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DESIRABLE IMPACT

An exploration of how design for desirability can enhance a forecast snowboarding safety product.

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Abstract

Title: Desirable Impact

An exploration of how design for desirability can enhance a forecast snowboarding safety product.

With origins in skateboard and surfing culture, snowboarding has grown to become a mainstream recreational and professional sport, officially recognized in the Olympic Games. This popularity can be attributed to several factors, including the sub-culture of rebellion and self-expression it embodies and the daring, dynamic aerial maneuvers and stunts often portrayed in the media. However, the sport also exposes participants to a well-documented injury pattern, with injuries rates typically twice as frequent as those seen in skiing. While a number of studies have shown existing snowboarding safety products reduce the risk of injury, these readily available products are not widely used among participants who view them as “uncool” and “unnecessary”.

Exploring how affective features and attributes can improve the desirability of a forecast snowboarding personal protective equipment (PPE) product, this thesis proposes that a primary requirement for these products must be desirability - to make attractive, to create a positive impression, to strengthen ones identity and engender appreciation. Responding to these emotional needs, this thesis presents a proposal for a product designed to enhance user-experience, challenging the current philosophy of safety products and their ‘uncool’ perceptions.

Keywords: *Industrial Design, Design for Desirability, Product Experience, Snowboarding, Personal Protective Equipment.*

Contents

Page

Figure List

1.0 Introduction	1	6.0 Design Criteria	78
		6.1 Experiential Criteria	78
2.0 Research Aim	2	6.2 Performance Criteria	79
2.1 Research Objectives	2	7.0 'Research Through Design'	81
2.2 Central Proposition and Project Scope	2	7.1 'Research Through Design' Methods	82
3.0 Research Approach	2	7.2 Concept Development	83
3.1 Research Methods	4	7.3 Design Outcome	116
3.1.1 Literature & Context Review		8.0 Design Evaluation	116
3.1.2 Questionnaire		8.1 Experiential Criteria	117
3.1.3 Immersive Research		8.2 Performance Criteria	122
3.1.4 Research Through Design		9.0 Conclusion	124
4.0 Literature and Context Review	6	10.0 Reference List	126
4.1 Snowboarding	6	11.0 Figure Index	128
4.1.1 Snowboarding Evolution: A Visual History		12.0 Bibliography	140
4.1.2 Injury Patterns		13.0 Appendix	142
4.1.3 Personal Protective Equipment		'Perceptual Product Experience' Framework	
4.2 Design Theory	20	User Questionnaire	
4.2.1 Contemporary Theory on Design for Desirability		Declaration of Originality	
4.2.2 Product Forecasting			
4.3 Emerging Materials and Technologies	32		
4.3.1 Material Properties			
4.3.2 Integrated Electronics			
4.4 Competing Products	36		
4.5 Visual References	38		
5.0 'Research For Design'	42		
5.1 Questionnaire Results	42		
5.2 Fashion in Snowboarding	46		
5.2.1 Categories of Ornamentation			
5.2.2 Fashion Styles in Snowboarding			
5.3 Immersive Research Observations	70		
5.4 The Experience of Snowboarding	73		
5.5 Performance Requirements	74		
5.6 PPE Products Vs Snowboarding Apparel	74		

