

Original Article

Psycho-Sustainable Design (PSD)

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Abstract - This paper proposes the Psycho-Sustainable Design (PSD) technique which enhances the sustainability of a product by improving psychological attributes for longer retention of the product, identifies the detail attributes in emotional and practical perspectives, suggests PSD tactics, and proposes a PSD chart for effective, sustainable design analysis. This PSD chart can analyze products' specifications in terms of PSD tactics, emotional consumerism, and practical consumerism, presenting which aspects are weak or strong. For easy understanding, the PSD chart is demonstrated with an example. Sustainability can be maintained effectively in some products using the PSD technique in this paper.

Keywords - Emotional consumerism, Practical consumerism, Psycho-Sustainable Design (PSD), PSD Chart, PSD Tactics.

1. Introduction

Designers and manufacturers have created products for use by consumers. Though engineering designers are largely focused on materials and functions, it is important to create attractive and desirable products in the aspect of psychology. Psychology is the scientific study of the mind and behaviour in humans. Psychology is tightly connected to product design. More values can be added to a product by better understanding human emotions, behaviours, and motivations. It should be one of the most important inputs in a product design. More meaningful and usable product designs can be created with the help of psychology.[1-5]

use, and throw products away so that new products can be purchased again.

This marketing style requires heavy new material extraction from the earth. If consumers are persuaded to purchase products and keep and maintain them so that they can be long-lived, fewer new products will be needed, and resource extraction can be avoided or reduced. True sustainability means that minimum resources are extracted from the earth. To achieve this, products should be used for as long as possible and much of the extraction problem originates from consumer conditioning.[6-10]

Therefore, another important input to a product design should be sustainability. Due to the recent climate changes and environmental crisis, it is not an option anymore in the product design phase. Indeed the concept of DFS (Design for Sustainability) plays an important role in the sustainable production and consumption of products.[11] The metric to evaluate the impact of a product on the environment, such as the carbon footprint or embedded energy, is quite common now.[6] Various sustainable design strategies have been developed, including TDCMS (Total Design Control Management Strategy), DFSM (Design For Sustainable Manufacture), and MCS (Maintenance Centred Sustainability).[11-15]

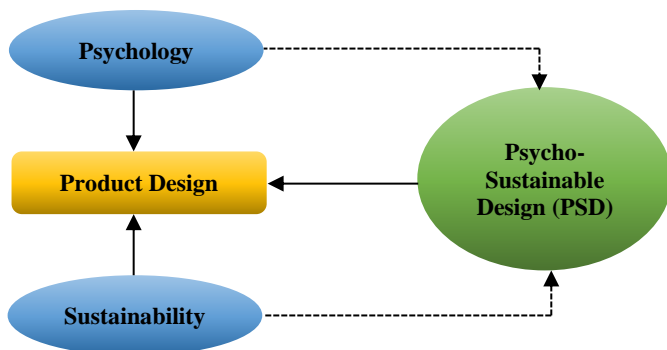


Fig. 1 Conceptual diagram of Psycho-sustainable design (PSD).

Meanwhile, the modern-consumer society has been termed “the throw-away society”, and consumers have been conditioned through subtle and delicate marketing to buy,

Psychology and sustainability, respectively, have long been studied as important inputs to product designs. Psychology mainly handles non-engineering perspectives,



while sustainability handles engineering perspectives in the design phase. A combined or integrated approach incorporating both of them has not been studied yet. This paper proposes a noble approach, PSD (Psycho-Sustainable Design), to investigate psychological perspectives to enhance the sustainability of a product in a design phase (Figure 1). Designers should consider PSD, which involves designing products that are so desirable that not only do consumers want to purchase these items but also to keep them and continue using them. The designs should be such that there is much less desire to discard products. This paper presents the effects of design and marketing and analysis of consumers in terms of emotion and psychology. This paper explains the PSD approach and demonstrates the system using a practical example.

2. Influences of Design and Psychological Strategies

2.1. Consumer Society

In the late 1950s, engineering statistician Genichi Taguchi promoted theories concerning the quality of manufactured goods.[16] Taguchi suggested that designers should specify quality before components are manufactured. The designers eventually created better component specifications, leading to large-quantity batch production methods revolutionizing manufacturing and production. The consequence was that goods became available to consumers in large quantities and at a very low cost. The consumers' mindset changed from "nurture" to "Throw away and buy new". Thus, in the 1960s, a so-called consumer society was born, expediting resource exploitation and severely impacting Earth.

