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Defining the construct and elements of Aesthetic Experience (AX) and User Experience (UX) in Augmented Reality Comics (AR Comics)

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Abstract

The purpose of this study paper is to characterise the user experience (UX) and aesthetic experience (AX) of augmented reality comics (AR comics). The researcher used a methodology review approach on six models of each of the three AX models and the rest were UX models in order to assemble the constructs and elements of both models. Principally, AX and UX are differently disciplined, similar to AR comics, which require a combination of the two disciplines. Previous studies found that comics are aesthetic objects or art forms that use aesthetic experience (AX) as a measurement method. Simultaneously, AR is a Human-Computer Interaction (HCI) based technology that is always centred on user experience (UX). Therefore, this research paper is a preliminary step to collect the constructs and elements of AX and UX as a guide to finding the potential merger of the two fields.

Keywords User Experience (UX), Aesthetic Experience (AX), Augmented Reality, Comics

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Introduction – Ideation Overview

Since 2013, the printing industry, especially books, magazines, and newspapers, has been through a more robust challenge when there is a decline in sales and acceptances to the media. The issue started with declining newspaper sales like the New Straits Times (NST), which recorded the most significant drop of 32.4% to 37,885 copies a day, followed by a 25% *Harian Metro*. On the contrary, there was a considerable increase in these newspapers' digital platforms when NST recorded 12.65 million users in news and information categories. Simultaneously, *Harian Metro* registered 13.07 million users, and *Berita Harian* gathered 41.06 million users throughout 2017 (Alivi et. al., 2018).

Likewise, with the National book industry, the fall of physical book sales has made the iconic bookstore MPH close one of its shops located at *One Utama* Kuala Lumpur at 0gos 2016, proving that the book industry is also on a tough challenge. MPH also expects that there will be another branch closing down as the response to physical books is getting less and more alarming (Bustamam et. al., 2021; Abdullah & Ishak, 2016).

Equally significant, the North American comic book business was impacted by this difficulty when the two major publishers, DC Comics and Marvel, declared a USD70 million (6.5 percent) decline in revenue from USD1.015 billion in 2016 to USD1.015 billion in 2017. One of the most prominent factors why this issue occurred is the rapid growth of the digital environment around the world. For instance, the DC Universe platforms are among the most popular venues for user-generated content (Schmidt, 2018).

In August 6, 2015, a local comic magazine created an unexpected history when MOY publication that publishes popular magazines *Apo* and *Ujang* was officially closed for the magazine publishing. MOY publishing director admitted that the trend of digital readers contributes to the magazine's sales collapse. Aligned with this, MOY has taken a digital approach by setting up *Bekazon's*, which is focused on e-comics and motion comics besides making online comic selling.

Since the new media's birth in 1995, the changes in life, social, way of thinking, and working environment have grown gradually (Alivi et al., 2018; Islam & Ahsan, 2020). In the publishing area, the newspapers, books, or comics are holistically changing from content form presentation to book production processes involving editing, designing, printing, and distribution. In today's digital environment, all traditional materials are no longer bound by a single format. It is more participatory and coexists with the

device that served as the reading platform (Abdullah & Ishak, 2016; Sanusi & Mustaffa, 2015). The emergence of new media and internet technologies has had a direct impact on the manner in which information is delivered. In the publication, Silva (2011) mentions that digital publishing is not merely a conventional format transfer to digital-only but has distinctive characters such as; interactivity and motion, which completely changed its publication format from traditional to the digital screen.

We are currently in the midst of a 4.0 industrial revolution, which includes mixed reality (MR), virtual reality (VR), augmented reality (AR), and holograms. When text, voice, visual, and animation all emerge in unison, the landscape of the publication changes dramatically. (Papadopoulos et.,al., 2021). This has caused a more significant impact on digital technology. Internet speed phenomenon and cloud computing also became a substantial contributor to the publishing industry when Nielsen (2018) reported that digital media had grown steadily through internet usage.

The transformation of conventional comics into digital comics reflects the growth of comics in the digital environment. It started with comics on the web, then switched to interactive and motion comics. Comics are no longer present as traditional forms, but the medium is relevant as technology progresses. In a practical sense, it can be said that comics are an ever-expanding aesthetic object (Halsband & Grimm, 2018).

