Raby, F., also “the very purpose of conceptual design is to use design as a medium to provoke discussion and debate, and to challenge assumptions regarding what it means to be a designer, a user, and a consumer.” [12]

To the extreme, the conceptual approach of design includes creating idealistic or utopian alternatives, and speculating future scenarios or hypothetical functionalities. In distinction, the Concept Attribute of Design connotes conceptual ideas that are grounded through the process of conceptualization and practical and commercial considerations.

1.5 Analogical Reasoning and Mapping

Technological products are known to be functional. On the contrary, jewelry products are expected to be stylish besides expensive. Across the spectrum are products of various kinds. Any product or design is analyzable with the APA methodology with the renewed understanding to be readily achievable. The two designs from the prestigious French jeweler, Van Cleef and Arpels (VCA), are being positioned differently in the APA mapping (Fig 6). The diamond ring in the lower position has a center stone that weights over ten carats and is certified for its quality. A gem stone as such is normally purchased for its investment value. The cost of the mounting in 18K (750) white gold and side stones are comparatively negligible. But the ‘investment’ is not wearable without its mounting. Commodity is therefore the prime attribution of this design. There is also utility aspect but it is hardly stylish or conceptual. The counter example is considerably conceptual. It is one of the late representations of the famous Mystery Setting of VCA, which was invented and has been patented back in 1933. The design’s aesthetical effect is unique to the Mystery Setting. The technique is very time-consuming, and it commands a supreme craftsmanship that only a very few can master.

One may argue that APA reasoning is personal and mapping is subjective. However, design is a form of creativity and, like any other, it must stem from an individual. Analogical thinking has long been regarded and suggested as the basis for creative thinking. [13] Analogical and logical reasoning are sometimes viewed as mutually exclusive, but formal logic is actually a highly constrained and stylized method of using analogies. [14] There is no shortage of logical thinking methods for business analyses but most design and business problems have no absolute answers to them. Hence the analogical reasoning APA methodology becomes more significant to strategic decision making for the Business-of-Design.
2.0 From Analogical Product Attributes (APA) to Business

Behind any goods or service commodity is always a production process or an operating system facilitated by a factory or company. On the other hand, the mere purpose of conceptualization is for people, consumer or customer. People or customer has basically no relationship with the factory or production process without the existence of product or service design. Design essentially acts as the bridge between people and process. Design has its dimension between utility and style. Hence, Design is to link up People and Process with Utility and Style. (Fig 7)

2.1 APA Design Thinking in Manufacturing Supply Chain

According to the view from the Manufacturing Supply Chain of Tong, G. (2009), in the real world, most businesses or companies are not connected to or has any direct contact with the ultimate consumer. In the supply chain, every link has its own function, and between the links are the connecting designs which facilitate flow of goods and services through the chain. The context of the design is different between the links. Product and service, gradually transforms from link to link until it reaches the consumer in the final stage. To the downstream material fabrication or component production end, design is more technological. To the consumer servicing or retaining end, design is more of humanity in nature. The dimension of design, between utility and style however, never changes. Hence, the design-centered APA reasoning is applicable to analyzing and understanding of business in every link of the Manufacturing Supply Chain. (Fig 8)

From the Manufacturing Supply Chain one can easily see the importance of sales channel to design and sales of product. From the business transaction point of view, there are apparently far more B2B (Business-to-Business) than B2C (Business-to-Consumer) opportunities. But, B2C and B2B can also be understood as aspects of design, then form the twofold approach of the conceptual attribution of APA thinking, which is applicable to any linkage in the Manufacturing Supply Chain. In APA thinking, the B2C approach is the same as the trendy ‘user-centric design’ concept, similarly, the concept of the B2B approach is ‘customer-centric design’. In B2B transaction, the customer is not the consumer or end-user of the product. For example, the Manufacturer is the direct customer and source of business to the Assembler. To the Assembler therefore, the B2B approach is often more important than the B2C approach in design considerations. The two approaches are directionally the same so there is little or no conflict between them.

New business opportunities can be created by strategically maneuvering the sales channel by the B2C and B2B considerations in product design. For example, in the beginning of the video camcorder production there were only two original equipment manufactures, namely Sony and Panasonic. The two OEMs also manufactured many other models for other brands such as Nikon, Fuji, NEC…, etc besides those models marketed under their own bands. Battery is a key accessory to these equipments, especially in those days when the power consumption was so high that the consumers often needed to carry along spare batteries to ensure that power
does not run out during operations. However, there wasn’t enough advantage for the OEMs to fulfill these market demands, because the SKU (single knockdown unit) batteries were manufactured by another company such as Sanyo. From the logistic point of view, the SKU equipments were the OEMs’ bread and butter. Totex discovered that there was a shortage in rechargeable batteries and seized this opportunity. The problem then, was how to establish the sales channel for the new supply. With B2B concerns in mind, Tong invented the universal battery design (Fig 9) which fits all Sony made camcorder models in one direction, and fits all Panasonic made when the battery is turned upside-down. Hence, one SKU battery fits many models of the equipment. The universal battery design aroused the interest of Philips to supply their consumer market with it through its wide retail channels, including the electronics and white-goods (electrical household appliances) outlets and the supermarkets outlets for its light bulbs, besides the conventional camera shops. This feature of a universal-fit battery is of little advantage to the end-user because one seldom owns two camcorder models, but the invention is of great advantage throughout the distribution channel, the manufacturer who markets the product, the distributors and the retailers. With the single universal SKU battery that fulfilled all the needs of consumers, the shops do not need to carry the many dedicated SKUs supplied by the different OEMs for their different camcorder models. This ultimately benefited the consumers making their equipment’s accessory being widely available. The invention also opened the channel for the ‘after-sales-market’ supply, which later facilitates the sales of the cellular phones, notebook computers and many other batteries and peripherals.

