Probing 2D skins from the perspective of 3D skins to construe a relationship model

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Abstract

Literature studies reveal that 'cross-domain influences' serve as potential sources of inspiration to evolve unique ideas. To examine such influences, 'architecture and clothing,' often recognized as the third and second skins that serve to protect humans at macro and micro scales are identified as potential domains in this study. Even though numerous papers exploring 3D and 2D are published, this study intends to construe a model based on shared views. Nearly one hundred and fifteen samples were collected from secondary sources based on a framed criterion. An exploratory methodology incorporating qualitative and quantitative data is adopted to investigate the ways through which the ideas drawn from 3D skins are espoused in 2D skins. The findings by the authors, intra-raters, and inter-raters are consolidated, synthesized, and interpreted to construe a relationship model.

Keywords: 2D skin; 3D skin; cross-domain influences; exploratory methodology; relationship model; shared views.

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1. Introduction

A systematic study of the literature reveals that 'cross-domain thinking' revolves around the ideas manifested in diverse domains and are explored as channels to creativity in an altogether different or a similar field to evolve unique ideas. Baer (2015), stated that domain specificity and expertise are needed to find solutions in a specific domain either individually or collectively with ideas borrowed from other domains. When the emergent outcomes of any open-ended task are observed to lie squarely in a specific field, there is a plausibility that the creative process may be rooted in some other domain (Scotney et al., 2018; Horton & Street, 2023). Ideas expressed in a field by an individual have the potential to inspire someone else in other domains (Ranjan et al., 2013). It is posited that individuals employ cross-domain thinking when they evolve new ideas (Ranjan et al., 2013; Scotney et al., 2018).

It is believed that cross-domain thinking is omnipresent (Scotney et al., 2019). Gabora and Carbert (2015) noted that the influences of such thinking are widespread. 'Viewing one discipline from the perspective of another' is also observed to be 'cross-disciplinary thinking' (Chattalas et al., 2016). For recognizing the relationship between outcomes in different domains, exploring the role of expertise is identified as a potential strand for further studies (Ranjan et al., 2013). Ranjan (2014) stated that cross-domain interaction is acknowledged as a creative process that includes the search for blatant evidence of the source in the emergent outcome.

Ranjan et al., (2013) observed that individuals or a group of individuals need to decode and translate the grammar from one to another domain effectively to evolve innovative ideas. Besides, these authors identified three directions to interpret cross-domain influences such as 'synesthesia', 'ekphrastic expression', and 'cross-media style.' The three directions refer to the 'intuitive translation of stimuli in another domain', and 'interpreting ideas from one to another field' followed by the 'artistic style demonstration in various mediums' respectively. Ranjan (2014) recognized 'cross-modal perception' that focuses on the relations between two sensory modalities, and 'common coding theory' that suggests the interactions between the systems for action and perception.

According to Breward (2003), research in the fashion domain is yet to gain momentum. Smal and Lavelle (2011) have stated the need to develop theories in the fashion domain. Fashion designers draw inspiration from many unusual sources that are tactile as well as visual in nature including architecture (Kumari, 2019). In most clothing design cases, finding appropriate and intelligible sources of inspiration and interpreting the ways through which such influences are complicated (Mete, 2006).

1.1. Literature review

1.1.1. Fashion and sources of inspirations

According to Webster's dictionary, the term 'fashion' is both a noun as well as a verb addressing 'the prevailing style' and 'to give shape or form to' respectively. It is a form of self-expression, specific to period, and place, and includes clothing, footwear, lifestyle, accessories, makeup, hairstyle, and body posture. Fashion is about creating a dynamic interplay between expressionism and all the aspects that go into making accessories and clothes (Williams, 2018). Eckert and Martins (2000) posited that sources of inspiration play significant roles in the design process. Looking at inspirations during the pre-processing phase leads to the emergence of unique outcomes (Gonçalves et al., 2016).

In the fashion domain, inspirations are drawn during the pre-processing phase from diverse resources. From various research papers, it is observed that inspirations are drawn from 'paintings, visual imagery, cinema, popular culture, historical evidence such as portrait paintings, fashion plates, photographs, literary sources, pattern books, trade catalogs, magazines, and serial type publications' (Smith, 1989); 'cultural studies' (Au et al., 2003); 'nature and

environment' (Al Yamani and Hanan Abdul 2011); 'movies and walks in the streets' (Potvin, 2013). Besides, 'everyday experiences and surroundings, observations, personal experiences, material culture, personal beliefs, and values' (Hwang, 2013); 'material culture' (Woodward & Fisher, 2014) 'nature, mechanics and materials' (Kyratsis et al., 2015) also play significant roles. Fashion designers look into 'abstract sources' (Eckert, and Martins, 2000); 'memory and categories of experience: 'computer technology' (Wolf, 2015; Petrack et al., 2018; Murtas, Pedeliento & Mangiò, 2023) and 'architecture' (Wolf, 2015; Abbasi, 2018; Kumari, 2019; Baruah and Namrata, 2020); deconstructionism (Zaitseva et al., 2020) as various channels to creativity in the fashion domain.

In recent years, associations between fashion and architecture have become more apparent (Lobo, 2012; Conlon, 2022). According to Riegelman, (2003), "draping is like architecture: the body is the armature, the internal structure, and the fabric, like skin, glides over this frame. The fabric falls and twists, forms knots, bends and curves, like a river it ebbs and flows over the contours of the body."