The effect of today's digital technology has integrated AR with VR into MR and is widely explored in various fields. AR is advancing at a breakneck pace in terms of content, visuals, animation, media, and interactivity. Additionally, the existence of mobile technology makes AR more relevant to consumers and makes it easier for people to meet their goals. (Jamali et al., 2014). Under these circumstances, there is a wide range of AR-based products on the market, such as AR colouring books, prosthetic reality, AR advertising, and AR shopper (Furht, 2011; Webel et al., 2011; Cowling et al., 2017).

Lately, AR products have added new quality and experience to art objects such as drawing, painting, and posters. Undoubtedly, there has been an emergence of conventional comics in comics that make an AR element a new experience for readers or comic fans. 2014, an initiative in the Modern Polaxis AR comic book project by Sutu, has made an AR experience as a new comic reading medium and the Destiny's Sword and the Masters of the Sun comic where these comics are presented traditionally supplemented with the

AR experience. Consequently, AR has become a bridge from conventional comics to digital technology (Hung et al., 2021; Mahmood et al., 2017).

In theory, AR products are related to the science of human-computer interaction (HCI) and utilise UX as a metric for evaluating them. (Law et al., 2008; Peng et al., 2009; Zaphiris, 2013). Hassenzahl (2007) identified two key UX components in his study: pragmatic and hedonic. Both components worked in tandem to provide a great user experience. In a pragmatic approach, the focus is on UX products that are perceived to have the ability to support achievements or do-goals. Hedonic, on the other hand, refers to the capacity to accomplish goals.

In the study of Partala and Kallinen (2011), pragmatic and hedonic elements were used as impression guides for the product on an acceptance or rejection dimension of a product. The study stated pragmatics includes task-oriented quality aspects, efficiency, and learnability, whereas the hedonic focuses on stimulation, aesthetic impression, and novelty.

Empirically, Matcha and Rambli (2011) emphasise that positive UX elements are crucial in a technology product or device to determine the effectiveness and usability to the user. That means that the UX approach avoids the negative UX in technology products (Azzawi, 2013). In other words, to test or implement a technology product, negative elements of UX such as dislike, frustration, and complexity will be avoided to improve a technology product (Thoren et al., 2020).

Usability is also an essential component in UX where time, function, priority, and positive experience are incredibly stressful. Considering how the user responds to a product and the UX element reaction before, during, and after using a product (Alenljung et al., 2017; Irshad & Rambli, 2016).

Irshad (2013) confirms that a significant UX component is designed to find the emotion. Each product created considers the positive emotions that come from the user's response to the product. Olsson (2013) advocated in his research by providing a substantial UX to measure and collect the positive user feedback for designing UX products and avoid negative UX (Ritos, 2011; Irshad & Rambli, 2016; Hassenzahl, 2007).

On the other hand, comics are regarded as an art form or aesthetic item and should be assessed aesthetically. There are narrative, visual and text elements in comics that can be a medium of expression to invoke emotion. (Muliyadi, 2015; Eisner, 2000; McCloud, 1993). Moens (2018) inspired AX's characteristics based on elements such as, formalities, content, cognitive, perceptions, and emotions become a vital component and essential in assessing and measuring aesthetic objects (Harrison & Clark 2016).

Markovic's (2012) study emphasises that an art object's context seeks to determine the AX element that will reflex from contemplating an art object. In the context of AX, the process of appreciating the artwork involves the spiritual sense born of its biological, psychological, and social functions, not just to see or appreciate the beauty of the work from a formalistic point of view. Still, it can evoke aesthetic emotions such as sadness, anger, joy, passion, motivation, or even annoyance (Mari et., al., 2021).

Redies (2015) mentions that appraisal or appreciating a piece of art requires the beholder to go through five stages of aesthetic judgment: formalistic, cognitive, content, emotions, and ultimately AX. On the other hand, the beholder who can only appraise the beauty of a formalistic point of view (colour, line, composition, and form) is considered a naive assessment and requires an expert appraisal to appraise an artwork.

AX has an essential design to stir emotions by captivating negative and positive emotions. In the context of an aesthetic object, the art-forms determines the negative or positive emotional elements such as joy, fun, amusement, sad, anger, fear and dislike. That needs to be on an aesthetic object to measure the AX element in the comic (Redies, 2015; Leder et al., 2004).

Based on the literature review, it is safe to say that there was no element of AX in the AR product even though studies were done using aesthetic objects as its subject and vice versa found no UX element in the art-forms despite using AR as its medium. Several studies involving AR products integrating with arts as its subject matter were evaluated in UX terms such as time, efficiency, usability and design. However, the evaluation is limited from design context, which only involves the formalistic elements and discards the emotion factor. In the facet of emotions, it is more than positive emotions such as motivation, passion, and encouragement. In other words, it avoids evoking the negative emotions (Olson et al., 2011; Radoslavov et al., 2015; Qu et al., 2017; Dirin et al., 2018).