Figure List

	page		
Figure 1: <i>Research aim and objectives.</i>	3	Figure 18: <i>Shaun White training in half-pipe.</i>	11
Figure 2: <i>Objectives and corresponding research methods.</i>	5	Figure 19: <i>Shaun White at Nokia Air-Style Competition.</i>	11
Figure 3: <i>Tom Sims.</i>	7	Figure 20: <i>Cover of Rolling Stone magazine featuring Shaun White.</i>	11
Figure 4: <i>Tom Sims and team.</i>	7	Figure 21: <i>Burton Audex helmet.</i>	11
Figure 5: <i>Tim Sims on slalom competition event.</i>	7	Figure 22: <i>Danny Kass, inspiration behind the Audex helmet.</i>	11
Figure 6: <i>Sims rider Craig Kelly at the World Snowboarding Championships in 1987.</i>	7	Figure 23: <i>Crossover of computer games and snowboarding.</i>	12
Figure 7: <i>Tahoe City half pipe in 1983.</i>	8	Figure 24: <i>Shaun White snowboarding game cover.</i>	12
Figure 8: <i>Tom Sander in 1998.</i>	8	Figure 25: <i>Luke Skywalker from Star Wars.</i>	12
Figure 9: <i>Tom Burt in 1989.</i>	8	Figure 26: <i>Adidas Skywalker sneaker.</i>	12
Figure 10: <i>Peter Line.</i>	9	Figure 27: <i>Big-Jump tricks applied to natural mountain runs.</i>	13
Figure 11: <i>Example of baggy pants trend.</i>	9	Figure 28: <i>Comparison of injury patterns.</i>	16
Figure 12: <i>Example of grunge influence in magazine advertising.</i>	9	Figure 29: <i>Common serious injury patterns among snowboarders.</i>	17
Figure 13: <i>Peter Line jibbing a park rail in 1996.</i>	9	Figure 30: <i>Examples of new apparel for 2009.</i>	20
Figure 14: <i>Nokia air-style competition.</i>	10	Figure 31: <i>Existing personal protective equipment (PPE) products.</i>	21
Figure 15: <i>Tina Basich at competition in 1995.</i>	10	Figure 32: <i>The multi-modal product experience.</i>	23
Figure 16: <i>Danny Kass on podium at Burton 2009 US Open Snowboarding Competition.</i>	10	Figure 33: <i>Sensory sub-components.</i>	24
Figure 17: <i>Terje White Harkonnen half-pipe in competition.</i>	10	Figure 34: <i>Cognitive sub-components.</i>	24
		Figure 35: <i>Affective sub-components.</i>	25
		Figure 36: <i>Apple iPod Touch.</i>	26

Figure 37: <i>Sub-components of the Experience.</i>	28	Figure 55: <i>Head ski-suit.</i>	36
Figure 38: <i>Categories of concept products.</i>	31	Figure 56: <i>Spyder Race Suit for the US ski-team.</i>	36
Figure 39: <i>D30 impact material.</i>	32	Figure 57: <i>Schoffel Protector S2 jacket.</i>	37
Figure 40: <i>DowCorning's Active Protection system fabric and molecular diagram.</i>	32	Figure 58: <i>Burton/Motorola Audex jacket.</i>	37
Figure 41: <i>Philips Bubelle dress illuminated.</i>	33	Figure 59: <i>Pop-culture influences.</i>	38
Figure 42: <i>Philips Bubelle dress illuminated.</i>	33	Figure 60: <i>Martial influences.</i>	39
Figure 43: <i>Philips Frission dress .</i>	33	Figure 61: <i>Historical armour design.</i>	39
Figure 44: <i>Philips Lumalive.</i>	33	Figure 62: <i>Science-fiction armour design.</i>	40
Figure 45: <i>Hussein Chalayan dress basic configuration, from Airborne collection.</i>	34	Figure 63: <i>High-tech suits.</i>	40
Figure 46: <i>Hussein Chalayan dress activated.</i>	34	Figure 64: <i>Performance sports products.</i>	41
Figure 47: <i>Hussein Chalayan video dress screen capture.</i>	34	Figure 65: <i>Sports PPE products.</i>	41
Figure 48 and 49: <i>Video dress from Hussein Chalayan's 2007 Airborne collection.</i>	34	Figure 66: <i>Red (Burton) 'Hi-Fi' helmet.</i>	42
Figure 50: <i>Example of active camouflage in Fallout 3 computer game.</i>	35	Figure 67: <i>Giro Audio helmet.</i>	43
Figure 51: <i>Screen shot showing the predators active camouflage in movie.</i>	35	Figure 68: <i>Burton 'Mutiny' helmet.</i>	43
Figure 52: <i>Screenshot from Ultraviolet movie showing colour-change fabric.</i>	35	Figure 69: <i>POC helmet.</i>	44
Figure 53: <i>Burton (RED) and Skullcandy Earpads jacket.</i>	36	Figure 70: <i>Burton Audex padded hat.</i>	44
Figure 54: <i>Willy Bogner's ski-suit.</i>	36	Figure 71: <i>POC helmet and iF design-award winning back protector.</i>	45
		Figure 72: <i>RED (Burton) Hi-Fi and Burton 'Mutiny' helmet.</i>	45
		Figure 73: <i>Analysis of snowboarding apparel.</i>	47

