My Helpful Laptop and its Bossy Calendar: *Ego State-Based Personalities of Objects in Product-Person Interactions*

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This research applied Transactional Analysis to investigate the attribution of personality to products. Grounded in the theory of Transactional Analysis, which posits that human personality comprises ego states, this paper examines how individuals attribute ego state-based personalities to products throughout product-person interactions. Through fifteen co-discovery sessions, pairs of participants attributed personality to everyday objects and shared their experiences of these objects while viewing the concept prompts. Findings indicate that individuals attribute diverse personalities to the same product based on their interactions and experiences. Unlike existing literature that predominantly focuses on aesthetics, this study, using the concept prompts with no picture, highlights attributions of ego state-based personalities to products' function. Products representing Nurturing Parent, Adult, and Free Child personalities are associated with perceived satisfactory functional performance and elicit positive emotions. These insights offer actionable strategies to develop products with personality attributes that enhance emotional experiences throughout product-person interactions in individuals' daily lives.

Keywords – Design and Emotion, Interaction, Product Aspects, Product Personality, Transactional Analysis.

Relevance to Design Practice – Understanding of product-person interactions through Transactional Analysis enables designers to attribute distinct personalities to products, enriching user interactions. Integrating ego state-based personalities into design frameworks facilitates the creation of products that evoke positive emotions, fostering emotional connection and enhancing overall user experience.

Introduction

Objects surround us and comprise a significant portion of our interactions with the world, sometimes surpassing interactions with humans. In daily lives, individuals often attribute human-like qualities to objects, perceiving them as entities capable of evoking emotions. For instance, a person might view their car as a caring figure providing warmth in cold winters, or a mother might consider her washing machine as an invaluable helper akin to her third child. These perceptions explain why people sometimes express anger towards computers when they malfunction or appreciation when they function efficiently. Human-product interaction shares similarities with human-human interaction, as both involve entities perceived to possess personality traits. While personality traits are intrinsic and inherent to human beings, product personality traits are perceived and ascribed by users or contemplators (Dumitrescu, 2010). According to Dumitrescu, users' perceptions of a product's personality are shaped by prior interactions and expectations, which influence their approach to future interactions with the product (Mugge et al., 2009). Attributing personality to objects and perceiving them as living creatures fosters a sense of uniqueness and enables the development of long-lasting relationships with these products (Fossdal & Berg, 2016). Our previous research showed that the perceived product's personalities can develop positive or negative emotions experienced at the visceral, behavioural, and reflective levels of emotions (Sepahpour et al., 2022b). Thus, it is important to understand how the perceived product personalities influence the experience of products.

To investigate the interaction between people and product personalities, various psychological theories such as Big Five (Fiske, 1994) and Transactional Analysis (Berne, 2016) can be applied. Big Five, which includes traits like extraversion and agreeableness, was highly regarded by research in the human-robot interaction field (Robert Jr et al., 2020). Transactional Analysis (TA), which refers to *parent*, *adult*, and *child* ego states as parts of human personality, considers communication between two individuals' ego states (Berne, 2016). Transactions are communication exchanges where each response acts as a stimulus for the next (Berne, 1964). Communication from a specific ego state anticipates a corresponding response. Complementary transactions occur when the interaction aligns with expected ego states, such as Adult-Adult, Child-Child, or Child-Parent. In contrast, crossed transactions, which can lead to negative emotions, arise when one communicator expects a complementary response but receives a reply from an unexpected ego state, disrupting the interaction (Berne, 2016).

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We adopted TA as our theoretical framework because it focuses on personality and improving communication and relationships, and has been used by other researchers to understand better people's interactions with everyday objects (Sepahpour, 2017; Sepahpour et al., 2022b; Williamson & Ward, 1999). TA is a valuable tool for anthropomorphising technology, shifting perceptions from functional tools to human-like entities (Williamson & Ward, 1999). By focusing on ego states and transactions, TA can provide valuable insight into emotional responses. As a dynamic interaction framework, TA can reveal how the perceived personality of a product evolves and influences interactions between users and products. We propose that TA, rooted in interaction, offers key concepts to deepen our understanding of product-person interactions. These concepts can prompt participants to reflect on and share their experiences of products. Applying the ego state typology of Parent, Adult, and Child may offer a way to anthropomorphise inanimate objects. By viewing objects through this lens, we can uncover richer insights into interactions that are both emotional and dynamic, leading to a deeper understanding of product-person interactions.

Notably, while this study uses the TA framework to explore product personalities, it does not address users' inherent personalities or psychological profiles. Instead, it focuses on how users attribute personalities to products based on their interactions. This distinction ensures the study remains grounded in how people perceive and experience products through the lens of ego state-based personalities, rather than diagnosing or analysing individual user traits.

While many researchers have focused on attributing personality to a selection of products representing a variety of appearances (e.g., Mugge et al., 2009), there is a notable gap in research regarding the attribution of personalities to

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different types of products in relation to how people experience user-product interactions. To enhance the emotional experience of everyday objects in product-person interaction through the application of TA as a theoretical framework, this paper aims to identify which ego state-based personalities are applicable to products, and how the experiences of products are influenced by or influence perceived product personality. The results can be used to develop a framework that designers can apply to gain a deeper understanding of user-product interactions, thereby enhancing the emotional experiences of products.

Design for Emotion

Design influences emotional responses, as products evoke emotions that shape user experiences. Norman's (2004) visceral-behavioural-reflective framework highlights how sensorial aspects like aesthetics trigger immediate reactions (visceral level), usability fosters satisfaction during interaction (behavioural level), and product meaning creates long-term connections (reflective level). Desmet and Hekkert's (2007) model shows emotional experiences arising from both aesthetic and symbolic meaning. Extending this, Fokkinga et al. (2020) introduced an impact-centred design model, emphasising how context affects emotional responses; e.g., a mobile phone's ringtone may evoke irritation during work but enthusiasm at home. Vaidya and Kalita's (2021) model links design objectives (e.g., function, ergonomics) with external stimuli (e.g., form, material, colour) that shape sensory perceptions and emotional responses.

Emotions evoked by products are shaped by aesthetics, usability, performance, and reliability (Jordan, 1998). Aesthetic aspects like form, material, and sensory appeal influence emotional engagement, while functional and symbolic features enhance user satisfaction (Jordan, 1998; Shin & Wang, 2015). Negative emotions often stem from functional deficiencies, contrasting with the joy and love tied to symbolic features (Shin & Wang, 2015). Materials and textures also play a key role; for instance, heavier phones feel more pleasant (visceral), offer better usability (behavioural), and convey greater symbolic value (reflective) compared to a lighter one. Motion and speed influence emotions, with faster speeds increasing arousal and upward motion conveying positivity, while wobbly movements evoke mixed feelings like fear and joy. Classical aesthetics, characterised by symmetry, clarity, and cleanliness, offer a sense of order and harmony which aligns with the valence dimension of emotion (pleasure), while expressive aesthetics, marked by creativity and originality, enhance arousal (Bhandari et al., 2019).

Although addressing negative experiences like discomfort is crucial, fostering positive emotions requires distinct approaches (Yoon et al., 2020). According to Hashim et al.'s (2021) pain-pleasure framework, designers must address pain factors such as ergonomics and functionality to meet basic needs, as their absence leads to adverse emotions. Conversely, pleasure factors, including motivation, novelty, and playfulness, which are purely hedonic, enhance enjoyment without causing distress if absent (Hashim et al., 2021).