3.1.2. The design process: 2D and 3D 'skins'

Fashion is intangible whereas clothing is tangible. Clothing refers to the varieties of fabrics that are tailored and stitched in a particular form so that people can wear them for self-protection and adornment. Clothing is an applied design that revolves around originality, creativity, and design process (Mete, 2006).

El-Gammal (2018) posited that 'design' and 'creativity' influence the 2D and 3D skins. Both domains revolve around non-verbal communications where geometry, proportions, and mathematics play significant roles and the emergent outcomes are temporal and specific to culture and society (Heydyat, 2012). The design of 2D and 3D skins revolves around lines, shapes, scales, and norms to create inventive forms Architects and fashion designers look into egress, proportions, aesthetics, and materials (Quinn, 2002; Vermaak et al., 2021; Lee, Park & Lee, 2023) and are linked with social, and political technological development period from the past to the present (Ertas and Samlioglu, 2015). Numerous 2D skins are designed with ideas drawn from built environments (Farhat, 2014). Fashion design inspired by architecture is more 'technical and structural' (Chinwendu, 2014).

Exploring the sources of inspiration, the content as well the ways through which the designers draw ideas is under-explored (Eckert and Martins, 2000; Gonçalves et al., 2016). To minimize the aforesaid gap by construing a relationship model for 2D and 3D skins (Kumari, 2019) the authors identified research papers exploring 'architecture and fashion'. Phrases such as 'architectural fashion', 'architecture and fashion', 'three-dimensional fashion', 'sculptural fashion', 'architects and fashion', 'relationship between architecture and fashion', 'architecture as a source of inspiration in the fashion world' were used to identify papers from the databases such as 'Research Gate', 'Google Scholar', 'Academia', 'Scribd', 'Semantic Scholar', 'Scopus' etc from 1st June 2020 to 25th June 2020 (Viklytra, 2018). Around forty-two papers that were published from 2000 onwards were identified. Nearly, twelve papers revolved around exploring the 'relationship' as well as the 'similarities and dissimilarities' addressing the two domains.

1.2. Purpose of study

The objective of this study is to construe a model depicting the influences of 3D skin in 2D skins, the exploratory methodology is adopted in this study.

2. Methods and Materials

An exploratory study is appropriate to address an under-explored phenomenon (Creswell and Clark, 2017). Swedberg (2018) has classified exploratory studies as Type I and Type II. In this study, the authors have adopted Type I incorporating triangulation by methods, investigators,

and theories sequentially as the objective is to construe a relationship model between the two skins. Multiple methods of data collection are adopted to explore the same phenomenon (Polit & Beck, 2012). Methodological triangulation is about the convergence of multiple methods that validate the findings seamlessly incorporating both qualitative and quantitative data (Heesen et al., 2019). The researchers combine both the qualitative and quantitative data in mixed method research (Creswell, 2003, Mik-Meyer, 2020). Mixed method analysis is inclusive, pluralistic, and complementary (Johnson and Anthony, 2004). The research question, purpose, and context play significant roles in conducting a mixed-method study (Venkatesh et al., 2013), where innovation (Fielding, 2012) and rationale (Bryman, 2006) play significant roles.

2.1. Data collection

Secondary data was collected from 15th May 2020 to 15th June 2020. The authors identified the samples from secondary resources that included both the building that served as a source of inspiration and the designed attire in a single frame. During the collection phase, phrases such as 'architectural fashion', 'three-dimensional fashion', 'architecture as a channel to creativity for fashion designers', 'structural designs in fashion', 'interrelationship between architecture and fashion', 'architectural concepts in fashion design,' 'architectural clothing' were adopted using 'Google' as the search engine. Data was sourced from archives such as 'Arch2o,' 'Architectural digest,' 'Mintsquare', 'Mymodernmet', 'Weburbanist', 'Dezeen', 'Irenebrination', 'Archdaily', 'Form follows fashion', 'Antonia Lowe Interiors', 'artisticcollision', 'Boca Do Lobo', 'lynelucien', 'bau.edu.il', 'geometry fashion', 'fashiontecture', 'crfashionbook', 'Pinterest', 'Slideshare', 'Tmagazines' etc. Different scales were adopted to evaluate the influences of 3D skins on 2D skins through an overall impression score on a ten-point scale by intra-raters. Two groups of inter-raters on a four-point and five-point Likert scale, specifically to shortlist the samples systematically for further study.

2.2. Samples

One hundred and fifteen attires along with the images of the 3D skins were identified. The attires designed by Iris Van Herpen, Herpen, Zara, Viktor&Rolf, Gaultier, Sun Woo, Charlotte Ham, Horner, Viktoria Lytra, Karl Langer, Issey Miyake, Elena Manferdini, Alexandra Verschueren, Serkan Cura, Yuki Hagino, Hiroko Masuike, Michelle Smith, Rosie Assoulin, Clare Waight Keller, Horsting &, Snoeren, William Opka, Maison Kitsuné, Jill Sherman etc. The internal consistency of the collected data was determined by Cronbach alpha (Hinkin et al., 1997; Tavakol and Reg, 2011). Around one-fourth of the sample size was designed by drawing inspiration from the interiors.