Figure 74: <i>Comparison of snowboarding jackets.</i>	48	Figure 95: <i>Snowboarders falling.</i>	72
Figure 75: <i>Scale of ornamentation.</i>	49	Figure 96: <i>Typical snowboarding activities.</i>	73
Figure 76: <i>Scale of ornamentation, with associated sports over-laid.</i>	50	Figure 97: <i>Analysis of professional rider while jumping.</i>	74
Figure 77: <i>Scale of ornamentation, with ornamentation analysis.</i>	51	Figure 98: <i>Snowboarding PPE Products.</i>	76
Figure 78: <i>Examples of bold or flamboyant patterning.</i>	52	Figure 99: <i>Snowboarding Products.</i>	76
Figure 79: <i>Examples of asymmetrical design.</i>	53	Figure 100: <i>Overview of 'research through design' process.</i>	81
Figure 80: <i>Examples of non-functional detailing.</i>	54	Figure 101: <i>Timeline of 'research through design' process.</i>	82
Figure 81: <i>Examples of accentuated closures.</i>	55	<i>Following sketches and photographs created by author unless otherwise stated.</i>	
Figure 82: <i>Oakley jacket advertising, circa 1997.</i>	56	Figure 102: <i>Suit animation concepts.</i>	111
Figure 83: <i>Outerwear, circa 1997.</i>	56		
Figure 84: <i>Higher level of ornamentation.</i>	57		
Figure 85: <i>Style-board description.</i>	59		
Figure 86: <i>Contemporary Grunge.</i>	61		
Figure 87: <i>Visual Noise.</i>	63		
Figure 88: <i>Future Tech.</i>	65		
Figure 89: <i>Luxury.</i>	67		
Figure 90: <i>Riding the Chairlift, Turoa Skifield 2009.</i>	70		
Figure 91: <i>Snowboarder jumping in terrain-park.</i>	70		
Figure 92: <i>Riders on chairlift.</i>	71		
Figure 93 & 94: <i>Riders wearing backpack and camelpack.</i>	71		

Future Scenario

Five-time world snowboarding champion, Ben White is feeling confident as he slides up to the drop zone, the raised pad where his run will begin momentarily. Beneath him, the half pipe is epic, a gouge running for half a kilometre down the landscape, lined with the thousands of spectators who have come to view the event. Like the cargo hold of some crashed spacecraft buried beneath the frozen tundra, the megalithic structure bears little resemblance to the snow covered ditches he learned to jump on as a child.

Getting in the zone for his run, he clips the large buckles at the front of his suit enjoying the clunk of the mechanism and the reassuring feeling of the protective armour embracing his back and shoulders. Sensing its activation, the suits armour momentarily hardens, simulating its impact mode, before relaxing again to allow for maximum mobility in the run. Pulling his long dark hair within the hood, Ben draws his goggles down over his face and clips his suits mask up over his chin. With his identity completely obscured, Ben flicks through the suits themes on his wrist, loading his personal avatar, an image synonymous with the rider. Glancing down at his chest Ben watches the suits white material begin to transform, with droplets of black ink randomly drifting outward, deforming into psychedelic ink blot patterns enveloping the entire suit. Far below, the crowd recognizes the famous avatar of the reigning champion and begins to chant "White, White, White". Raising his arms in victorious response, the young rider hops his board towards the edge and drops into space...

1.0 Introduction

With origins in skateboard and surfing culture, snowboarding has grown to become a mainstream recreational and professional sport, officially recognized in the Olympic Games. This popularity can be attributed to several factors, including the sub-culture of rebellion and self-expression it embodies and the daring, dynamic aerial maneuvers and stunts often portrayed in the media. However the sport also exposes participants to a well-documented injury pattern, with injuries rates typically twice as frequent as those seen in skiing (Bladin, McCrory, & Pogorzelski 2004).