Even though the existing frameworks vary in theoretical background and terminology, they share the idea that few one-to-one relationships between product properties and emotion exist (Yoon et al., 2020). Designers can benefit from structured frameworks that map emotions to interaction qualities (e.g., joy to playful, and love to careful interactions), enabling them to target certain interaction qualities through certain positive emotions (Yoon et al., 2020). These interaction qualities, arguably reflecting human-like characteristics or perceived personality, warrant deeper investigation.

Users and Products Personality

Product personality is a concept derived from the semantic meanings of products, characterised by a set of human personality traits (Jordan, 2000). Users' perceptions of a product's personality, shaped by the interaction of each user with the product (Dumitrescu, 2010), influence their approach to future interactions with the product (Mugge et al., 2009). For instance, a user would handle a product that has a sensitive personality with consideration and care (Mugge et al., 2009). Product personality traits can help people to explain or rationalise their emotional relationship with products (Dumitrescu, 2010). For instance, people often refer to objects in similar terms as human interactions and expect similar behaviour from products as they expect from other people with an equivalent degree of relationship (Jacob et al., 2012). Inspired by humanlike characteristics, designers can anthropomorphise products either physically or psychologically (Mourey et al., 2017).

Unlike product personality, which is ascribed and perceived by users and developed by designers (Dumitrescu, 2010; Mourey et al., 2017), users' personality traits develop through the interplay of cognitive processes, emotional responses, and social interactions (Alzeer & Benmerabet, 2023). Whether people prefer products with personalities similar to their own has been denied (Jordan, 2002) or proved by different studies (Jordan, 2000; Mugge et al., 2009). The same disagreement can be seen in the field of psychology, where some psychological view believes that the similarity of personality has a positive influence on attraction, and another psychological view notes that people are attracted to others who complement them (Govers & Schoormans, 2005). However, Su et al. (2015) found that some products have multiple personalities that are preferred by different people with different personality traits.

Multiple personalities of the same product are possibly determined by design (Su et al., 2015), and designers can create the product personality at a general level. In contrast, at the individual level, users attribute personality to products based on their interaction with the product (Dumitrescu, 2010). Arguably, users with different personality traits may perceive the same product's personality differently, attributing multiple personalities to it.

Although the literature shows that product personality is influenced by users' interactions with the product, it often lacks details on how or why these interactions result in specific product personality attributes. Some research found correlations between the product's shape and personality (Gorno & Colombo, 2011; Prieto et al., 2013), while others indicated the influences of product interaction sound (Klanovicz et al., 2022), texture (Ranaweera et al., 2021), and material (Choi, 2023) in attributing personality to products. However, users' interaction with a product extends beyond the sensory perception of the product and needs a deeper investigation into its relation to product personality.

Approaches to Developing Product Personalities

The design literature developed lists of individual personality traits, such as serious, feminine, cute, elegant, reliable, and gentle, that could be attributed to both humans and products. The individual personality traits were developed through different methods such as collecting an extensive pool of personality descriptions from the literature (Mugge et al., 2009), collecting human personalities from psychology literature (Endres, 1995; Su et al., 2015), brainstorming workshops (Jordan, 2002), and participants' explanations of famous people's personalities (Govers & Schoormans, 2005). Some studies also attributed personality to products as a part of research on person-product relationship (Jacob et al., 2012), customising (Moon, 2002), and anthropomorphising (Mourey et al., 2017; Muzumdar et al., 2013). Researchers tested the validity of personality traits by showing the images of a selection of products to participants (Dumitrescu, 2007; Gorno & Colombo, 2011; Jordan, 2002; Mugge et al., 2009; Wells et al., 1957).

Some research applied product personality assignment techniques to assign individual personality traits to products. For example, participants rated the opposing personality traits in relation to a product (Choi, 2023; Klanovicz et al., 2022; Kohllöffel et al., 2023). However, it is highly recommended to consider the significance of psychology (Kohllöffel et al., 2023) and to use additional personality assessment tools (Klanovicz et al., 2022), because these methods, while suitable for visual design of a product, cannot fully relate product personalities to product preferences (Vaidya & Kalita, 2023). In fact, most literature attributed personalities to a selection of products representing a variety of appearances, for instance, coffee makers in Mugge et al. (2009). However, different product types can demonstrate different personalities (Jacob et al., 2012) that could be defined based on their appearance, function, and the meaning they hold. Products have various roles in our lives, which affect and are affected by user-product relationships. For example, products such as cars and laptops are perceived as friends, demonstrating good teamwork, while sofas and family tables are perceived as family, demonstrating loyalty (Jacob et al., 2012). Extending this idea, products may also be perceived in roles similar to parent, adult, and child, referencing TA.

Although individual personality traits developed by design research are applicable to products according to their methodology, the literature did not explain how these personalities influence the experience of products, such as which personality traits are most suitable for enhancing users' emotional experiences of products in product-person interactions. To identify those personalities, TA as a theoretical framework can help because this theory is about both interactions and personalities.

TA and Personality Attributes

Based on the theory of TA, human personality is made up of three ego states. Each ego state is a system of thinking, feeling, and behaving from which we interact with one another's systems (Berne, 2016), aligning with the APA's (2018) definition of personality. An individual's personality is shaped by multiple ego states, each distinct but contributing to the whole (Berne, 2016). Ego state personality theory is grounded in the evidence that the brain develops and is trained through repeated experiences during early childhood (Emmerson, 2011).

Parent ego state refers to traditions and values recorded during childhood (Berne, 2016). The parent ego state could be that of an unsupportive Critical Parent or a helpful and comforting Nurturing Parent (Berne, 1964).

Adult ego state is an independent state that evaluates reality pragmatically (Berne, 1964). Without any emotion, the adult makes decisions based on data and logic (Berne, 2016).

Child ego state that represents the recorded feelings and information of one's childhood can be Free Child, which is natural and carefree, or Adapted Child, which is seen as the result of the domination of parental influence (Berne, 2016).

Based on the definition of ego states, TA experts have assigned adjectives to ego states (Williams & Williams, 1980) that show ego states' characteristics (Table 1). For example, a critical parent is bossy while a nurturing parent is understanding. According to Berne (2016), when a person interacts from one of her/his ego states, s/he expects a particular response from the other side of the interaction. The interaction could be between two individuals' same ego states (e.g., Adult-Adult), or between different ego states (e.g., between one's Child and the other's Parent ego state). Table 1 shows different ego states' characteristics which help to recognise a person's active ego state throughout the interaction [adapted from, Temple (2002), Thorne and Faro (1980), and K. Williams and Williams (1980)].

Although all adjectives listed in Table 1 show the characteristics of each ego state, some have also been assigned to products as personality attributes. For example, generous and energetic, which are respectively characteristics of Nurturing Parent and Free Child, were listed as product personalities by Dumitrescu (2007). The blue boxed area of Table 1 shows adjectives that not only define ego states' characteristics but also are applicable to products according to design literature (the same word or its synonym/antonym was assigned to products). Thus, the adjectives in the blue boxed area are those personality attributes suitable for understanding product-person interactions based on TA, referred to as ego state-based personality attributes.