By way of example, Morreall (2009) used elements of AX in his study to measure comics such as amusement, the paradox of tragedy, and mental jolt without reference to UX elements even though the comic was already integrated with technologies such as interactive, motion comics, webcomics, and AR comics. (Smith, 2015; Ayer, 2014; Wang et al., 2019).

Empirically, there is a substantial theoretical gap between AX and UX when managing art and technology-based products like AR comics. This requires a new model to review this product. Among UX features in AR are efficiency, inspiration, motivation, creativity, and meaningfulness, while AX features in comics are; amusement, harmony, storytelling clarity, and mental jolt (Morreall, 2009; Klaehn, 2015; Plutchiks, 1980; Olsson & Mattila, 2011).

In brief, establishing the principles of AX and UX in augmented reality comics is important for a variety of reasons: 1) While augmented reality is an HCI-based product that is very important to UX as a measurement technique, comics are aesthetic products that must rely on AX as a measurement method, 2) UX evaluates users, usability, time, and design, while AX involves feeling, content, and expert appraise 3) UX involves technology products and usability, while AX is an aesthetic object and requires appreciation. AR is produced only in enhanced information, but it is imaginative and enhances the emotional experience in AR comics.

Summarising the Three Models of AX

Table 1 Model of AX by Redies (2007), Leder et al. (2004) and Markovic (2012)

Model	Concept	Main components	Processing flow	AX elements
Redies 2015	Involves external information in the encoding process to recognise the unity of AX	Cognitive, emotional and perceptual.	**Stimulus** Something as direct between the beholders with an image or artwork. **Context & Content** Depicted as a person, natural or animate object & the relationship with each other. Context is depended onto the content of the artwork. **Internal representation sensory system & brain** Sensory coding & cognitive coding- the translation of external information into further information.	**Cognitive processing** Reflection of the daily experience of a person **Emotional processing** Occur when the creation of artworks and appreciation of artworks. **AX** Basics emotion- through elective perception to communicate with beholders.

			Beauty responsive mechanism Beauty and preoccupation requisite artistic qualities that stir the emotion	
Leder, Belke, Oeberst et al., 2004	Propose a processing stage involving the AX process generated by the cognitive and affective states.	Nurture and increase interest and appreciation of AX that proponent emotional state.	**Context and input** AX objects emphases of their appearance (galleries, museum or exhibition. The art object is when practising the aesthetic principle in the process of creation. **Perceptual analyses** Optical considerations with process focus on the formalistic features. **Implicit memory integration** The implicit memory describes the work based on prior or implied memory register in the human cognitive system. **Explicit classification** The content and style process by expertise and knowledge of the expert, creator & the beholder. **Cognitive mastering & evaluation** Feedback & appraisal by beholder, artist and art experts.	AX is dependent on the subjective well-being of information processing and is often described as a pleasure and happiness as a positive state.
Markovic 2012	Ax and affective tone	Positive & negative emotion	**The initial** Perception & cognitive assessment of fundamental properties (formalistic elements) **The main stage** Focusing on more complex detection. Process of a composite equation & narrative interpretation. **Aesthetic information processing** Narrative (literacy, theatre, film & painting. The temporal semantic structure provides narrative information, stories and discourse. **The processing of form and composition** Aesthetic objects have some physical form that determines the style & the art aspects of the artworks.	**Cognitive** Explicit meaning, more profound meaning, perceptual associations & discovery of regularities **AX** Emphatic emotion & diffuse emotions.

Summarising the Three Models of UX

Table 2 Model of UX by Hassenzahl (2007), Irshad&Rambli (2016) and Ritos (2011)

Model	Concept	Main components	Processing flow	UX elements
Hassenzahl (2007)	Involves designer perspective and user perspective.	Hedonic dimensions & Pragmatic approach	Three facets of hedonic 1. Stimulation (novelty, change, personal growth) 2. Identification (Communication of identity to relevant others & relatedness) 3. Evocation 4. (Provoking memories & symbolising.)	Designer perspective: Intended product character User perspective: Apparent product character -Pleasure -Satisfaction -Appeal -Consequences
Irshad & Rambli (2016)	Subjective experience perception, emotional response and product environment.	Implementation, the design of research for mobile, augmented reality (MAR) products based on positive UX	MAR products 1. Presentation 2. Information content 3. Service functionality 4. Augmentation 5. Mobility Time 1. Anticipated UX (before usage) 2. Momentary UX (during usage) 3. Episodic UX (after usage) 4. Cumulative UX (overtime)	Specific experience being invoked by positive UX.
Ritos (2011)	An action plan of AR and aims to be the catalyst to the standard method of AR prototype.	AR through UX	Input a. Visual b. Auditory c. Tactile d. Kinaesthetic Sensory modalities Combination of sensor fusion and sensor-emitter. Out-put a. Visual b. Auditory c. Sensor-emitter Context-awareness Health and safety Integrity, privacy and security.	Sense of immersion and arousal.