In contrast to this statistic, a number of studies have shown existing snowboarding personal protective equipment or PPE to be highly effective at reduce such injuries (Bladin, et al., 2004, Sulheim, Ekeland, & Bahr., 2005). For example, one study estimated that snowboarders wearing wrist guards are three-times less likely to sustain a wrist injury (Bladin, et al., 2004). Another examined the effectiveness of helmets and found riders wearing them to be 60% less likely to receive a head injury (Sulheim, et al., 2005). However, among participants of this rebellious, image-conscious recreational sport, these PPE products are often considered “uncool” and “unnecessary” (Cassell, Clapperton, Aroni, Ashby, & Sawyer, 2005, p.6). Consequently, their effectiveness does not translate into everyday use, and research suggested that less than 10% of snowboarders actually utilize such devices (Langran & Selvaraj, 2005).

To overcome these negative perceptions and encourage the use of PPE products, this thesis proposes that desirability must be a primary requirement when designing for this market - to make attractive, to create a positive impression, to strengthen ones identity and engender appreciation.

Challenging the current ‘function focused’ design philosophy of safety products and their ‘uncool’ perceptions, this thesis presents a user-experience focused design process applied in the development of a concept PPE product for snowboarders.

Utilizing qualitative research methods such as ‘product personality profiling’, immersive ‘skifield’ research and mood boards, research focused on developing an appreciation of the wants, needs and desires of this unique sub-culture. Based on this understanding, Warell’s (2008) perceptual-product-experience framework was utilized, providing a structure for defining experiential design criteria which could add desirability to PPE products.

With this foundation, the study utilized creative research-through-design methods such as concept sketching, digital painting and fabric prototyping as a means to explore affective features and attributes, drawing inspiration from industrial design, fashion design and science fiction.

The design outcome represents a design-probe, a forecasted concept product exploring emerging materials and technologies to reinterpret the PPE product genre and challenge the negative perceptions. Addressing this need presents a means of minimizing injuries, while enhancing the experience and visual culture of snowboarding.

2.0 Research Aim

To explore how affective or experiential features and attributes can improve the desirability of forecasted Personal Protective Equipment, (PPE) product for snowboarding.

2.1 Research Objectives

The project aim was broken down into five research objectives, each with corresponding research questions as presented in figure 1. These questions are later used to define the research methods presented in section 3.1.

2.2 Central Proposition and Project Scope

This research proposes that the main barrier to the voluntary acceptance of PPE products is not their performance as a protective device, but the negative perceptions of these products among end users, who often view them as “uncool” and “unnecessary” (Cassell, et al., 2005, p. 6).

This study brings together elements of industrial design, fashion design and science fiction to present a forecasting product proposal as an alternative to an existing PPE product or products. This prototype will be completed to aesthetic prototype level, with true materials and technologies substituted or simulated where necessary. From a commercial perspective, this research should be considered an ‘image building’ or ‘future vision’ exercise, conducted to explore emergent technologies, gain market feedback and reinforce brand image.

It should be noted that the outcome of this forecasting study is not intended to be utilized for real-world ‘crash testing’, nor is the outcome intending to meet requirements of established PPE product standards. Previous comprehensive studies into the effectiveness of personal protective equipment for snowboarding have been conducted, and these will be referenced where relevant.

3.0 Research Approach

Research in this project has been split into two sections:

- Research For Design
- Research Through Design

The first section is primarily involved in developing a holistic appreciation of snowboarding’s sub-culture, identifying latent needs and desires, and scouting new materials and stylistic influences. In addition, this section generated a number of design criteria, which subsequent concepts could be measured against. The second phase utilized the creative practice of ‘research through design’ to generate and refine concepts in response to these design criteria.