Ego States in Design Research

While design literature has also benefitted from TA, ego state characteristics are usually used in studies on human communications improvement (Vos & van Rijn, 2021), and were assigned to objects like teddy bears and pillows to symbolise the client's child ego state in psychotherapy sessions (Subramanian & Dewaram, 2012). Not only teddy bears but also computing devices can play a role as humans with ego states while interacting with us. For example, the help system of Microsoft Office could be considered as Adult, which monitors users' actions, Nurturing Parent, which gives a hand, or Critical Parent, which seeks to improve users' behaviour (Williamson & Ward, 1999).

Ego states' characteristics have been used to understand how a customer's choice of mobile phone is influenced by ego states (Sepahpour, 2015) and to explore the active ego state interacting with the product (Sepahpour, 2017). A mobile phone sends the user some sensory signals, and the user responds with one of his/her ego states based on the experience of the product. The user's Nurturing Parent protects the product while his/her Child gets comforted or annoyed by the product's surface (Sepahpour, 2017). Brands have also been considered as a partner

Table 1. Characteristics of ego states.

Critical Parent	Nurturing Parent	Adapted Child	Free Child	Adult
autocratic	praising	defensive	artistic	alert
demanding	forgiving	hurried	spontaneous	clear-thinking
stern	unselfish	confused	enthusiastic	fair-minded
prejudiced	warm	moody	affectionate	methodical
forceful	generous	submissive	pleasure-seeking	precise
nagging	gentle	anxious	adventurous	reasonable
controlling	caring	inhibited	energetic	efficient
severe	tolerant	arrogant	humorous	unemotional
dominant	kind	awkward	excitable	rational
fault-finding	helpful	nervous	imaginative	logical
intolerant	sympathetic	dependent	natural	organised
bossy	understanding	loyal	playful	evaluative

with Parent, Adult, and Child ego states, and the customer's Child ego state is invited by a brand's playful Child and/or Parental voice (Molesworth et al., 2018).

People with different personality traits attribute different personalities to the same product regarding their own personality at a particular time (Su et al., 2015). Since users' active ego state changes in different situations (Berne, 2016), people may not only prefer different product personalities but also attribute different personalities to the same product based on their active ego state.

In our previous study (Sepahpour et al., 2022b), through an extant literature review, we developed a product-person relationship model based on TA. The model shows that people attribute ego state-based personalities to products, and products trigger emotions which are experienced at visceral, behavioural, and reflective levels of emotion. Our study showed that some products are associated with some personalities more than others. For example, beds and fridges have a Nurturing Parent personality while make-up items have both Critical Parent and Free Child personalities. However, we found that most products can be assigned to more than one ego-state-based personality depending on the interaction and the experience of the product.

Although the literature has used TA to understand the interaction between users and products (Sepahpour, 2017; Sepahpour et al., 2022b; Williamson & Ward, 1999), several areas remain underexplored. Williamson and Ward (1999) thoroughly examined the two sides of interaction: users' ego states and the perceived ego states of computers. However, their study focused only on the Microsoft Word help system with just two participants. Sepahpour (2017), by contrast, included 33 participants and explored the interaction between mobile phones and users based on TA. Sepahpour's study was limited to the interaction between the mobile phone's sensorial signals and users' ego states. The implications of their study, which suggested that users' Parent ego state protects the phone, and the Child is cared for by the product, were interpreted as the phone itself adopting the roles of Parent and Child, communicating with users' Parent and Child ego states. While these studies demonstrated that products could exhibit ego-state-based personalities, their limited sample sizes and product scope highlighted the need for more comprehensive research. To address this gap, Sepahpour et al. (2022b) focused on ego-state-based personalities across various everyday objects with 30 participants, developing a model that shows a product's ego state-based personality could vary depending on users' experiences. However, further research is required to understand how the experiences of products influence or are influenced by product personality, which will be explored in the present paper.

Method

Studies that applied product images generated visual-related personalities. However, ego state-based personality is a new concept that requires a way to get as much information as possible. Interaction is not only about appearance; hence, personality should go way beyond reactions to product images or aesthetics. Since the literature has used co-discovery (iterative protocol)

mostly to investigate experiences of newly designed interactive products (Alhadreti, 2021; Hallewell Haslwanter et al., 2020), this method can be suitable for exploring new concepts and arguably can generate sufficient information using the concept prompts (Yogasara, 2014). The concept prompts could include lifelike phrases that prompt participants to anthropomorphise inanimate objects (Mourey et al., 2017).

We conducted co-discovery sessions where participants were prompted to talk about their experiences of various product types and various ego state-based personality attributes. The co-discovery method was employed to facilitate a guided reflective process in which participants actively engaged with prompts based on the TA framework. By framing the conversation around ego state-based personalities, participants can explore how product personality influences experiences of products in a more structured and less stereotyped manner than typical memory-based approaches. This method encourages participants to think more critically about their experiences of products, reducing bias by focusing on specific, relevant themes. To guide this process, a prompting booklet was developed prior to data collection to elicit participant concepts for product personalities.

Concept Prompt Material Design

The concept prompt material is a booklet presenting product prompts on the left side and personality prompts on the right side (Figure 1). The booklet was developed to help participants interpret and discuss the objects and personality attributes relevant to their experiences and memories. The concept prompts included one list of product categories and five lists of personality categories (Table 2). Participants looked at the list of products on the left side, then flicked through the right-side pages and looked at the lists of personalities (see Figure 1 & Table 2).

The list of product categories prompted participants to recall memories of using everyday objects (regardless of appearance, model, and brand) and share their experiences with various product types of each category. These categories were presented as examples just to prompt participants because this study seeks the products' personality attributes and the associated experiences, and we avoided directing participants' minds by presenting a limited number of product types. We did not present any particular device or image as this would limit participants to talk just about the presented objects' aesthetic aspects. Instead, giving the list of product categories prompted participants to recall memories related to interaction with the devices they have directly experienced.

The list of personality attributes prompted participants to talk about their experiences with different objects and explain how they felt about those objects and their personalities. Personality attributes were selected from the boxed area of Table 1, which shows adjectives not only represent ego state characteristics but also have been attributed to products by design literature. We carefully chose adjectives that were suitable for grouping together. However, the booklet was just for prompting, and participants were free to use any adjective they wanted.

Figure 1. The concept prompt booklet.

Table 2. Arrangement of the concept prompt booklet pages.

Left Page	Product categories	Right Pages	Personality categories
Page 1	• Computing devices (physical or virtual products) • Wearables • Personal health and beauty products • Furniture • Household goods	Page 1	**Caring/Nurturing Parent** warm, tolerant, helpful, gentle, generous
		Page 2	**Criticising/Controlling Parent** intolerant, fault-finding, severe, dominant, bossy
		Page 3	**Mature Adult** organised, reasonable, efficient, logical, evaluative
		Page 4	**Natural/Free Child** energetic, imaginative, playful, humorous, adventurous
		Page 5	**Submissive/Insecure Child** anxious, moody, nervous, awkward, dependent

As Table 2 indicates, Pages 1, 2, and 3 represent categories of Nurturing Parent, Critical Parent, and Adult, respectively, while Pages 4 and 5 represent Free Child and Adapted Child ego states, respectively. The title of each personality category has been adapted for ease of understanding for participants who are not familiar with the ego states' terminology and characteristics.