2.1.1. Life Cycle Design to Reduce Environmental Impact

The Taguchi analogy for quality can be applied to sustainable engineering since the designers are responsible for designs throughout the life cycle and are the only people who can influence the sustainability of every element of the product life cycle. Moreover, design function has long been regarded as the key to sustainability throughout the product life cycle.

One of the early practitioners was Luttrup, who suggested 10 golden rules which can be applied to the product life cycle to a less or greater extent for sustainable product creation.[18] Some relate to minimizing mass, thereby minimizing resource extraction, whilst other rules suggest a reduction of energy in sourcing, manufacturing, and usage. Maintenance for longevity is also featured. These points and others can be applied to the product life cycle when considering creating sustainable products. There are seven life cycle elements in Table 1.[19]

The design function can greatly influence all seven elements and product features that can reduce environmental

impact. For example, the design function is responsible for prescribing 80% of the manufacturing process.[21]

Table 1. Seven life cycle elements [12]

1	Material Sourcing
2	Product Design
3	Product Manufacture
4	Transport (material transport from sourcing to completion of manufacturing)
5	Product Usage
6	Product Maintenance
7	Product Disposal

Designed-in maintenance is possibly the biggest environmental saving since maintenance can extend a product's life, which means that each time a product is maintained and returned to service, resources are saved by avoiding replacing otherwise discarded products. A product's life can be extended by carefully designed maintenance procedures such as easy access parts, lubricants, modular construction, and sacrificial parts such as bearings, seals, tires, etc.

It is clear that the design function plays a key role in influencing the entire life cycle of a product and is the only function within the life cycle that takes responsibility for applying sustainability principles.

2.1.2. Product Longevity in Terms of Psychological Aspects

Psychological marketing is well known for sophisticatedly persuading the consumer to buy more.[22] This approach perpetuates the throw-away society and, of course, leads to unsustainable behaviours. However, a new alternative concept in improving the longevity of a product can be used and is persuading consumers to continue using their current products rather than discarding them in favour of new products. Psychological marketing techniques are successful in persuading consumers to purchase products. Likewise, it is suggested that similar approaches can be used. This approach persuades consumers to retain products resulting in longer product life expectations, thus enhancing sustainability.

3. Analysis of Consumers

It is necessary to consider reasons why consumers buy products and then why those products would be discarded. It is also useful to consider why the consumers would keep the products.

3.1. Emotional Consumerism

Most consumer activities are based on emotions which can be translated into desires. The desires to own or possess something your neighbours do not possess, the desires and satisfaction from purchasing a bargain, and pure purchases on a whim exist. All these and several other reasons for

purchasing related to them can be called Emotional Consumerism. Table 2 indicates how emotional human behaviours manifest themselves in terms of purchase, retention, and discarding.

Table 2. Emotional Consumerism-Reason for purchase, retention, and discarding a product

Reason for Purchase	Reason for Retention	Reason for Discarding
Human desire for new things	Hoarding Syndrome (E1)	Desire fading
Persuasive marketing	Desire Purchase (E2)	Fashion
Bargain	Continued desire/use (E3)	Low value (cheap)
Fashion	Continuously in fashion (E4)	New fashion items available
Competing with neighbours	Continuing to look new (E5)	Product looking tatty/worn
Collector	Competing with neighbours (E6)	Competing with neighbours
Iconic	Collectable (E7)	Need to release value
Gift	Iconic (E8)	Owner's death
Being Wealthy	Sentimental (E9)	Whim
Whim	Whim (E10)	

From Table 2, reasons to purchase, retain, and discard products can be obtained. When it comes to reasons to purchase products, there is a natural tendency for humans to desire new things. There is a desire to own exciting new technology or new fashion items. There is a natural competition to own everything matched to or better than your neighbours. The emotion of desire may not just be to own something but to make something last. This could lead to purchasing old components for reuse or new components to upgrade the current product.

There are some reasons relating to retention. An item which always looks fresh and new such as a wristwatch, may be continually used. Competition with other consumers relates to powerful egotistic emotions. People keep a product because of its usefulness. Maintenance of products is an important factor in keeping products serviceable, useful, and continually desirable. And lastly, there are other emotional reasons for keeping products. Perhaps it was a gift or possibly an heirloom, and consumers are emotionally attached to those items.