The design philosophy of existing safety products appears to focus on the utilitarian and performance functions (refer section 4.2.1). Breaking from this convention, this project is led by design initiative: exploring new features and attributes improving the desirability of PPE products. Consequently, user feedback and market research is considered as a starting point, rather than a core-component of the design process. According to Ravasi and Lojacono (2005) this approach can prevent the designer stifling their creativity in trying to “...conform with existing product categories, features and expressed customers wants” (p.59).

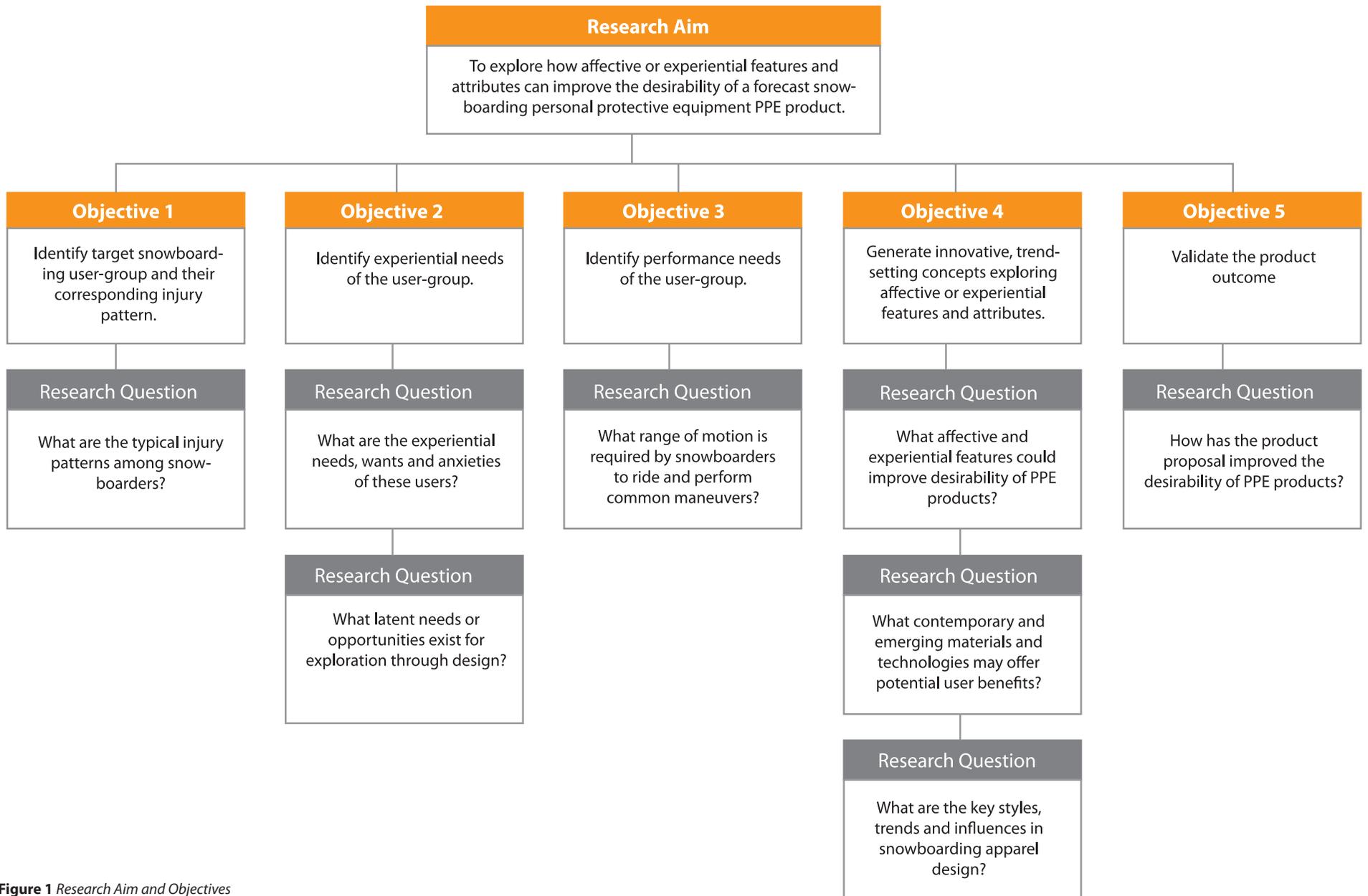


Figure 1 Research Aim and Objectives

3.1 Research Methods

Figure 2 presents a flow chart of the research process followed during this study. The eight research questions from figure 1 are presented along the top. Correlating research methods have then been split into data collection and analysis methods, with expected outcomes presented along the bottom. This flow chart presents an overview of the process, with research methods covered in greater detail in the following sections.