Co-Discovery

The research participants were thirty university students (mostly, Higher Degree Research students from various study fields) with an average age of 33 (ranging from 21 to 54). Fourteen women and sixteen men who were interested in participating in this study were recruited. However, students who have a background in Design and Psychology were excluded due to their previous knowledge about the design of products and psychology, which may inform their answers. This study followed a rigorous and ethical procedure (institution Human Research Ethics approval number: 1900000332).

Fifteen co-discovery sessions were conducted between two participants for 40 minutes, and all sessions were audio/video recorded. Paired participants were asked to think of objects as having personalities. They attributed personalities to everyday objects while they were looking at the concept prompt booklet (Figure 1) and shared their emotional experiences of those objects, considering the assigned personality.

After a 10-minute warmup and thought of objects as if they have human personality, the investigator gave each of the participants one Concept Prompt booklet and explained how to use it to help them initiate, as suggested by Derix and Leong (2019). The investigator was present during the session to ask for more clarification if a participant stated something unclear or needed more explanation about some personality categories in the concept prompt.

Data Analysis

To analyse the data, the audio files were transcribed and transferred to Atlas.ti, which is efficient software for coding qualitative data (Adelowotan, 2021; Smit & Scherman, 2021). The coding scheme included the code of each participant who shared their experience; the product type that had been experienced; various adjectives as personality attributes that participants used to describe products; and the reason/experience that linked a product to a particular personality attribute. This associated experience (AE) revealed aspects that are influenced by/influence attributing personality in product-person interactions. AE aspects included various adjectives participants used to describe their own feelings about the interaction; statements that reveal if a participant is talking about products' functional, aesthetic, or symbolic aspects; and statements that reveal if product performance is perceived as poor or satisfactory by users.

Emotions evoked by products were categorised based on Russell's (1980) circumplex model. This model is adaptable to emotions which could be evoked by using products (Desmet, 2008), and has been applied by many design studies to measure participants' emotion (e.g., Feng et al., 2022; Kim & Mansfield, 2021). This two-dimensional model includes unpleasant/negative (left) to pleasant/positive (right) on a horizontal axis, and sleepy/passive (down) to aroused/active (up) on a vertical axis (Russell, 1980). This creates four areas of emotions, and Figure 2 illustrates examples of experienced emotions and their position in each area, adapted from Desmet (2008) and Russell (1980).
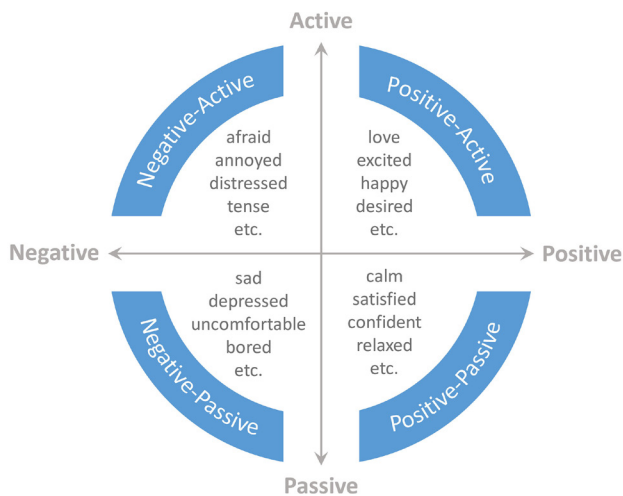

Figure 2. Product-relevant emotions in each area of the circumplex model.

As Figure 2 shows, happy is positioned in the area between the positive and active axes because it has the aspects of both states. Although most adjectives mentioned by participants are included in Figure 2, we found some more adjectives participants used to describe their feelings, which can be categorised based on their meaning. For example, the term nervous, which does not appear in Figure 2, is categorised as a negative-active emotion because its meaning is similar to tense or afraid.

Product aspects were categorised as aesthetic, functional, and symbolic aspects that can be used to code emotional responses that people experience with their products (Shin & Wang, 2015). The product aspects elicit different emotions while people are interacting with a product (Xue et al., 2020). The aesthetic, functional, and symbolic aspects respectively refer to visceral (about sensorial aspects), behavioural (about usability), and reflective (about associated memories and product meaning) levels of emotion (Jordan, 2000; Ludden & van Rompay, 2015; Wu, 2017) introduced by Norman (2004). Norman's three levels of emotion have been applied by previous literature to identify user experience (Alonso-García et al., 2020; Hou, 2020; Zhao & Zhu, 2019). We also identified whether the experience participants described was referring to the product's aesthetic, functional, and symbolic aspects. Table 3 shows the coding scheme and the way participants' quotes have been interpreted.

An example of a participant's quote coded in Table 3 shows a product with a Nurturing Parent personality (helpful), which evokes positive-passive emotions (confident and relaxed). In this example, the participant mentioned being able to do research and communicate with other people as functional aspects of the laptop, which is easily possible (satisfactory performance).

Table 3. Interpretation of coding scheme.

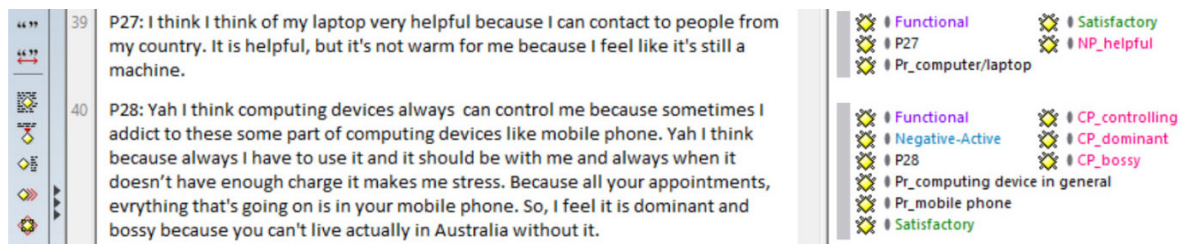| Category	Subcategory	Description of interpretation	Example
Product Personality	Nurturing Parent	Adjectives that describe a product and can be categorised based on ego state characteristics in Table 1	*"I think my laptop is **helpful** because I can **easily use** it for different purposes like **research and to communicate with people**. I use it every day and it makes me **feel confident and relaxed**."*
	Critical Parent		
	Adult		
	Free Child		
	Adapted Child		
Perceived Performance	Satisfactory	If the product fulfils participants' needs as expected	
	Poor	If the product does not fulfil participants' needs	
Product Aspects	Functional	Statements indicating if participants are talking about how the product works	
	Aesthetic	Statements indicating if participants are talking about how the product looks	
	Symbolic	Statements indicating if participants are talking about the product's meaning and associated memories	
Evoked Emotions	Positive-Passive	Adjectives that not only describe participants' feelings towards the product but also are adaptable to Circumplex model (based on Figure 2)	
	Positive-Active		
	Negative-Active		
	Negative-Passive		

Figure 3. Assigning codes to two quotations created in Atlas.ti.