When it comes to reasons to discard a product, one reason products are discarded is that the owners' desires for products fade or that there are new fashionable items which drive the consumer to buy those items. Peer pressure is also a powerful influence in purchasing and discarding products.

3.2. Practical Consumerism

Though many purchases can be linked to emotion, practicality often takes the lead in persuading consumers to purchase. Table 3 describes decision factors in terms of practical aspects. There are many practical reasons to purchase, retain, and discard products. When it comes to reasons for purchase, a genuine need may lead to purchasing a new product, which means the purchase may be made mostly on technical grounds. Some products, such as computers, are upgradable, in which case they will be continued to be used until they eventually become obsolete.

In many cases, products may be kept alive and in service if sacrificial components can replace those that are worn. The end of the life of a product can occur in several ways. The product may become obsolete and overtaken by new technology. Some products are designed to be used and discarded. For example, a washing machine was designed for finite life, after which it is often scrapped.

PSD can only partially influence a practical need since a consumer making a practical purchase/retaining decision is only partly influenced by his or her emotions. If the principles of sustainability are to be invoked in a consumer, the designers must pay attention to the consumer's emotions to create the desire to purchase and retain products.

4. Psycho-Sustainable Design (PSD)

4.1. PSD Tactics Influencing Consumers

Marketing and sales personnel have long since used psychological influence strategies to sway consumers' behaviours. Sustainability design engineers can use some of these strategies to influence consumers to retain their products. Below are selected 15 tactics which could prove useful for PSD.

4.1.1. Priming (T1)

Priming is a method of stimulating a response which can lead to a selection process. PSD practice: ensure the devices be coloured with religious, personal, or thematic significance.

4.1.2. Reciprocity (T2)

If someone does something for you, you naturally want to do something in return. A design may give something extra that the competition does not offer. PSD practice: add extra features giving something for free before being asked.

4.1.3. Social Proof (T3)

People will adopt the beliefs and actions of people they know and trust. There is a desire to conform, which is why celebrities promote products to engender group behaviours. Therefore, products that are used in a group context or social context fit into this category. PSD practice: practitioners should invoke environmental or sustainability-related social events, which could include, for instance, equipment to clean trash from rivers.

Table 3. Practical Consumerism: Reason for purchase, retention, and discarding a product

Reason for Purchase	Reason for Retention	Reason for Discarding
Genuine need	Permanent installation (P1)	Replaced
New technology	Upgradable (P2)	Obsolete
Old components for re-use	Sacrificial components available (P3)	Product
Long lasting	Reusable components available (P4)	End of life
New components for upgrading	Maintainable/repairable (P5)	Replaceable
Maintainable	Continued usefulness (P6)	Broken product, beyond repair
Healthy product	Improve health (P7)	Designed to be unrepairable
Investment	Value steady/increase (P8)	Patient becomes well
Consumable product	Remains unused (P9)	Need to release equity
		Use once then discarded

4.1.4. Decoy Effect (T4)

Offer a feature to act as a decoy which interests and entices a greater desire to own the product. It might include a specialist use or application. This is similar to “reciprocity”. PSD practice: offer a low-cost design element that enhances the product or its application.

4.1.5. Scarcity (T5)

Scarcity creates a desire to own products. The scarcer, the more valuable it is perceived to be. PSD practice: create limited editions and make the product scarce or rare. Scarcity or rarity can be brought by offering an engraved limited-edition number or a certificate of authenticity. This will also create a desire to collect and avoid being discarded.

4.1.6. Anchoring (T6)

People tend to be loyal to a particular brand or store. The brand or the store is anchored for the consumer and involves trust in the brand. This may take time to become

established. However, look-alike features could be incorporated to emulate a well-known brand. This is not illegal. However, it must not be too close to the original. PSD practice: create a well-known product: branded product, special design product, or iconic product.

4.1.7. Baader-Meinhof Phenomenon (T7)

This phenomenon occurs when one encounters something for the first time and then notices the item cropping up. It is also called the “frequency illusion”. [24] This happens because of selective attention: the unconscious mind looks for the item. Confirmation bias: this reassures the observer that each sighting is further proof of its importance. PSD practice: design recognizable features of shape, colour, name, function, and sustainability value.

4.1.8. Verbatim Effect (T8)

People remember general aspects rather than detail. [25] PSD practice: create an iconic or recognizable shape.