3.1.1 Literature & Context Review

This research covered four main categories:

- **Snowboarding Culture:** This research began with a review of a *New Zealand Snowboarder* magazine for each year going back to its founding in 1994, identifying qualitative data including fashion trends, underlying themes and outside influences. To observe international trends, the US based *Transworld Snowboarding* and Australian *Transfer* magazines were referred to. Several books examining snowboarding culture were also heavily referenced, including *Amped* (Browne, 2004) and *The Way of the Snowboarder* (Reed, 2005).
- **Sports Medicine:** Focused on clinical studies into snowboarding injury patterns and the effectiveness of PPE equipment, this section provided quantitative data in support of this projects central proposition. A number of studies were reviewed and are covered in section 4.1.2.
- **Design Theory:** Examining contemporary theory on design for desirability and user experience, this research was predominantly article and book based, with work by Warrell (2008) highly influential.
- **Products and Materials:** This section examined emerging 'smart' materials and technologies and current applications as a source of inspiration. Given the rapid development of this field, the most relevant research came from periodical articles such as *Haut Tech* (Jordan, 2008) and online sources such as D30's website (2009).

The findings from this literature and context review can be found in section 4.0, divided by topic.

3.1.2 Questionnaire

The objective of this research was to gain an appreciation of user perceptions regarding PPE products and styles. To achieve this objective, a questionnaire was structured to elicit qualitative data regarding:

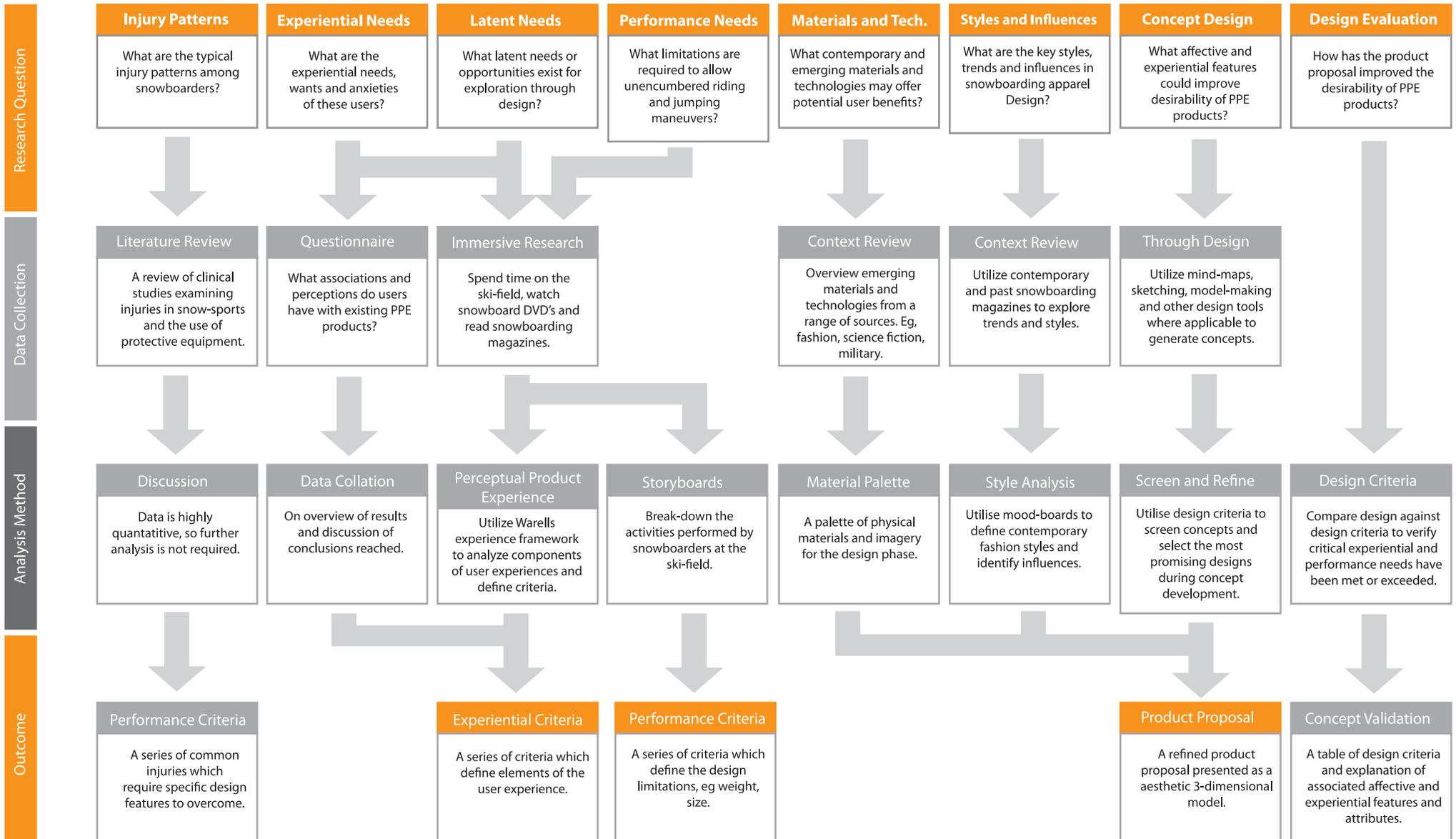
- Perceived values when choosing a PPE product
- User associations with a range of PPE aesthetic styles