Figure 3 shows coding the quotations created in the Atlas.ti 7 environment, which presents two participants' discussions involving both helpfulness and dominance of computers. Noticeably, P27 and P28 refer to Session 14 participants, and the prefixes such as Pr, CP, and NP respectively refer to the product type, and Critical Parent and Nurturing Parent personalities.

As Figure 3 indicates, some quotations were not assigned to emotions, and some were assigned to more than one personality attribute. In this example, P27's experience of a helpful laptop does not present her emotions. On the other hand, P28's experience is assigned to three personality attributes from the Critical Parent personality category.

Results

Participants referred to 131 different product types. Products mentioned more than 20 times in more than 10 sessions include: clothes (wearable category), mobile phones and computers/laptops (computing devices), hair/skincare products (personal health and beauty products), and oven/stove/grill/toaster/microwave (household goods category). Participants used personality attributes either to talk about products in general: "I think mobile phones are efficient," or to mention their experiences with a specific product: "I feel my toaster is moody."

Data analysis showed that each particular product type can be associated with different personalities, and identified the relationship between each personality and product aspects, perceived performance, and evoked emotions.

Ego State-Based Personality Attributes

Participants referenced personality attributes 903 times, and Figure 4 illustrates the frequency of each ego state-based personality attribute across the total of fifteen co-discovery sessions. Personality attributes include adjectives listed in the concept prompts as well as other adjectives mentioned by participants that present characteristics of ego states (noted as *other* in Figure 4).

The bolded numbers in Figure 4 show personality attributes mentioned more than 30 times, out of which helpful, bossy, efficient, and organised were mentioned in all 15 sessions. All personality attributes from each ego state-based personality (the five categories in Figure 4) have been mentioned by participants and helped them discuss their experiences.

Relationship between Product Personality and Product Aspects

Results indicate that all ego state-based personalities have been attributed to products' function far more than aesthetic or symbolic aspects. There is a statistically significant difference among means of product aspects as determined by one-way ANOVA [$F(2, 12) = 63.25, p < .001$]. The mean score for function ($M = 136.40, SD = 31.21, n = 5$) is significantly more than aesthetic ($M = 9.40, SD = 5.89, n = 5$) and symbolic ($M = 21.00, SD = 12.65, n = 5$) while symbolic and aesthetic are not significantly different ($p = .633$). The Chi-Square test results ($p = .685$) showed that the categories of functional, aesthetic, and symbolic aspects of
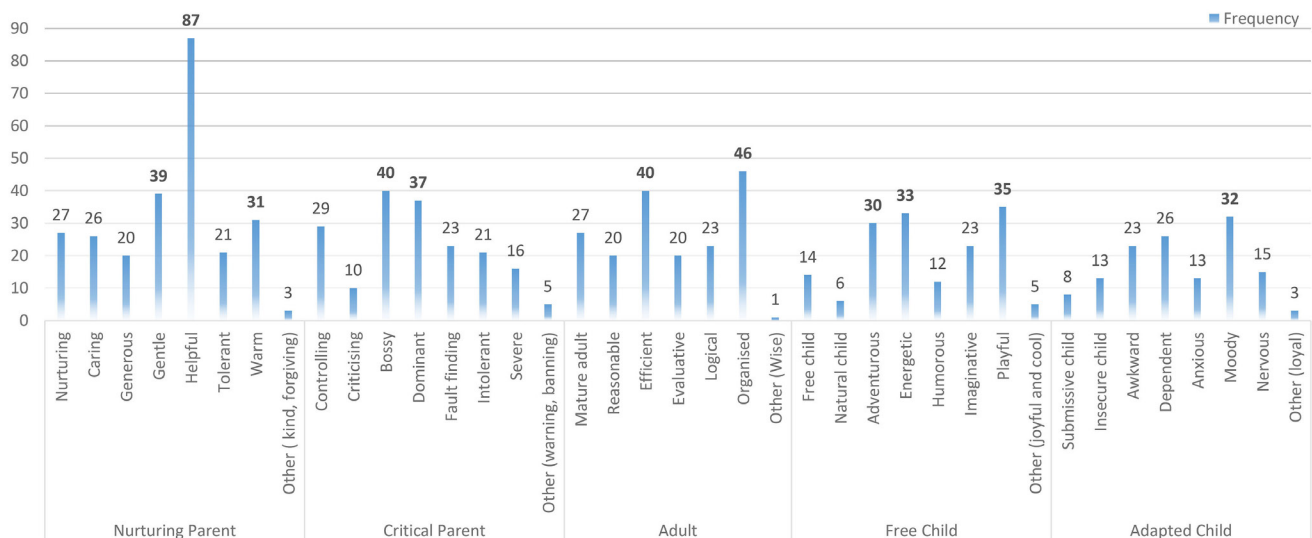

Figure 4. Frequency of ego state-based personality attributes assigned to products.

products were equally distributed in the categories of Nurturing Parent (NP), Critical Parent (CP), Adult (A), Free Child (FC), and Adapted Child (AC) personality (Figure 5).

Although the role of function in creating all ego state-based personalities is far more than other aspects, the percentages on the right side of Figure 5 show that the symbolic aspect of products also plays a role of 13% or more in creating Critical Parent, Nurturing Parent, and Free Child personalities. For example, a pair of shoes was assigned to Free Child because of its symbolic aspect and the associated memories: "My running shoes are energetic. As I wear them for long runs, the moment I wear them, I feel like yes! Let's start running" (P15). On the other hand, shoes can also be assigned to Nurturing Parent because of their function: "I have different kinds of shoes, but these ones are gentle on my feet and comfortable for walking. Yeah, kind of caring, nurturing parent" (P16). Some personality attributes participants assigned to products' function far more than other attributes (mentioned more than 30 times) are: helpful, dominant, organized, and efficient.

Relationship between Product Personality and Product's Perceived Performance

Ego state-based personalities were associated with products perceived as satisfactory performance more than poor performance. However, the perceived poor/satisfactory performance is not equally distributed in all ego state-based personality categories (Figure 6), and the Chi-Square test results ($p < .001$) showed a significant relationship between products' perceived performance and personalities.

In fact, Nurturing Parent, Adult, and Free Child were only attributed when the product's performance is perceived as satisfactory. For example, gentle, helpful, efficient, mature adult, organised, and playful personality attributes were associated with perceived satisfactory performance (mentioned more than 20 times by participants).

On the other hand, perceived poor performance of products is only associated with Adapted Child and Critical Parent personalities. For example, participants assigned a moody character (Adapted Child) to products that sometimes work and sometimes represent functional failure (i.e., are inconsistent): "I wear watch … sometimes, it makes me nervous because especially when I use the metal one, sometimes, I feel itchy on my skin. … so, my watch is sometimes moody and sometimes it's comfortable on my hands" (P17). The Critical Parent personality can also be assigned to a mobile phone that does not satisfy customer needs: "Its touchpad is criticizing and fault-finding. It's difficult to type and makes you anxious. It cracks easily whenever you drop the phone, compared to the old technology. It would stay there in terms of design" (P01).