2.3. Procedure

The study is carried out in three phases as shown in Table 1 includes the decoding of the samples for overall understanding, and identification of samples through triangulation by investigators followed by methodological triangulation to construe a model. Denzin (1978) has posited that triangulation by investigators leads to the confirmation of findings from different perspectives thereby adding breadth to the identified topic (Denzin, 1978).

Table 1

The three phases adopted in the study

Phases	Activities	Outcomes
Phase I	A framework to identify the samples from secondary resources and to decode the attires qualitatively and quantitatively	Comprehend the relationship between 3D and 2D skins through visual coding
Phase II	Investigators triangulation	Identify exceptional samples for further study
Phase III	Construe a model to map the relationship	

Both qualitative and quantitative data collected from the perspectives of intra-raters, inter-raters, and authors were analyzed by adopting mixed methods. Intra-raters play a significant role as decisions are made through discussion and participation, whereas the inter-raters evaluate the emergent outcomes independently. The methods adopted to evaluate the identified samples from three perspectives adopting the principles of the framework developed by Dorst and Nigel (2001) are displayed in Table 2. The framework adopted to meet the intent of the exploratory sequential approach as framed by Ramaraj and Jothilakshmy (2017) is modified concerning 'class intervals' in this study. The samples were evaluated quantitatively and qualitatively by the intra-raters and inter-raters respectively. Besides, the authors decoded the elements as well as the principles of design in the attires, and the findings were synthesized to construct the 'big picture'.

Table 2

An exploratory sequential method

Phase	Data collection & analysis				Investigators
I	Identify samples from secondary sources during the data collection phase and examine the internal consistency of the identified samples for decoding through mixed methods				Authors
II	Investigators triangulation	Quantitative analysis	Overall impression rating of the relationship between 3D and 2D skins on a ten-point scale		Intra-raters
		Qualitative (Interpretations)	Responses to interpret the degree of relationship between 3D and 2D skins	Four-point Likert scale (technocrats)	Inter-raters
				Five-point Likert scale (students pursuing fashion design)	
III	Shortlisting of attires for further study to construe a model for mapping the relationship				Authors

2.4. Data analysis

Firstly, the authors synthesized various attributes that addressed aesthetic values from the literature with a thrust on fashion and design. Cinar (2017) identified five parameters of analysis such as 'silhouette, rate and lines, texture, color, press, and decoration' to explore how fashion designers were inspired by art. In this study, parameters such as 'texture, motifs, color and transformation' as in Table 3 were adopted to map the relationship between the 2D and 3D skins. Shape, silhouette, and fit were also included to comprehend the 2D skins from the designers' perspectives.

Table 3

An insight into the parameters for exploring the ideas drawn from built forms, interiors, and the identified attires

Parameters				Features	
Ideas drawn from 3D skins				Structural and decorative	
Functional and aesthetic values (Kumari, 2019)	Cinar (2017)	Shape & Silhouette		Sheath, A-line, straight column or rectangular or H line, hourglass, bell, trumpet, shoulder wedge, trent or trapeze, extreme volume, asymmetrical, empire, egg shape or oval or cocoon round, mermaid, inverted triangle or wedge or tapered or Y line	
		Texture		Visual and tactile (Wong, 1993; Gong & Shin, 2013); fabric manipulation (Przybylek, 2019)	
		Fit		Tight, loose, optimum, rigid, partly tight, partly rigid and tight, partly rigid and loose, partly rigid and optimum (Based on degrees of change put forth by Reinhardt, 2007)	
		Motifs		Lines (Cinar, 2014); Geometry, natural, abstract, stylized, conventional (Koester, 1993), and spatial cells (Wong, 1993)	Visual and tactile texture

Colors	Classic colors such as white, black, navy, grey, and camel (King, 2012)

One hundred and fifteen attires were analyzed qualitatively and quantitatively by intra-raters and inter-raters. Three architects (average age: 38 years; average experience: 13 years) rated the relationship collectively on a ten-point scale. Two teams of inter-raters were identified through convenience sampling. One team comprising fight technocrats (average age: 25 years; professional experience: 5.5 years) with little knowledge of 'architecture' and 'fashion' assessed the relationship between the designed attires and the buildings on a four-point Likert scale. The numbers from one to four represented 'strongly disagree,' 'disagree,' 'agree,' and 'strongly agree' respectively. Similarly, the other team comprised thirteen students pursuing fashion design (average age: 20 years, 14 females and 2 males) at Sathyabama Institute of Science and Technology rated the relationship visually on a five-point Likert scale. Cronbach alpha was determined for the responses given by the two groups of inter-raters separately to examine the internal consistency from two different perspectives. The calculated values for the responses given by the technocrats as well as the fashion design students were 0.83 and 0.97 respectively. Both the values indicate that the internal consistency is good.

During the rating phase, a visual presentation of the images was planned. Each slide had an image that was shown to all the inter-raters for a maximum of thirty seconds. The numbers incorporated in the slides served as codes for the identified samples. The attires for further study were identified based on the criteria as shown in Table 4. The findings were limited to the one hundred and fifteen images that were identified during the data collection phase based on a framed criterion.