4.1.9. Clustering (T9)

People have a limited short-term memory capacity in the short-term memory and to cope with this, most people tend to “cluster” similar pieces of information. [26] When creating content, design to increase memory retention by grouping design functions, shapes, colours, etc., together. PSD practice: group designs together to aid memory retention. Create a range of designs of a similar shape or purpose.

4.1.10. Loss Aversion (T10)

A natural human response to ownership is that once someone possesses something, they do not want to lose it. [27] This psychological need can be a useful emotional hook when designing products so that the consumer will retain the product. PSD practice: design a product which is iconic, expensive, rare, sentimental, and related to an event or a person so that the consumer has an emotional connection, thus retaining the product.

4.1.11. Emotional Pull (T11)

Emotional and psychological appeals tend to resonate more with consumers than explaining a feature or function. PSD practice: design in sentimentality linking the product to an emotional hook. This could be a millennium product, a marriage product, an event product, or a means of protecting the environment. They are maintainable and therefore have the potential to be long-lived.

4.1.12. Position Your Product in the Market (T12)

The best position for a product within the market is at the higher end of available similar items. This may mean the product must be high quality, have limited production, have an exclusive design, etc. PSD practice: create a product with exclusivity, scarcity, quality, special, and limited quantity.

4.1.13. Promote Exclusivity (T13)

Exclusivity exudes quality and makes people feel that with ownership, they are special. As presented in Maslow’s hierarchy of needs pyramid, self-esteem is placed near the top level.[28] PSD practice: design products that show the owner is special, pertaining to a particular lifestyle, exclusivity, quality, appropriate colours, etc. Many people use a high-class car to project this image.

4.1.14. Introduce Uncertainty and Doubt (T14)

This emotional hook is perhaps one of the best PSD tactics used to make consumers stop, think, and change their behaviour. The emotional influence can be used to introduce a feeling of safety or a feeling of being isolated from your social group if you do not own this product. Fear of scarcity is one emotional draw that will influence the consumer to retain the product. In terms of PSD, the emotional hook is harming the planet or, alternatively, retaining the product and helping to save the planet. These emotional hooks will require education and time to generate the appropriate response. PSD practice: introduce emotional features into the design, making consumers feel good. Feelings might include doing a good service for society or the environment.

4.1.15. Colour (T15)

Colour has various effects on desires and emotions. Colour may affect differently depending on people, and it psychologically affects their needs to purchase or retain products.[29] PSD practice: The selection of a product colour is highly personal; however, the product could be aimed at a particular age, type, and gender of the consumer, in which case a product colour selection could be extremely important. The aim is to create an emotional desire to retain the product.

4.2. A Practical Approach to Psycho-Sustainable Design (PSD)

PSD aims to design products which would be retained by consumers rather than thrown into the trash. Marketing engineers use psychology to persuade people to buy a product. A psycho-sustainable engineer must look beyond mere initial ownership to persuade the consumer to retain the product until the end of its useful life. To this end, the PSD tactics have been combined with practical product elements in a chart which allows the designer to formulate a design based on consumer response. This can be seen in Table 4.

The basic approach to PSD follows: On receiving the brief for the new design, the marketing and design teams should work together and define the product specification. The specification elements can then be matched to the PSD tactics in the “Technical Specification” column. This is an essential step since it will assist in matching design elements and the PSD tactics with the decision-invoking areas, namely: Emotion Attributes and Practical Attributes.

When each PSD tactic is matched to the appropriate Reason for Retention, the values can be counted, indicating the value and impact of each PSD tactic. Evaluations can, then, be derived related to design performance and the impact of emotional and practical attributes. Marketing information can also be evaluated. This can be better explained with an example of a classic cruiser-styled motorcycle, as discussed below.

Once the brief is given to the design team, the technical specifications need to be provided. By working through the PSD chart, features on the motorcycle can be defined. The specification is presented in Table 5.

Table 4. PSD chart template

PSD Tactics	Cal	Emotional Consumerism										Practical Consumerism									Total
		Reason for Retention										Reason for Retention									
		E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	P1	P2	P3	P4	P5	P6	P7	P8	P9	
T1																					
T3																					
T2																					
T4																					
T5																					
...																					
T15																					
Total																					

Table 5. Technical specification of motorcycle

S1	Mid-range engine power 600 cc
S2	Classic cruiser styling
S3	Usage two-people touring
S4	Black and chrome finish
S5	Driver and passenger seating
S6	Two headlights
S7	Smooth lines
S8	Engine protector (belly pan)
S9	Standard extras: heated seats, heated hand grips, windscreen, touring luggage bags
S10	Intercom system between driver and passenger
S11	Mechanical systems throughout: no computer control, only adjustable mechanical elements
S12	Maintainable: simple mechanical systems, adjustable
S13	High-quality manufacture and finish
S14	Power options: low emission gasoline engines, emission filters, hydrogen engine, electric drive

Most of these features are non-technological but are designed to provide emotional consumerism to a target group of males 40 years and over (and some females) who wish to belong to an outdoor biking fraternity. The group would be affluent, and the social level would be professional people who would have been deemed to have “made it” in their profession.