While Nurturing Parent, Free Child, and Adult personalities are fully associated with perceived satisfactory performance, Critical Parent and Adapted Child are not exclusively linked to poor performance. In fact, 56% of Critical Parent and 22% of Adapted Child personalities are associated with perceived satisfactory performance. For example, the moody personality was linked to perceived poor performance 20 times but also associated with satisfactory performance on five instances (Table 4).
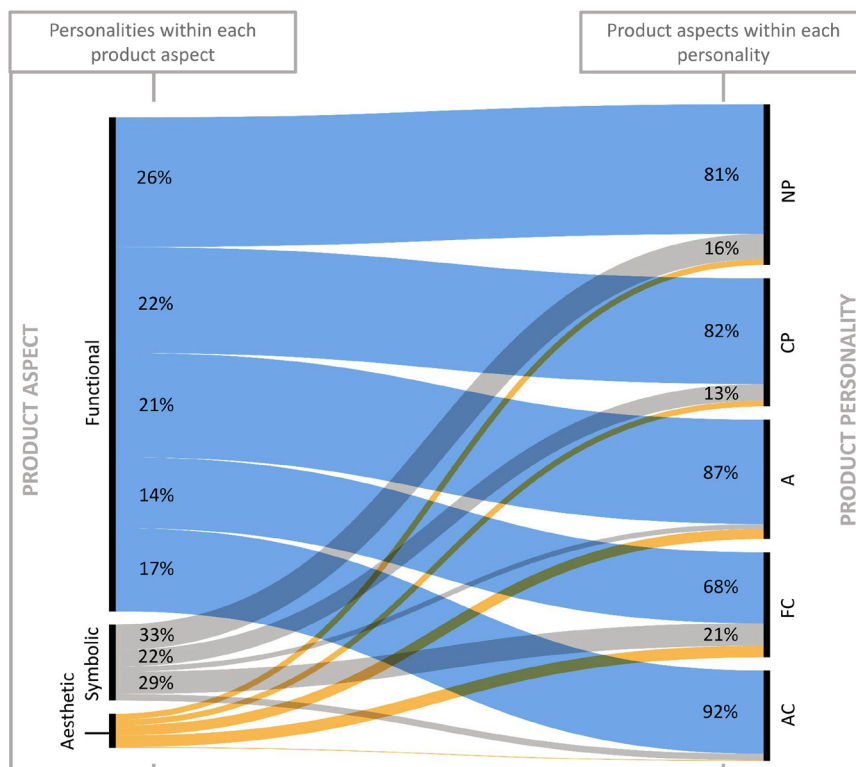

Figure 5. The relationship between product aspects and ego state-based product personalities.
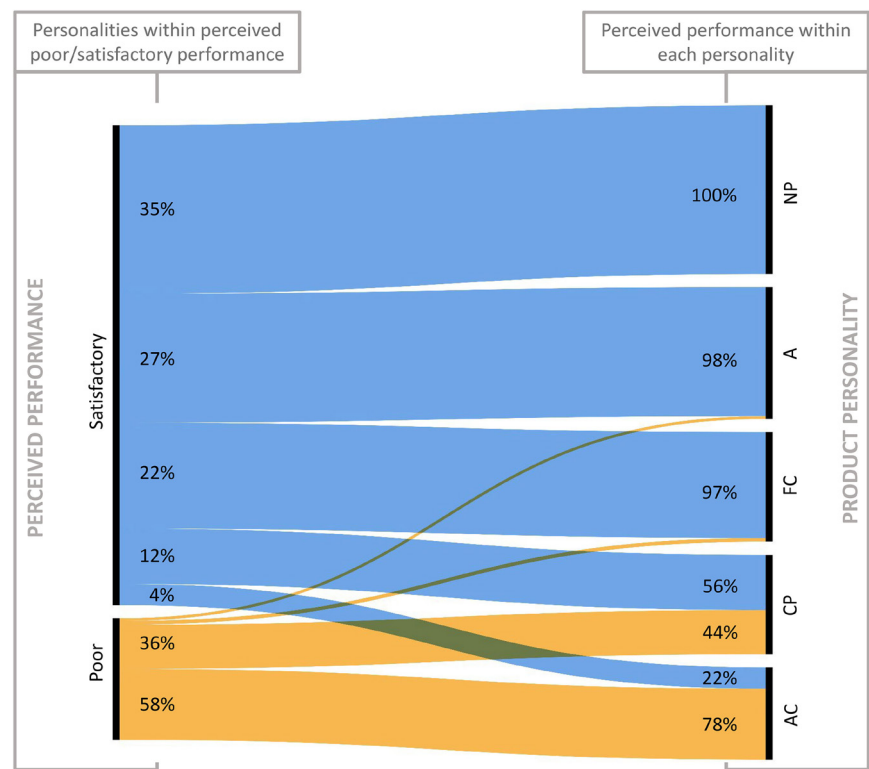
Figure 6. The relationship between perceived performance and ego state-based product personalities.

Table 4. Examples of Critical Parent/Adapted Child associations with perceived satisfactory performance.

Personality	Examples of Personality attributes	Association frequency	Examples of products
Critical Parent	Bossy	16	• Products like alarm clocks, calendars, and Fitbits that frequently alert users and control daily routines (e.g., when to wake up, eat, or exercise).
	Dominant	15	
	Controlling	11	
	Fault-finding	11	• Applications like Grammarly that notify users of mistakes and suggest corrections.
Adapted Child	Dependent	5	• Digital devices dependent on electricity, frequent charging, maintenance, or updates to function.
	Moody	5	• Digital devices that sometimes perform better than expected (e.g., batteries lasting longer), and products whose comfort changes based on environmental factors (e.g., clothing comfort varying with the weather).

Table 4 shows examples where Critical Parent and Adapted Child personalities were associated with perceived satisfactory performance. For example, Critical Parent personality can be assigned to a product that satisfies customer needs by notifications reminding people of their schedules: "my calendar prompts me to do yoga. It is hard to get up at 6:00 a.m. So, I feel guilty about it. It is bossy because it is always instructing me to work on the next task" (P16). This example indicates that even when a product satisfies user needs, a Critical Parent personality can still evoke negative emotions.

Relationship between Product Personality and Evoked Emotions

The results indicate that the Nurturing Parent, Adult, and Free Child personalities were associated with positive emotions, whereas the Critical Parent and Adapted Child were associated with negative emotions. The strength of relationships between product personality and evoked emotions is illustrated in Figure 7. The relationship between product personality and evoked emotions is statistically significant (Chi-Square test: $p < .001$). Standardised residual
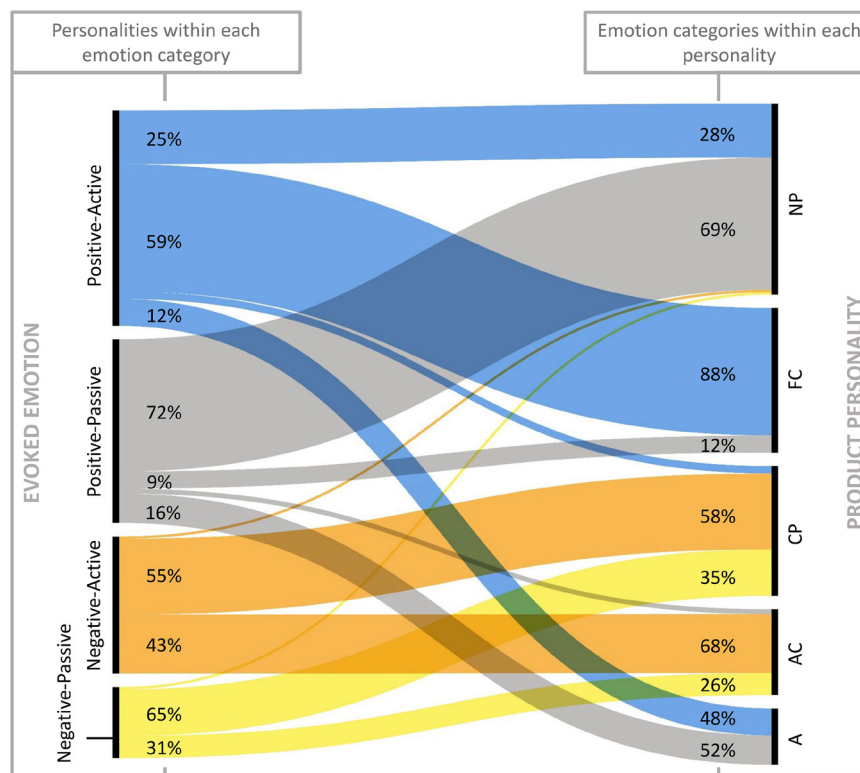
Figure 7. The relationship between evoked emotions and ego state-based product personalities.