Table 4

Triangulation by investigators

	Investigators			Criteria	Based on all the four criteria, attires were shortlisted for further study
Intra -raters	Architects (Overall impression score on a 10-point scale)		October 2020	Scores > 7.4	
Inter-raters	Technocrats (4-point Likert scale)	Likert scale	November 2020	The overall impression score on a 10-point scale converted to a four-point scale is N (base score) N>3 N-1, N, N+1	
	Fashion design students (5-point Likert scale)		June 2022	Cumulative score > 90%	

The attires were qualitatively analyzed by the authors from diverse perspectives: shape transformation (Prats, Lim, Jowers, Garner and Chase, 2009); principles of form and design (Wong, 1993); synchronous and asynchronous approaches (Lawson, 2006); literal interpretation and metaphors (Antoniades, 1990); continuity, collection and use (Chun, 2021).

2.5. Ethics

The data collection procedure and the findings of this study conformed to ethical standards. No human, organization, or environment was harmed or can be harmed by this study.

3. Results

Findings interpreted through quantitative analysis of various attires revolving around 'shape and silhouette, motifs and texture, color, fits and transformation' as in Table 3 and 'diverse opinions about cross domain relationship' are summarized in the following sub-sections for all the identified samples.

3.1. Shape and Silhouette

In fashion 'silhouette' is related to the line of the dress or the overall shape of the designed attire. There are various types of silhouettes as mentioned in Table 2. However, during the analysis phase, the authors observed a combination of two types, such as 'sheath and shoulder wedge,' 'mermaid and shoulder wedge,' 'A-line and shoulder wedge,' 'A-line and extreme volume,' 'sheath and extreme volume,' 'shoulder wedge and asymmetrical,' 'sheath and inverted A line,' 'sheath and asymmetrical' in the identified attires. Around 10.4% of the attires fell under 'sheath,' followed by 'rectangular or column' type which accounted for nearly 13.9%. Nearly 11.3% of attires fall under the 'bell' category, whereas the 'A-line' profile was observed to be 10.4% and the other combinations were observed ranging from 3 to 10%. This was followed by 'mermaid,' 'A-line and wedge shoulder,' and 'trapeze' accounting for 2.6% each. Only 1.7% of the attires were observed to be 'sheath and extreme volume.'

3.2. Motifs and texture

The Oxford Dictionary defines the term 'motif' as 'decorative image or design, especially a repeated one forming a pattern.' The motifs are classified as 'geometrical, natural, abstract, stylized, conventional' (Koester, 1993). The attires with motifs were around 35% only. Among these attires, 50% of the attires exhibited geometrical patterns, whereas the realistic and abstract motifs were around 15.9% each. The 'stylized' and the 'spatial cells' occupied 9.1 % each. According to Wong (1993), a spatial cell is a three-dimensional unit that projects out on surfaces that are associated with fabric manipulation in a way by which, the fabric becomes more dimensional (Przybylek, 2019)**.** Around 18% exhibited tactile texture achieved through manipulation techniques such as 'pleats, chords, cutworks, layers, embroidery works', etc portraying lines and geometrical profiles in an intangible way.

3.3. Colors

The attires were predominantly 'mono colors' that accounted for 57.4% and were predominantly black, white, red, silver, gold, grey, and blue. Uses of two colors were observed in 34% of the attires. Around 5.3% of the attires had more than three colors. Attires with three colors were 1.7%, whereas two attires were 'translucent' and 'illuminated' occupying 0.8% each*.*

3.4. Fit

Most of the designers have adopted 'partly tight' fits which were observed to be 30.4%, followed by the 'tight' fit which accounted for around 20.9 %. The combination of 'partly rigid and tight' was around 14.8%, while 'optimum fit' was 11.4% each, whereas 'loose fit' was 13.9%. The authors observed the 'wholly rigid' category to be 6.1%. 'Partly rigid and optimum fit' as well as 'partly rigid and loose fit' were around 1.7% and 0.8% respectively.
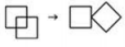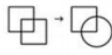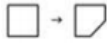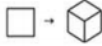
3.5. Exploring the Collective Responses

The analysis of scores on a ten-point scale portrays that around 9.6% of attires were graded with more than nine points. Around 27% of the attires were observed to be categorized under the second interval, greater than eight but less than nine. Around 22.6%, 27.8%, and 13% of the ten-point scores of the attires were observed to fall under the rest of the other intervals such as greater than seven and less than eight; greater than six and less than seven; greater than six and less than five respectively.

As discussed in the data analysis section, the scores rated by technocrats were categorized under the five intervals. The intervals were based on the difference between the intra-raters scoring converted into a four-point scale and the scoring of the inter-raters. It was observed that only 4.3% of the attires were rated as 'strongly agree' by all the inter-raters. Around 11.3% of the attires were observed to fall within 0.5 ranges above and below the collective rating. The number of attires falling within the ranges 1 and 1.5 concerning the overall rating is around 20.9% and 46.1% respectively. Around 17.5% of the attires were noted to have a range greater

than 1.5. Besides, concerning the students pursuing fashion design, around 34% of the attires were observed to score more than seventy-one points cumulatively. Twelve attires were appreciated collectively for displaying a strong relationship with the ideas drawn from the 3D skins. These attires were analyzed further to evolve a model depicting the relationship as in Table 5.