A core component of the questionnaire was a product personality profiling exercise similar to that presented in the paper new product development by eliciting user experience and aspirations, by Bruseberg and McDonagh-Philip (2001). This exercise "helps to uncover social value systems and emotional responses to products" (Bruseberg and McDonagh-Philip, 2001, p.441) by asking users to describe who they perceive the user of each product to be. Five snow-sport helmets with visually unique aesthetic styles were selected for this exercise, with participants asked the following questions about each:

- What age would the wearer of this helmet be?
- Would the helmet be work by a male, females or either?
- Would they be a Snowboarder or skier?
- Where on the ski-field would they ride (eg, jumps, or learner slopes)?
- What experience level would they have?
- What stereotypes do they associate with this helmet?
- What words do they associate with the style?

Questionnaires were handed out during a large pre-season snowboard sale-day at a mainstream sports shop (R&R Sports, Wellington), with 12 returned fully completed. The target demographic was based on previously identified injury statistics: males in their late teens and early 20's. Results from this research are presented in section 5.1.

Figure 2 Objectives and Corresponding Research Methods



3.1.3 Immersive Research

This method immersed the researcher in elements of the snowboarding culture and sought to answer the following questions:

- What are the experiential needs, wants and anxieties of these users?
- What latent needs or opportunities exist for exploration through design?
- What limitations are required to allow unencumbered riding and jumping?

This research was predominantly gathered on observational and participatory visits to Turoa skifield on Mt Ruapehu during October and November of the 2009 ski season.

- A notebook was used to record observations regarding user behavior, observed fashion styles, potential latent user needs and other design opportunities.
- Photography also supplemented these observations, particularly fashion styles and user behaviour and provide visual references for the design phase.

In addition, the experience of being on the skifield among other riders, talking with them while riding the lifts and learning to snowboard helped the researcher gain an appreciation for other qualitative needs. Results from this research are presented in section 5.1.

3.1.4 Research Through Design

The creative component of this research was generated through-design related activities, which are discussed in depth in section 7.0 'Research Through Design'.

4.0 Literature and Context Review

This section presents the findings from the literature and context review split into sections by topic, as covered in section 3.1.1.