The Elements of Aesthetic Experience (AX)

Under these conditions, the AX entails multiple mental steps that must be passed. Among these are the stages of creation (by the artist), appreciation (by the artist, by the beholder, and by the expert), and assessment (artist, beholder, expert). To ensure AX's synergy, these stages are based on cognitive, emotional, and perceptual domains.

Schindelr et al. (2017) conducted extensive research on over 50 emotions associated with aesthetic items and events such as concerts, musicals, dance performances, art exhibits, and films. Negative emotions, prototype aesthetic emotions, epistemic emotions, nostalgia, animation, grief, and amusement are some of the new emotions Schindelr et al. (2017) came up with at this point. Under the circumstances, this study has developed a new method to measure AX named AESTHEMOS by combining a top-down theoretical approach with a bottom-up empirical approach.

In the field of comics, AX's element has long been used to confirm the imagination, and surprises that extend beyond the soul's joy are referred to as playful or hilarious. It is vital to strengthen the connection between humour and AX intended to elicit laughter regardless of the artistic paradigm employed in various comedic genres like satire, parody, lampoon, burlesque, caricature, farce, slapstick, and limerick.

Morreal (2009) has now introduced nine AX aspects in comic book art. Indeed, the aesthetic experience that has been highlighted is classified as enjoyment, a paradox of sorrow, and mental jolts. By contrast, each category possesses aesthetic emotions with distinct forms of reaction to the aesthetic experience of comic art.

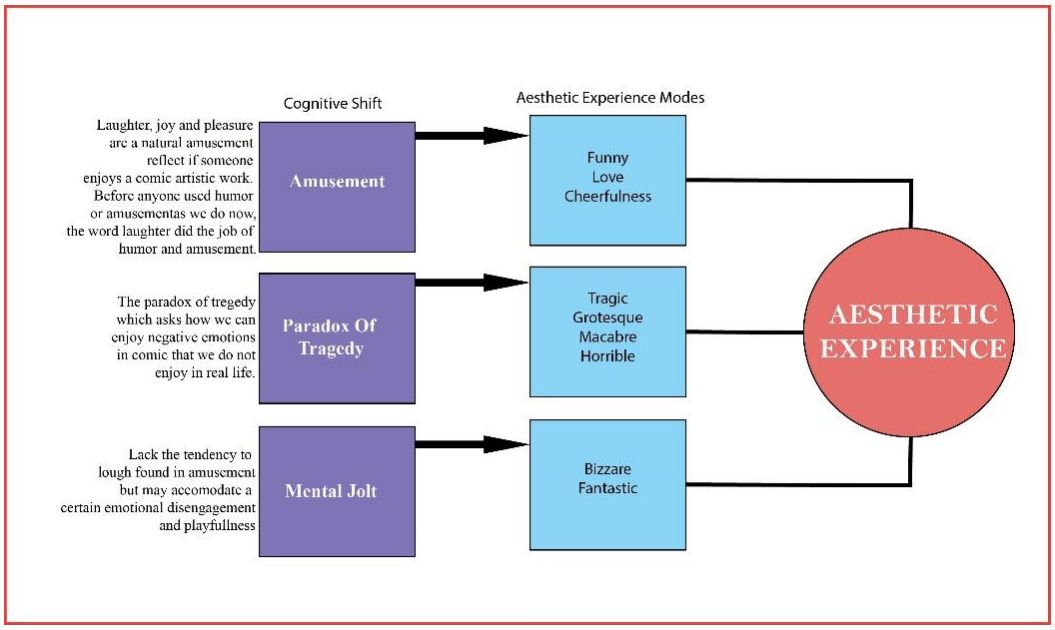

Figure 1 Cognitive Shift of AX in Comic Art (Morreall, 2009)