Table 5

An insight into shape transformation

Shape transformation (Prats et al., 2009)		
Outline		One endpoint of the transformed element is retained (bend, straighten, thicken, extend shape, change width or length)
Structure		Flip, angles, change direction, split, change position
Substitute		Replacing an existing element with a new one
Add		Introduction of a new element (add a new shape, combine shapes)
Delete		Removal of an element
Cut		A part is retained
Change view		Change view

3.6. Findings

The qualities of the attires such as 'shape and silhouette,' 'fit,' 'motif and texture,' 'color,' and 'shape transformation' were analyzed and interpreted. The diverse opinions of the intra-raters' and inter-raters' perspectives along with the attires falling under the identified codes were consolidated and synthesized as shown in Table 3. While exploring the common silhouettes, 'A line, rectangular or columnar fits' were commonly observed whereas concerning combinations 'sheath with asymmetrical profiles' were predominantly adopted. Fits with a single characteristic or with a combination were observed almost in equal proportions. Concerning motifs,' geometry' was preferred by fashion designers followed by 'realistic and abstract expressions. Spatial cells were adopted by around one-fifth of the identified attires. The authors observed that a variety of motifs were achieved through 'fabric manipulation' that included smocking, chording, embroidery, pleating, draping, layering, cut works, etc. Nearly 92% of the attires were either following mono or bi-colored schemes. Nearly 57.4% of the attires were the expressions of combined 'outline and substitution'.

However, for interpreting how each technocrat assessed the attires, the score of the intra-raters on the four-point scale was taken as the base score and represented as 'N.' During the process, five intervals such as <N-0.5, N, <N+0.5; <N-1, N, <N+1; <N-1.5, N, <N+1.5; <N-2, N, <N+2; <N-2.5, N, <N+2.5 were developed. Such intervals were developed focusing on the average scores based on a four-point Likert scale. Based on the scores, the identified items were categorized.

The attires falling under the first three intervals were identified. The attires falling under N>3, based on the overall score by the intra-raters; N-1, N, N+1, and the frequency of 'strongly agree', greater or equal to five as per the inter-rater's evaluation were the three codes identified for further analysis. The attires falling under all three codes as well as N>3 and either of the other two codes along with the buildings as well as the fashion designers were consolidated and
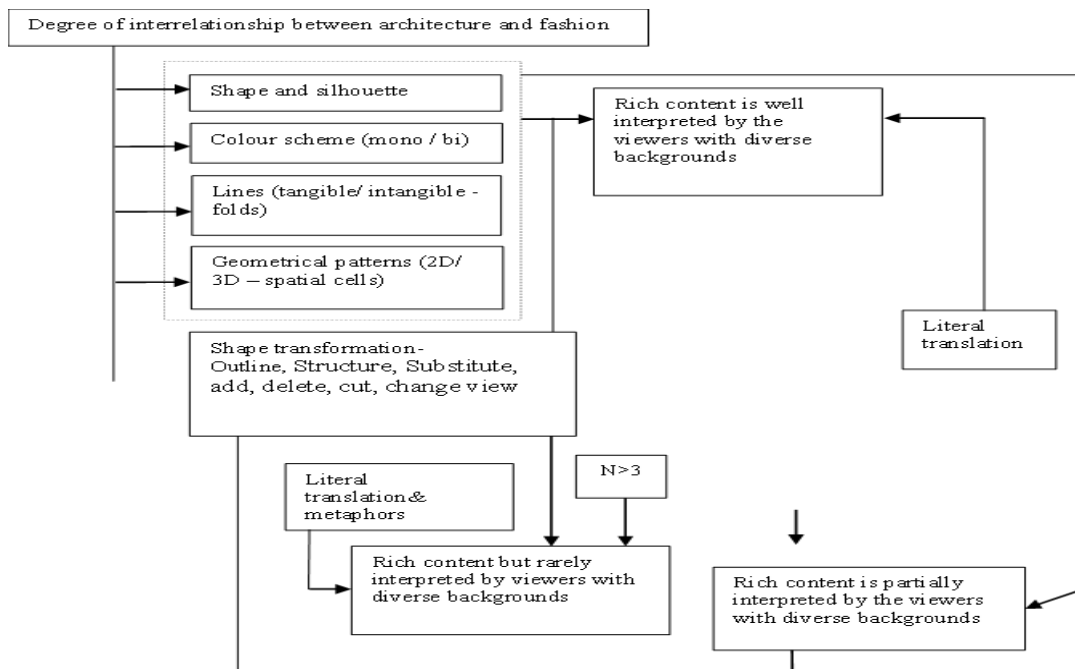
synthesized as shown in Table 6 including the names of architects and the fashion designer who designed the building and the attires. Besides, the responses given by the students pursuing fashion design were consolidated and the scores greater than 71 points were identified. Fourteen attires falling under the three criteria as shown in Table 1 were shortlisted for further study.

Table 6

A systematic shortlisting of the attires

Investigators		Criteria	Number of Shortlisted samples		
Architects (10-point scale)		Scores > 7.4	Forty-nine		
Technocrats (4 points Likert scale)	Likert scale	The overall impression score on a 10-point scale converted to a four-point scale is N (N>3)	Thirty-eight	Nineteen attires	Twelve attires were shortlisted for further study (Appendix A)
		N-1, N, N+1 where N is the base score	Twenty-nine		
		Number of 'strongly agree' occurrences greater or equal to 5 times	Twenty-six		
Fashion design students (5 points Likert scale)		Cumulative score >71	Thirty-four		

The attires falling under all the five criteria portray that the translation and transformation of ideas from architecture to fashion design involves an amalgamation of representations. Such attires are easily interpreted by the observers with diverse backgrounds as mapped in Figure 1. It is observed that 'mono color' has been observed as a thread connecting both domains. Besides, 'spatial cells', 'structural', and 'decorative' are the aspects that played significant roles in exhibiting a strong relationship with architecture.