analysis (significant if exceeding ± 1.96, $p < .05$) revealed that Free Child was significantly associated with positive-active emotions ($z = 4.3$), and Nurturing Parent with positive-passive emotions ($z = 4.2$). Additionally, Adult personality was associated with both positive-active ($z = 0.5$) and positive-passive emotions ($z = 1.4$), although the relationship was not notably strong. In contrast, Critical Parent was strongly associated with both negative-active ($z = 3.5$) and negative-passive emotions ($z = 3.3$), while Adapted Child was associated with negative-active emotions ($z = 3.8$).

These findings suggest that specific product personalities elicit distinct emotional responses more frequently than would be expected by chance. Attributes like adventurous and energetic evoke positive-active emotions, whereas gentle, helpful, and warm are linked to positive-passive emotions, co-occurring more than 10 times. For instance, computers/laptops with a helpful character evoke positive-passive emotions: "I feel my laptop is helpful and gives me more confidence. It is actually for helping me through my studies, and I work at home as well" (P07). This example shows that Nurturing Parent personality was assigned to the product's function because of its perceived satisfactory performance.

A Chi-square test of independence revealed that the relationship between evoked emotions and personality attributes is also statistically significant ($p < .001$). This indicates that specific personality attributes are significantly associated with distinct emotional responses. Standardised residuals exceeding ± 1.96 ($p < .05$) were considered significant, as shown in Table 5 (bolded numbers). The table also illustrates examples of emotion words, often mentioned by participants, in association with personality attributes.

According to Table 5, negative-passive emotions such as boredom and discomfort were strongly linked to the intolerant and controlling attributes (Critical Parent category). Additionally, no personality attributes from the Adult category were significantly associated with any emotions.

Discussion

This study indicated that users often attribute distinct ego state-based personalities to everyday objects based on their interactions, leading to varied experiences. While the literature attributed individual personality traits to products' aesthetic (Dumitrescu, 2007; Gorno & Colombo, 2011; Jordan, 2002; Mugge et al., 2009; Wells et al., 1957), our findings showed that ego state-based personalities are attributed to products' function far more than symbolic and aesthetic aspects. In fact, ego state-based personalities are those individual personality traits that can be categorised based on TA and consequently can be useful for understanding product-person interactions.

Considering the results, product personality is shaped by perceived functional performance and, in turn, influences elicited emotions. The study highlights the role of these personalities in shaping users' perceptions and emotional responses. Attributes such as helpful, organised, and bossy are frequently associated with products, influencing overall user experience. The analysis reveals a significant relationship between ego state-based personalities and the associated product experiences. Notably, Nurturing Parent, Adult, and Free Child personalities are linked to perceived

Table 5. Strong associations between emotion examples and personality attributes.

Emotion examples	Relaxed & Confident (Positive-Passive)	Happy & Excited (Positive-Active)	Annoyed & Frustrated (Negative-Active)	Uncomfortable & Bored (Negative-Passive)
Caring	$z = 3.2$	$z = -1.2$	$z = -1.4$	$z = -1.0$
Gentle	$z = 2.4$	$z = 0.1$	$z = -1.9$	$z = -1.4$
Helpful	$z = 2.7$	$z = -0.5$	$z = -1.7$	$z = -0.9$
Nurturing	$z = 3.1$	$z = -1.0$	$z = -1.6$	$z = -1.1$
Warm	$z = 2.8$	$z = -0.3$	$z = -1.9$	$z = -1.4$
Adventurous	$z = -1.3$	$z = 3.1$	$z = -1.6$	$z = -1.1$
Energetic	$z = -0.9$	$z = 3.2$	$z = -2.0$	$z = -1.4$
Free child	$z = -0.8$	$z = 2.2$	$z = -1.3$	$z = -0.9$
Imaginative	$z = -1.5$	$z = 2.8$	$z = -1.3$	$z = -0.9$
Playful	$z = -0.7$	$z = 2.6$	$z = -1.6$	$z = -1.1$
Anxious	$z = -1.2$	$z = -1.3$	$z = 2.7$	$z = 0.5$
Dependent	$z = -1.0$	$z = -1.0$	$z = 2.8$	$z = -0.6$
Insecure child	$z = -1.1$	$z = -1.2$	$z = 2.2$	$z = 0.8$
Moody	$z = -0.7$	$z = -2.0$	$z = 2.2$	$z = 1.5$
Awkward	$z = -1.1$	$z = -1.2$	$z = 2.2$	$z = 0.8$
Bossy	$z = -1.6$	$z = -1.2$	$z = 3.5$	$z = 0.0$
Dominant	$z = -1.9$	$z = -1.1$	$z = 2.6$	$z = 1.4$
Fault-finding	$z = -1.3$	$z = -1.5$	$z = 3.1$	$z = 0.4$
Controlling	$z = -2.1$	$z = -2.2$	$z = 2.2$	$z = 4.2$
Intolerant	$z = -1.0$	$z = -1.0$	$z = -0.8$	$z = 4.5$

satisfactory performance and positive emotions. Nurturing Parent evokes positive-passive emotions, while Free Child evokes positive-active emotions. In contrast, Adapted Child is associated with poor performance and evokes negative-active emotions. Critical Parent evokes both negative-active and negative-passive emotions, regardless of the perceived performance quality.

While some participants' reflections may implicitly reveal aspects of their ego states, the analysis was limited to the personalities attributed to products, as described by users in the context of their interactions. This approach ensures that the focus remains on how users perceive and engage with products, rather than interpreting their internal psychological states.

Unravelling Insights through Novel Methods

The methodology employed in this study was designed to elicit comprehensive insights into product personalities and user experiences. Participants were provided with a list of product categories, encouraging them to discuss various types of products and their emotional experiences. While some participants shared general emotional insights about products, others recounted specific experiences with particular products. This approach allowed for a nuanced understanding of how users interact with different types of products, suggesting the potential applicability of the findings to the design of specific products.