In addition, comic book creators Breyfogle and Klaehn (2015) performed an interview session to define the most critical requirements for the aesthetics principle of comics and the aesthetics reaction, which is comparable to AX. Arising out of this, AX response suitable serve as a construct for expert review, which is the constructs is directed towards AX in comics. The four constructs are listed in the table below:

Table 3 Breyfogle in Klaehn (2015) aesthetics principle of comics and aesthetics response

Aesthetics principle of comics	Aesthetics response
Harmony	Verisimilitude, accuracy
Humanism	Authenticity
Naturalism	Drama
Storytelling clarity	Surprise, amazement

In summary, AX components are typically found in artistic items or activities like as painting, sculpture, theatre, cinema, comics, and illustration. These components have been validated and examined in relation to aesthetic items or activities. The aspects of AX in comic books have been evaluated and validated in this study in order to guide future research.

The Elements of User Experience

Under these cases, end-user knowledge may necessitate determining the type of experience that is expected. In this regard, the research knowledge is prepared to be used in UX design, particularly in the MAR service. The UX itself entails numerous steps of the mental process that must be successfully completed. Developing (by developer) to the end-user is one of them (target users). In practise, these stages encompass a variety of components, including useful, UX characteristic, emotion, usability, assessability, and desirability (Qu et al., 2016 & Klingbeil et al., 2017).

Olsson and Mattila (2011) gathered UX construct aspects from prior research involving technology, including the use of AR technologies. They have encapsulated their user experience qualities in terms of component technology. This can be viewed in Table 4.

Table 4 Characteristics of expected mobile AR user experience (Olsson and Mattila, 2011)

UX characteristic	Description of the experience	Technology components
Experiences originating mainly from service functionalities		
Efficiency	Efficiency in ad hoc information retrieval in various contexts: saves time and effort and facilitates performing everyday tasks	AR, Embeddedness, Context-sensitivity
Empowerment	Gaining new practical benefits by enabling novel activities and sources	Embeddedness, Context sensitivity
Increased Awareness	Increased awareness and of one's surroundings and the digital affordances in it, thus creating feelings of discovery and insight	AR, Embeddedness, Context-sensitivity
Inspiration	Feeling of being encouraged, cognitively stimulated, and eager to try new things or appropriate the service for new purposes	AR
Motivation	Feeling of being more motivated to participate or to do tedious tasks as results of the novelties in MAR (e.g., the way of Interaction, proactivity)	AR, Context-sensitivity
Surprise	Positive surprises and wonder due to surpassed expectations and receiving extraordinary information automatically	Context-sensitivity, Embeddedness
Experiences originating mainly from the Information content		
Connectedness	Feeling of having novel ways for social Interaction and being connected with and aware of other people using MAR services	Mobility, Embeddedness
Collectively & participation	Sense of community, participation, and belongingness by collectively creating and producing AR content	Embeddedness, Mobility
Creativity	Creative, self-expressive, and artistic feelings in creating AR content and in mixing the digital with the real world	AR, Embeddedness
Liveliness	The service and environment feeling vivid and dynamic because of steadily accumulating and updating content related to surroundings	AR, Embeddedness, Mobility

Meaningfulness	AR content feeling personally meaningful and relevant, as well as reliable, up-to-date, and corresponding to the real-world objects	Context-sensitivity, AR
Playfulness & entertainment	Feelings of joy, amusement, and playfulness that arise from intriguing and productive content as well as novel ways of Interaction	AR, Embeddedness
Experiences originating mainly from Interaction with the augmented reality		
Captivation	The feeling of being immersed and captivated in the Interaction with the AR	AR
Intuitiveness	Feeling of naturalness and human-likeness in interacting with the AR information and intuitiveness of how AR content is aligned to real world	AR, Embeddedness
Tangibility	Feelings of concreteness and coherence of environment-related content, leading to senses of presence and unity with the surroundings	AR, Embeddedness

Wang (2016) states that UX elements' are essential variables that are an aesthetic response or can be defined as emotional UX. In a nutshell, this variable can be classified into three categories: sensory aesthetics, which refers to sensations that provide pleasure through the arousal of the senses, formal aesthetics, which is concerned with aspects such as shape, complexity, and rhythm, and symbolic aesthetics, which explains the connotative of the associated elements in the stimulus.

As Hassenzahl and Tranctinsky (2006) suggest, psychological needs are an essential component of UX. Therefore, emotions are also an integral part of UX and become central in empirical research measurement. As the previous discussion in UX, the emotion coexists with a positive experience as a guideline to HCI products and services. On account of this, Partala and Kallinen (2011) listed ten satisfying emotional experiences and ten unsatisfying emotional experiences in interacting with UX devices. In short, ten elements of pleasurable emotion using UX devices show a high rating and prove that positive UX elements are emphasised in the study closely related to UX. The ten elements of emotional experience are determined, alert, inspired, attentive, active, interested, enthusiastic, proud, strong, and excited.