Figure 1

Interpreting the emergent outcomes from diverse perspectives

Literal translation or interpretation' and 'metaphors' as put forth by Antoniades (1990) are adopted to classify the emergent outcomes in the fashion domain. The grammar integrating the architectural projects from which the inspirations were drawn by the fashion designers is

mapped as shown in Figure 1. Based on the degree of content translated from architecture to fashion, the attires are classified as 'well, partially, and rarely' interpreted.
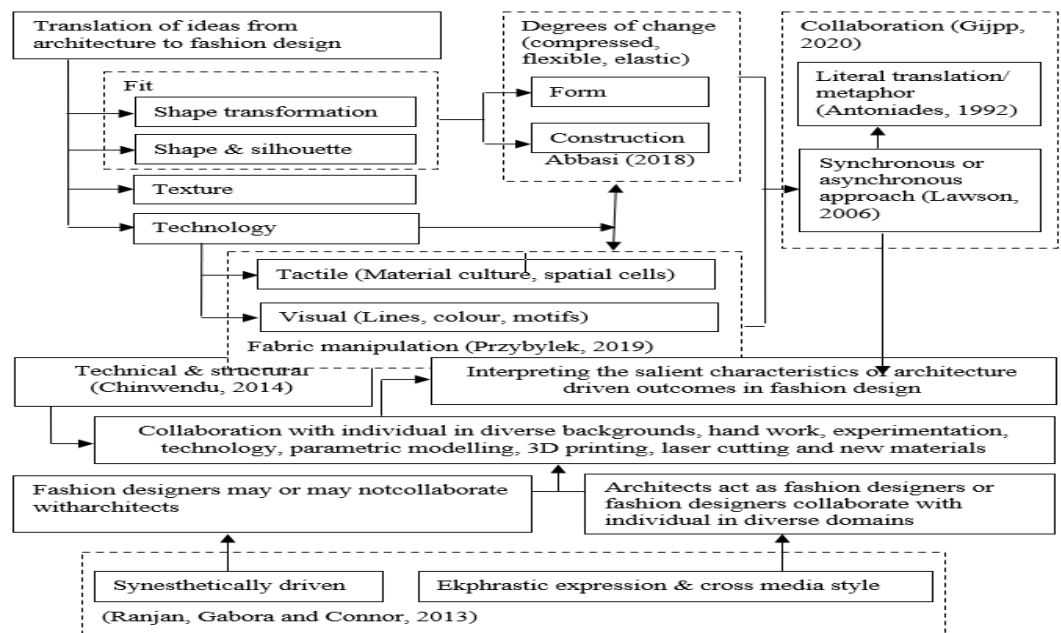
The attires falling under N>3 and either any one code is 'partially interpreted' by the authors. Architects rated nearly 43.5% of attires with scores greater than three on a four-point scale falling under two categories 'literal translation' and 'metaphor.' Even though these attires were observed to be rich in architectural grammar, attires falling under 'literal translation' are easily distinguished. Besides, an attire designed by Iris Van Herpen, a fashion designer who is identified to exhibit a strong relationship with a building by the skilled assessors was explored further.

Among the nineteen attires that were identified to display strong relationships by the skilled assessors, twelve were observed to fall under all four codes as shown in Table 6. Among these ten, two outfits were designed by fashion designer Iris Van Herpen and architect Viktoria Lytra. The attires designed by drawing inspiration from 'Sagrada Familia' and 'Yas Viceroy Hotel' were designed by Herpen. The attires were designed with inspirations from 'Al Bahr Towers,' 'Reggio Emilia train station' and "MuCEM" which were designed by Lytra. The works of Viktoria Lytra pursue 'form follows fashion' driven by technology that investigates the common purpose of architecture and fashion, shelter the human body with a thrust on aesthetics to design clothes and buildings.

3.7. Translation of ideas from architecture to fashion design

The authors associated the decoded parameters with 'degrees of change' as put forth by Reinhardt (2007). These include 'compressed', 'flexible', and 'elastic' that are associated with 'an automatically programmed surface, with a directional texture flow, fixed seams, and specific dimensions', 'gravitational clothing', and 'dynamic change system' respectively as in Figure 2. 'Texture' is further classified as 'tactile' and 'visual'. Tactile texture is interpreted to revolve around 'material culture' and 'spatial cells', whereas the 'visual texture' addresses 'line both tactile, intangible as well as tangible; colors and motifs' identified as 'fabric manipulation'.

Figure 2

Decoding the Influences of 3D skins in 2D skins

From Table 4, it is observed that designers have adopted a variety of strategies to translate the ideas inspired by buildings while designing attires. 'Form', 'construction', and 'texture' in architecture and effective translation to fashion concerning shape transformation, silhouette,

motifs, colors and fit have played significant roles. Besides, collaboration and the need to experiment with technology, materials, and manufacturing techniques play significant roles in creating unique attires.