Unlike previous research methods that primarily focused on assigning personality traits to the aesthetic of a particular product type (Gorno & Colombo, 2011; Prieto et al., 2013), our study uniquely assigned personalities based on the functional aspects of diverse product types. Participants were given the freedom to articulate their emotions using their own words, without being constrained by a predetermined list of emotion words [as suggested by Hu et al. (2020)]. However, this freedom also posed challenges, as some participants struggled to verbalise their emotions effectively, potentially due to language skills or memory limitations (Hu et al., 2020).

While the co-discovery method was effective in stimulating discussion and generating new concepts, and valuable for eliciting emotional experiences tied to product personalities, it is not without limitations. As it relies on participants' reflections on previous interactions, there may be biases from memory recall. Moreover, it may not fully capture product-person interactions

in more naturalistic settings. Future studies could address this by incorporating observational or more diverse data collection methods for greater generalisability of the findings.

The method also presented limitations, such as the risk of participant influence and difficulties in assigning certain personality attributes to products. Participants referred to Nurturing Parent personality attributes more frequently than Adapted Child and Free Child. However, the reason could be either due to the design of the Concept Prompt booklet or participants had difficulty assigning Adapted Child and Free Child personality attributes to products.

Nonetheless, alongside previous studies affirming the suitability of the co-discovery approach for providing early feedback on product experiences (Hallewell Haslwanter et al., 2020) and identifying numerous minor usability issues (Alhadreti, 2021), our study unveiled the effectiveness of this method, particularly when utilising concept prompts, in generating the novel concept of ego state-based personalities linked to emotional experiences.

Understanding Personalities in Product Interactions

People can attribute ego state-based personalities to everyday objects based on their interactions with those objects. Not only can different products represent different ego state-based personalities, but an individual product can also represent different personalities throughout the interaction.

A product can represent an ego state-based personality based on its main function (Sepahpour et al., 2022b). For example, mobile phones and laptops/computers, being the most commonly mentioned by participants, are often associated with positive-passive emotions and helpful personality attributes from the Nurturing Parent category. However, products representing Critical Parent personalities, despite evoking negative emotions, are associated with both poor and satisfactory performance. This explains our previous research findings regarding the negative emotions elicited by products' perceived satisfactory performance (Sepahpour et al., 2022a). In fact, some more experiences are mediated by products but not directed by those products (Fokkinga et al., 2020). While products with Critical Parent personality are not pleasurable, people still tend to use them for critical functions like alarms and reminders because these products mediate a positive impact on people's lives: "I'm frustrated with Grammarly. It's fault finding and helpful. That's why it is a parent. It is a controlling parent. It helps us do things. But I hate those red squiggles that it puts down underneath everything I type" (P16).

A product can represent different ego state-based personalities during the interaction. Firstly, the personality of the product can differ regarding its function, aesthetic, and symbolic aspects. For example, a pair of sneakers may exhibit a Nurturing Parent personality in terms of function and a Free Child personality in terms of associated memories and product meaning. Secondly, as users' ego states interact with products (Sepahpour, 2017), people attribute personalities to products based on their ego states activated during the interaction. For example, a severe product that controls us and makes us nervous and anxious activates our Adapted Child and has a Critical Parent personality (hence, the interaction

is between Critical Parent and Adapted Child). Therefore, TA as a theoretical framework is useful for understanding the dynamic interactions between people and products.

Implications for Design Practice

The research findings could serve as a framework for designers to improve people's experience with everyday objects. Designers can tailor products to evoke positive-passive (e.g., relaxed, confident) or positive-active (e.g., happy, excited) emotions, respectively, by incorporating personality attributes of Nurturing Parent (e.g., gentle, warm) or Free Child (e.g., playful, energetic) into the functional aspects of the product, expanding Yoon et al.'s (2020) suggestion of mapping emotions to interaction qualities. Designers can further enhance perceived product personalities by incorporating personality attributes into various aspects of a product. Attributes such as gentle, soft, and lively can be conveyed through elements like shape, material, and interaction sounds, as demonstrated by Choi (2023), Desmet et al. (2008), and Klanovicz et al. (2022). For instance, metal can convey a serious personality, which might be suitable for certain products (Choi, 2021), referring to Critical Parent personality.

Designers can also combine multiple personalities within a single product to shape different aspects. For example, a product might feature an energetic and warm aesthetic (Free Child and Nurturing Parent) alongside a caring function (Nurturing Parent). While Critical Parent and Adapted Child personalities evoke negative emotions, they are sometimes unavoidable due to the product's goals and functions. The bossy and dominant personalities of calendars reflect their role in delivering essential reminders, while the dependent personality of smart devices stems from their frequent need for charging and maintenance (Sepahpour & Blackler, 2025). However, to reduce the negative emotions associated with these products, designers can incorporate traits of Nurturing Parent or Free Child personalities (as shown in Table 5) into various product aspects. For instance, modifying the harsh buzz of an alarm clock to a gentle tone can balance perceived usefulness with pleasurable interaction.

Aligning product personalities with user preferences is key to enhancing the overall experience. For example, a sofa may benefit from a purely Nurturing Parent personality for its caring and comforting nature. At the same time, an office chair could combine Adult (balanced, reliable), Nurturing Parent (soft, caring), and Critical Parent (firm to prevent slouching and promote upright sitting) traits to support ergonomic function. These insights significantly contribute to Human-Centred Design research. Although focused on everyday objects, our findings are also relevant to Human-Robot Interaction, where assigning personalities to robots in the anthropomorphising process can enhance user experiences and trust (Cho & Nam, 2023; Robert Jr et al., 2020).

Building on the insights presented in this paper, and recognizing the importance of positive emotions in fostering active use, attachment, and irreplaceability (Kowalski & Yoon, 2022), this study lays the groundwork for applying ego state-based product personalities in design practice to enhance users' emotional experiences and support the development of product attachment.

Conclusion

This paper identified ego state-based personalities applicable to everyday objects and investigated how the experiences of products are influenced by and influence product personality. These personalities result from user-product interaction and help users to interact with products. Analysis of data from 15 co-discovery sessions revealed that individuals attribute varied ego state-based personalities to the same product, influenced by their personal experiences. Notably, Adapted Child personality, associated with perceived poor product performance, evokes negative emotions, while Nurturing Parent, Adult, and Free Child personalities, associated with perceived satisfactory performance, evoke positive emotions. On the other hand, the Critical Parent personality evokes negative emotions and is associated with both perceived poor and satisfactory performances of products. Functional aspects of products predominantly evoke ego state-based personalities, overshadowing aesthetic and symbolic aspects.

This study contributes to design literature by developing a list of personality attributes that directly benefit the design field. This newfound knowledge lays the groundwork for future emotional design initiatives, offering insights to enhance users' emotional experiences with products. It paves the way to develop a design framework that strategically evokes specific emotions, such as applying the Nurturing Parent personality to the product's function to generate positive-passive emotions.

Furthermore, the identified relationships between product personality and positive emotions suggest the potential for fostering product attachment. Future research will delve into how ego state-based personalities contribute to product attachment development. Additionally, investigating the reciprocal influence between product personalities and users' active ego states during product-person interactions holds promise. Since some participants used statements that possibly reveal their active ego state, further psychological investigations could define the interaction between users' ego states and products' ego state-based personalities.

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