The designed features of the motorcycle can be linked to the PSD chart as presented in Table 6. This can be done for expedience and ease of evaluation. The technical specification column matches the motorcycle design features to the PSD tactics. The PSD tactics are then matched to the Emotion/Practical Consumerism elements. The number of “hits” can then be counted both horizontally and vertically.

The summation of black circles in one row presents how a specific tactic is useful, indicating the influences of the PSD tactic on consumers in terms of marketing. High values, in this case, belong to Loss Aversion, Uncertainty, and Fear, with values of 10, respectively. Both tactics can be utilized by the marketing team in their push to influence purchasing and long-term ownership, as presented in Table 6. The lowest value of (T7), the Baader-Meinhoff Phenomenon, with a value of three, may not be involved in a marketing campaign. However, the low value may suggest that the motorcycle requires new features that apply this PSD tactic, thus increasing its value. The summation of black circles in one column indicates the effectiveness of design features and the Emotional/Practical Consumerism they may be targeting. There are several high-value summations relating to consumerism. For instance, Hoarding and Social Competition have both a value of 10 and Collectable and Iconic both have a value of 12. These values are useful to the

design team whose design elements seem to have successfully matched Emotional/Practical Consumerism. If these values are low such as sentimental with a value of 7 compared to the highest one, then the design may be changed to increase the value of this emotional evocation. The higher values also show the equivalent strength of emotional or practical pulls the design elements may have.

It was suggested previously that practical considerations would engender a more clinical approach to purchase. However, emotions will still play a major role, especially if emotions can be invoked after the clinical selection has been made. Table 6 also suggests that the emotional input has been much reduced but can still play a role. The maximum horizontal summation belongs to Uncertainty, Fear, with a value of 10. The value indicates to the marketing team which PSD tactic would be effective after considering practical considerations.

The vertical summations also show that emotional evocation is reduced when practical considerations are being applied but indicate that emotion still plays a role. The design team may wish to improve certain features to invoke stronger emotions. Noticeably, the higher values of (P5) Maintainable and Reusable, with a value of 4, would relate to increasing the longevity of the motorcycle.

PSD Chart can be read so that low values may be used to reinforce weak elements of the design, which can then be strengthened.

4.3. Marketing of Product Sustainability

PSD is a new approach, and design and marketing teams will work on tasks together to promote long-term and sustainable product ownership. In PSD, design functions are central to creating products which have the least environmental impact over their entire life cycle from material sourcing through to disposal.[16]

The key is to form a multi-disciplined team. The core design team may be responsible for creating a technical specification. However, the peripheral design team should consist of various specialists such as marketing, sales, transport, disposal engineers, packaging engineers, etc. The product can be created for sustainable efficiency across the entire life cycle by interacting with these disciplines. When the product has been introduced to the marketplace, it is the task of the marketing function to educate consumers providing information for the consumers to make an informed decision and eventually an emotional selection of the product.

The education should consider several levels and several audiences. The aim is to inform consumers, manufacturers, and designers of the environmental impact and offer methods and systems where the environmental impact can be reduced.