4. Discussion

From the literature survey, the parameters defining the relationship are identified as 'shape and silhouette, motifs and texture, color, fits and transformation'. The parameter 'fit' was added as a parameter determined by both 'shape transformation' as well as 'shape and silhouette'. Besides, the 'cathedral dress' designed by Iris Van Herpen which was recognized to display a strong relationship with Sagrada Familia, the basilica designed by Gaudi by the assessors was selected to decode the characteristics qualitatively from an architect's as well as the fashion designer's perspectives (Ana Vasiljevic, n.d.). Finally, the authors related Wong's principles (1993) that revolve around the 'conceptual, relational, constructional and practical elements' with the 'basics of fashion designs' to develop a 'relationship model' as represented in Table 7.

Table 7
Integrating Wong's design principles and design elements in 2D skins

Principles of form and design: 2D and 3D designs (Wong, 1993)		Design elements in 2D skins			
		Shape /Silhouette	Form/fit (Reinhardt, 2007)	Texture (Gong & Shin, 2013)	
				Visual	Tactile
Conceptual elements	Point	Transforming shapes from a specific building in designing attires (Prats, Lim, Jowers, Garner & Chase, 2009)		Lines (Cinar, 2017); Geometry, natural, abstract, stylized, conventional (Koester, 1993)	Spatial cells (Wong, 1993) – New materials, Material manipulation techniques, 3D Printing, futuristic
	Line				
	Plane				
	Volume				
Visual elements	Shape				
	Size	Concerning physique			
	Color	Visual texture (Hue, value, intensity, color schemes) →			
	Texture	Skin + Bones			
Relational elements	Position				
	Direction				
	Space	Tight, partly tight, partly rigid and tight, partly rigid and loose, partly rigid and optimum (Reinhardt, 2007)			
	Gravity				
Constructional elements	Vertex				
	Edge				
	Face				
Architecture and fashion: Shelter, geometry, structural skin, construction volume identity, tectonic strategies, wrapping, pleating, printing, folding, and synthesis (Lobo, 2012)					

The translation of the parameters from architecture to fashion design is coded to interpret whether the process is 'synchronous' or 'asynchronous' (Lawson, 2006). When ideas drawn from architecture are manifested in 2D skins through collaboration with individuals from diverse backgrounds, it is identified to be a 'synchronous approach' whereas attires that are designed without collaboration, are observed to be 'asynchronous' as shown in Figure 3.
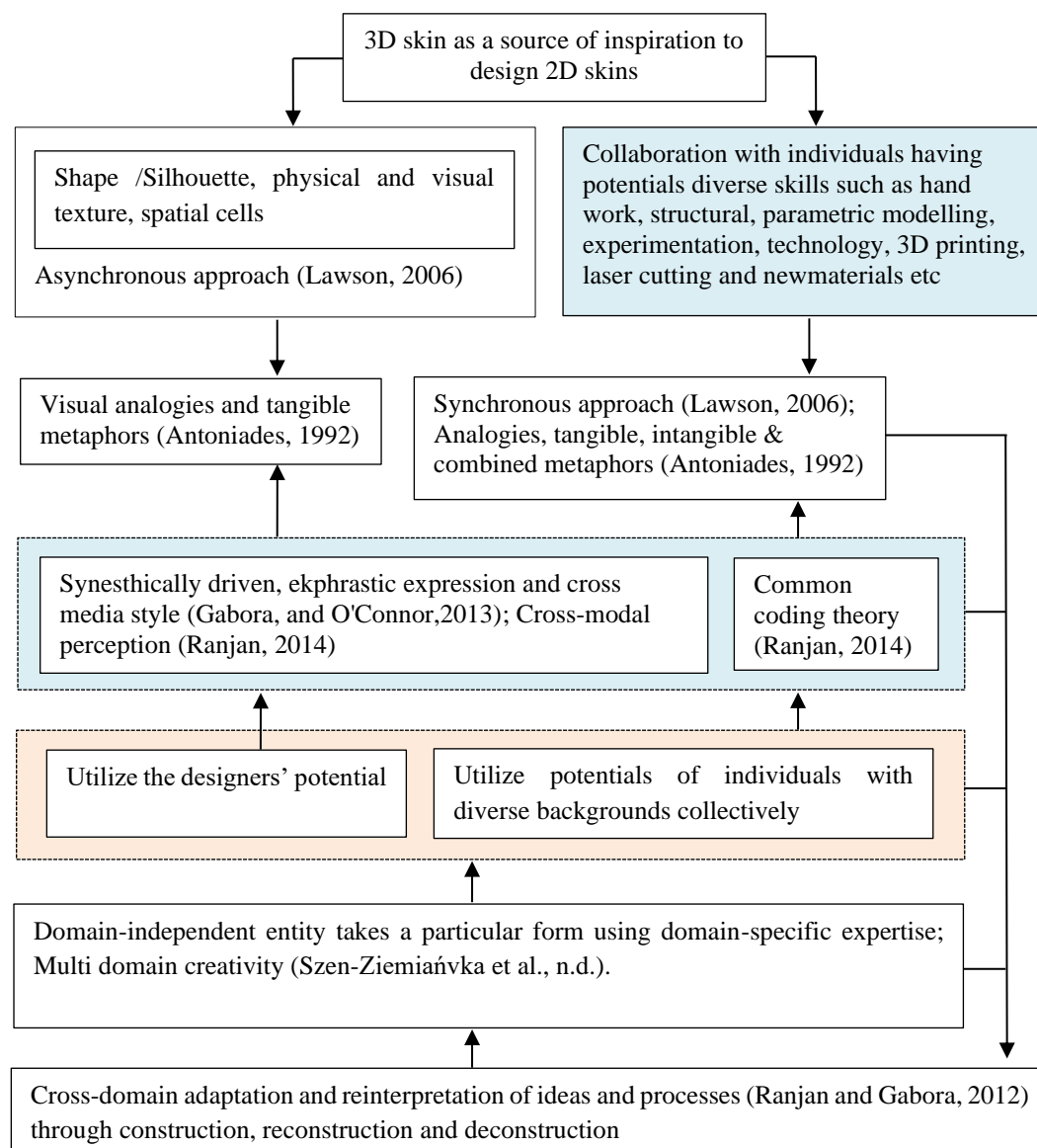
With the qualitative and quantitative findings, the authors have interpreted the 'relationship model' to extend beyond Wong's three-dimensional principles and the basics of fashion as in Table 5. It is observed that elements and principles of design drawn from architecture collide, conflate, and layer, and take shape in fashion through collaboration, technology that includes