Meanwhile, Mahlke (2008) describes an integrated research approach to the experimental study of emotional user reaction as segments in three central components of UX. UX's user reactions mentioned subjective feelings, motor expression, physiological reactions, cognitive appraisals, and behavioural tendencies.

To put it another way, Saariluoma and Jokinen (2014) outlined an emotional UX concept based on three main components: primary emotion, core effects, and the appraisal process of emotion. The next topic of emotion will discuss that psychologically basic emotion is based on universal emotion that usually

affects the body responses and universal emotional signs with facial expressions. In the HCI field, emotions studies are usually published when using a device or a technology product as users reflect from experience towards the product (Dirin & Laine, 2018; Nikov & Gumaia, 2016).

In like manner, core affect, which is defined as the most straightforward possible part of the emotional process, is still accessible to consciousness. On the other hand, the core effect integrates hedonic and arousal component values and can be identified as a single key in the circumflex concept of valence-arousal (Hassenzahl, 2007; Partala & Kallinen, 2011).

In a similar vein, an appraisal theory defines emotion as a process, not a state which recursively interacts during the appraisal and results in a change in cognitive, physiological, motivational, expression, and subjective feeling responses (Bilgihan, 2016).

The Elements of AX and UX for AR Comics

Before developing a model or framework, structures and components can be gathered through the literature review process (Hair et al., 2020). The researcher collects linked constructs and aspects in this research using the methodological review technique.

The AX and UX construct postulate from methodological review (MR) activity where the process of intensive, selective selection, screening, integration, and critical reading of selected reference materials within the study's scope is applied intensively. Methodological review is a literature review technique that takes into account the question of method by looking at the outcome process is implemented (Kallio et al., 2016). In this regard, researchers have made MR processes against AX and UX models to collect as many constructs and elements as were found in previous studies.

An MR is designed to ascertain the integration of pertinent models and theories. These models are selected based on their usage frequency through citation, models that other scholars often refer to. These models are believed to be completed and provide a clear explanation of the theory. It was based on three models and the concept of UX as noted by Hassenzahl (2007), Irshad and Rambli (2016), and Ritos (2011). Additionally, the screening, selection, integration, and formulation processes are inextricably linked to

defining UX features for AR in order to obtain the constructions and elements in the UX. The theory and the AX model are both based on the same premise. Three models are combined, filtered, and constructed in order to find AX components for comics and to further identify AX constructions and elements. Redies (2015), Leder et al. (2004), and Markovic (2012) are the three models. However, the components and aspects discovered come from a study by Olsson and Mattila (2011) for UX in AR and a combination of Morreall (2009), Klaehn (2015), Plutchik (1980) and, Parrot (2001). It is shown in Table 5 below:

Table 5 MR proses of construct and element of AX and UX

The construct and element of UX		
No	Construct	Element
1	Efficiency	Time, effort.
2	Increase awareness	Feeling of discovery, feeling of insights
3	Inspiration	Cognitive stimulated, encourages, eager to try new things.
4	Motivation	Being motivated, Interaction proactivity
5	Creativity	Self-expressive, creative
6	Liveliness	Vivid, dynamic
7	Meaningfulness	Personal meaningful, relevant
8	Playfulness and entertainment	Joy, amusement, playfulness
9	Captivation	Captivate, immerse
10	Intuitiveness	Human likeness, naturalness
11	Tangibility	Concreteness, coherence
The construct and element of AX		
No	Construct	Element
1	Amusement	Love, funny, cheerfulness
2	Paradox of tragedy	Tragic, Grotesque, Macabre, Horrible
3	Mental jolt	Bizarre, fantastic
4	Harmony	Verisimilitude, accuracy
5	Storytelling clarity	Surprise, drama, amazement, authenticity

Conclusion

In conclusion, the constructs and elements collected from the methodology review are an initial step to obtain a new theoretical framework or model involving art-based products and HCI. Researchers intend to possibly use exploratory factor analysis and confirmatory factor analysis to obtain a theoretical framework or model related to the product mentioned. Realising that IR 4.0 technology today is very significant in using art and reality technology such as VR, MR, AR, and immersive reality, researchers feel a theoretical model should explain the phenomenon.

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