The ‘customer-centric’ design approach has not been emphasized by the academics, since the market structure as in the Manufacturing Supply Chain has seldom been theoretically studied and understood from the design-centric approach.

On the other hand, the Manufacturing Supply Chain also shows that APA design considerations of, say, the Assemblers, should be made aware of the technological possibilities available from its downstream suppliers, besides that of the production process of their own on the commodity side.

2.2 APA Reasoning in Commercial Design

The APA methodology can be used as a tool for the analysis across the spectrum from industrial design to commercial design, as demonstrated by the two advertisements shown (Fig 10).

The author was initially attracted by an ad. depicting a relaxed world renowned fashion designer, Vivian Tam. However, the author was initially unable to identify the chair in the background and thought that it was a dental chair, and not until the nondescript Northwest Airline logo was found at the bottom, that the author realized that it was an in-flight passenger seat. The business of an airline company is obviously a ‘commodity business’ [15] as many frequent travelers, like the author himself, would much rather trade any in-flight services for the shortened flight time. The value of a commodity is about
its efficiencies such as cost, speed, reliability…, etc rather than of its nonfunctional differentiation from other like products. Therefore, airliners often put the emphases on the utility and style of service designs, hence the ads. of both Northwest and Korean Air (Fig 10).

In both ads., the passenger seats are being advertised, as the seats are considered to be the main part of ‘general utility’ of airline companies’ service designs. On the other hand, styles are represented differently in the ads of the two companies. As discussed earlier, the Style Attribute of Design in APA can be considered twofold, being general and specific styles. The style of Northwest is more specifically demonstrated by Vivian Tam with her design sketch also displayed. In Korean Airline’s ad., style is more generally represented by a relaxed lifestyle, which is directed to relate to the utility design of the passenger seat, thus arousing the potential user’s anticipation of a specific satisfaction. There are differences in the concepts and representations of the two ads., yet both ads. are clearly analyzed. So, APA reasoning is valid to analyzing and understanding of concept of service advertisements and their creative design.

2.3 APA Model Strategic Positioning for Business Development

There are methods being used frequently by the students in their general business studies, such as the 5W+H [16] and SWOT [17] analysis. These analyzing tools are primarily of the same model, which in principle are listing exercises. There are numerous other less popular methods of the same principal, such as OFPISA, PISCO…, etc. [18] The questions asked in the methods are different, but the analyzing process is the same. It is based on short listing of facts cognizable to the analyzer in the encompassing circumstance. The process also involves categorizing of facts according to the definitely defined and usually separated folds of the selected method. Hence, the whole situation is broken down into component facts with the understandings being categorized. Through such exercises, one may be able to recognize more facts or discover hidden ones. However, such tools do not directly help in designing the next step in business. One in business who had deep understanding of the facts may not need these tools. On the other hand, the high-level understanding of situation needed for creative business strategic design may not be achievable with such listing exercises.

The Analogical Product Attributes is neither a listing exercise nor a specific thinking tool, but is rather a positioning exercise. It is indeed a methodology or operating principle for the high-level understanding of circumstance and strategic design or business positioning. As formal logic is a highly constrained and stylized method of using analogies, APA model promotes and facilitates the use of analogical reasoning for business innovation. The APA thinking process involves understanding the source (analogue) and target by cognizing the analogy or transferring of information from the particular subject (the source) to another particular subject (the target). The source and the target are both variable to the cognition and imagination of the designer, thus a new target position is consequently found. Imagination, crucial to the designers, is fully utilized in the analogical reasoning process, though it has never been valued in formal thinking which relies primarily on logical
reasoning., Imagination and logical thinking are undeniable mutually exclusive, it hence provokes analogical thinking. Analogical reasoning is not only concern about the shared relationships between objects, but also attributes, functions, regularities, patterns, affects and ideas for achieving the high-level understanding of both analogous source and target. In which, it also corresponds to idea conceptualization in constrains that sets a new target or objective for design and business development.

The Analogical Product Attributes (APA) model is arisen from the reflection of the author’s thirty years experience in industrial design and business innovation practices, its full potentials and uses for the different fields still needs to be further explored.


[2] Business of Design Week <http://www.bodw.com> is one of the most significant international design-related events hosted by Hong Kong annually since 2002. BODW focus on the intricate relationship between business and design which sets it apart from other networking, sharing and knowledge building platforms.


[17] SWOT stands for Strengths, Weaknesses, Opportunities and Threads. It is thought to be derived from Barney, J. B. (1997)

[18] OFPISA stands for Objectives, Facts, Problems, Ideas, Solutions and Actions findings. This method is known to the author for over thirty years but its origin is unknown. Similar to it is the PISCO of de Bono, E. (1982) Thinking Course, The Bath Press, Bath. PISCO stands for Purpose, Input, Solutions, Choice and Operation.