parametric modeling, 3D printing, laser cutting techniques, and experimentation with materials. Iris van Herpen produces a post-human style of in-betweenness, by merging art, fashion, and technology which encounters between craftsmanship and technology, between the organic and inorganic, and between materiality and immateriality (Lawason, 2006; Smelik, 2020).

Collaborations with experts in diverse domains, hand work, parametric modeling, experimentation, technology, 3D printing, laser cutting, and new materials play a significant role in the fashion domain. This paves the direction to study the design process from the fashion designers' perspectives while translating and transforming the ideas drawn from 'architecture' in fashion. This study highlights the need to think beyond 'architecture and fashion' where 'collaboration, technology, experimentation and new materials play significant roles.

Figure 3

Interpreting the cross-domain creativity: Architecture and fashion

The outcomes are interpreted to be an 'ekphrastic expression' translating art from one medium into another as well as a 'cross-media style' where cross-domain re-interpretation is common. The outfits designed by fashion designer Iris Van Herpen are the outcomes of collaboration with experts in diverse domains such as architects, scientists, photographers, experimentation, manufacturing technology, and new materials with a thrust on 'multi-domain

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creativity' (Szen-Ziemiańvka et al., n.d.) and 'shared design process.' The emergent outcomes are observed to be synchronous as this involves collaborative actions amongst individuals with diverse backgrounds as in Figure 3. The study is limited to the samples identified based on a framed criterion and shared views. The study needs to be extended to investigate the design of 2D skins by drawing influences from 3D skins by looking through the lenses of fashion designers.

5. Conclusion

According to the authors, the contribution of this study is very minimal and numerous studies need to be conducted integrating other domains to construct thick descriptions. To comprehend 'cross-domain creativity,' the study shall be extended to other domains such as 'paintings and fashion,' 'music and fashion,' 'dance and fashion' 'nature and fashion', 'movies and fashion,' 'puzzles and fashion,' 'origami and fashion,' 'upcycling and fashion,' 'architecture and accessories in fashion design,' materials 'sculpture and fashion,' 'technology and fashion' that revolves around manufacturing techniques, parametric modeling, new materials. The role of intangible sources of inspiration in fashion shall also be explored to comprehend synchronous and asynchronous approaches, specific to cross-domain creativity.

Moving away from fashion, the relationship between architecture and other related domains such as paintings, sculpture, dance, movies, music, literature, puzzles, computational modeling, and technology shall also be studied. Besides, cross-domain influences of puzzles in product design; and music in sculpture to name a few shall be explored to construct knowledge from diverse perspectives to understand, interpret, and investigate 'synesthesia,' 'ekphrastic expression,' ' cross-media style' and 'cross-modal perception.'

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Appendix A

Building	Fashion designer	Architecture driven manifestations in fashion	Building	Fashion designer	Architecture driven manifestations in fashion
Sagrada Familia	Iris Van Harpen		Gothic architecture	Jean Paul Gaultier	
Outline /Structural & decorative/ brown/ spatial cells			Outline, change transformation & substitute / Decorative/ gold/ spatial cells		
Yas Viceroy Hotel	Iris Van Harpen		Ragnitzstraße Housing	Serkan Cura	
Outline & add /Structural & decorative/ black and translucent/ spatial cells			Outline / Structural/ Brown & white/ Tactile lines		
Reggio Emilia train station	Kamila Garwroska		Yokohama Terminal	Horsting& Snoeren	
	Outline/ Structural/ white /tactile lines		Outline & add / Structural/black and white/ spatial cells		
	Victoria Litra		MuCEM	Victoria Litra	
	Outline, change transformation & add / Structural/ white/ tactile lines		Outline, add &change transformation / Decorative/white & black/ tactile motifs		
Church of Our Saviour	Jill Sherman		Health Department	Victoria Lytra	
Outline / Decorative/black/intangible lines			Outline /Structural/pale brown/tactile lines		
Heikenji Temple	Marchesa		King Fahad Library	Verschueren	
Outline & substitute / Decorative/ red/ tactile lines			Outline/ Decorative / Pastel / Spatial cells		