Table 6. PSD chart for motorcycle

PSD Tactics	Technical specification	Emotional Consumerism										Practical Consumerism								Toatl			
		Reasons for Retention										Reasons for Retention											
		(E1) Hoarding	(E2) Desire Purchase	(E3) Continued Desire/Use	(E4) Fashionable	(E5) Looks New	(E6) Competition	(E7) Collectable	(E8) Iconic	(E9) Sentimental	(E10) Whim	(P1) Permanent Intallation	(P2) Upgradable	(P3) Sacrificial	(P4) Reusable	(P5) Maintainable / Repairable	(P6) Usefeful	(P7) Improves Health	(P8) Value Steady/Increase		(P9) Remains Unused		
(T1) Priming	S1,S2,S4, S7,S13	•	•		•	•		•	•		•												8
(T2) Reciprocity	S6,S9, S10				•			•	•	•	•												5
(T3) Social Proof	S2,S5, S10,S14		•					•		•			•	•	•	•							7
(T4) Decoy Effect	S9,S10	•						•	•	•	•				•		•						7
(T5) Scarcity	S6, S7, S12,S13, S14	•	•	•		•		•	•	•	•												9
(T6) Anchoring	S2,S4, S13	•			•				•	•	•												6
(T7) Badder-Meinhoff	S2,S4, S13	•									•									•			3
(T8) Verbatim	S2,S4,S6								•														1
(T9) Clustering	S2,S3, S4	•	•		•	•			•	•		•	•								•		9
(T10) Loss Aversion	S6, S7, S12,S13, S14	•						•	•	•	•		•	•	•	•					•		10
(T11) Emotional Pull	S2,S4,S7, S9,S14	•			•			•		•	•									•			6
(T12) Market Position	S1,S2,S4, S13,S14		•		•	•		•	•	•											•		7
(T13) Exclusivity	S2,S4,S6, S13,S14	•	•		•	•		•	•	•	•		•										9
(T14) Uncertainty, Fear	S1,S8, S11,S12, S14	•							•	•	•			•	•	•	•			•	•		10
(T15) Colour	White																						0
	Black		•		•	•		•	•	•													6
	Red																						0
	Yellow																						0
	Blue																						0
	Green																						0
	Brown																						0
	Chrome		•		•	•		•	•	•		•											7
	Total		10	8	1	9	7	10	12	12	7	9	3	4	3	3	4	0	3	5	0		

This educational drive should be mainly targeted at consumers who can absorb the complex information, which can be applied on several levels, such as Basic level explaining fundamental sustainability principles, Medium complexity level explaining the life cycle of a product and how a product impacts the environment, and High complexity level providing figures and data to inform consumers from an individual through corporate to national and global levels and systems. These educational levels are designed to influence and assist many different consumers in sustainable sourcing, using, maintaining, and disposing of the product.

In many cases, designers are in a position where they are to educate consumers, perhaps through public lectures or educational involvement. Nevertheless, it is the “Sustainable Marketeer” who is unusually in direct contact with the consumers and has the best opportunity to educate the consumers at the point of sale. This new breed of marketeer should use the PSD tactics and the PSD Emotional/Practical Consumerism elements are designed into the product to inform and evoke strong and unbreakable hooks in the consumers.

5. Conclusion

The objective of Psycho-Sustainable Design is to induce a desire from consumers to retain products preventing the product from being discarded until the end of the life expectancy of the products. A sustainable product is long-lived, often through maintenance, so it can be reused indefinitely. Translated into everyday consumerism, longevity means that products should be used as long as possible. Consumers should be conditioned to keep using products rather than discard them in favour of the next new things. The life extension of a product is one way of being sustainable. The longer a product’s life can be extended, the fewer new products made and the fewer resources required.

Most consumers have a certain level of wealth so that they can initially purchase products. However, the emphasis is to educate consumers to remind themselves of the need to

retain products. Therefore, influences of design and marketing are reflected on, and based on these influences, analysis of consumers proceeds. Finally, emotional and practical factors and PSD tactics can be applied to the psychological aspects and task model.

More subtle ways to introduce sophisticated design elements which evoke appropriate emotions are embodied in the PSD tactics, which assist in achieving an appropriate emotional response or certain behaviours. Also, Tables 4 and 6 present PSD charts which give examples of the application of the PSD tactics with Emotional/Practical Consumerism based on Technical Specification. Furthermore, the PSD formulation allows sustainability designers and marketeers to evaluate products regarding emotional and practical needs and the consumers' reactions. This analysis enables feedback to the design team to change or manipulate products to bring out appropriate responses or behaviours.

This paper focuses on the basic framework and implementation of PSD. Further investigation is needed to verify the effectiveness of PSD with the quantitative data or analyses comparing the proposed approach with other research.

The responsibility for sustainability lies with everyone living on the planet Earth. However, a wealthy society is the enemy of sustainability. A wealthy society can merely discard products and simply purchase new ones. There is no need to be sustainable. Thus, to save the world, PSD tactics are one of the important sustainable tools. Conversely, if a society is poor, it will find ingenious ways to prolong the life of its belongings. Here, there is a definite need to be sustainable since poorer people cannot afford to discard items and buy new ones.

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