4.1 Snowboarding

The following sections investigate several themes to develop an understanding of the relevant literature and context, providing a basis for further research.

4.1.1 Snowboarding Evolution: A Visual History

4.1.2 Injury Patterns

4.1.3 Personal Protective Equipment (PPE)

4.1.1 Snowboarding Evolution: A Visual History

To gain an understanding of the sport and culture, past and contemporary snowboarding literature was reviewed. Presented in chronological order, this research highlights a number of core values which have shaped snowboarding, as well as areas of influence which may be referenced for design inspiration.

Origins

Originally conceived as a children's toy in 1965, the snowboard was adopted by surfers and skateboarders of Generation-X during the mid 1970s post-war movement. Placing an emphasis on self-expression and anti-establishment ideals, this movement was instrumental in shaping the foundations of snowboarding sub-culture, which developed alongside skateboarding, punk rock, hip-hop and brakedancing (Gargiulo, 2004).

“Snowboarding pioneers adopted a position outside the existing frame-work of winter sports to foster the growth of their sports as they saw fit.”

(Reed, 2005, p.22)

This culture and the freedom these sports encouraged were a revelation for youths who had grown up with team sports and the rules, uniforms and schedules they demanded (Browne, 2004). Board-sports allowed them to define themselves through their “...maneuvers, routines, clothing and even the stickers slapped onto their boards.” (Browne, 2004, p.2).



Top Left: **Figure 3** Tom Sims and team

Top Right: **Figure 4** Tom Sims

Centre Left: **Figure 5** Tom Sims on slalom competition event

Bottom: **Figure 6** Sims rider Craig Kelly at the World Snowboarding Championships in 1987

Freestyle

Before the 1980's snowboarding had consisted of downhill and slalom riding similar to skiing, but the discovery of a natural half-pipe formation in Tahoe, California revolutionized the sport with the invention of free-style (Reed, 2005). "The dynamic movements of vert-skateboarding met the snow and freestyle was born (with snowboarders) launching, grabbing, tweaking, and landing like skateboarders on a ramp." (Reed, 2005, p.42).

The mid-1980s saw the arrival of snowboarding magazines, and several years later, the first snowboarding movies '*Western Front*' and '*Snowboarders in Exile*'. Regarding these films, Reed (2005) comments:

"The formats were loose and the soundtracks echoed snowboarding's loud, rebellious attitude. As a result, young skiers from all parts of the country, who couldn't see this type of riding first hand, converted to snowboarding in droves...(These) films function as windows into the culture of snowboarding (and allow) viewers to connect with the latest personalities, styles, destinations, and tricks" (p.112).



Top: **Figure 7** Tahoe City half-pipe in 1983

Bottom Left: **Figure 8** Tom Sander in 1998

Bottom Right: **Figure 9** Tom Burt 1989

Grunge Music and Street-Skating

The early 90's saw the arrival of grunge music which, "spawning out of the north-west, swept the nation in attitude and fashion, particularly among Generation-X" (Reed, 2005, p.140). This movement replaced neon, skiwear and headbands with earth tones, oversized clothing and beanie hats and introduced a completely new style of snowboarding. Borrowing techniques from the recent skateboarding movement of street-skating it "started, more or less, by riding fallen trees on the mountain and progressed to pedestrian handrails near the base area - anything in their path that could somehow be ridden" (Reed, 2005, p.145).

According to Browne (2004) "...rail-riding was truly the equivalent of street skating - raw, punkish, and unpretty, and practiced on suburban and city streets"(p.105). Expanding on this transformation, Howe (1998) comments:

"Much as skateboarding and surfing ended their association in the late '70s, snowboarding separated from skiing and took on the increasingly urban, aggressive attitude of skateboarding in the early 90s." (p.112)



Top Left: **Figure 10** Peter Line

Top Right: **Figure 11** Example of baggy pants trend

Bottom Left: **Figure 12** Example of grunge influence in magazine advertising

Bottom Right: **Figure 13** Peter Line jibbing a park rail in 1996

The Effect of Competition

In 1995 the Entertainment and Sports Programming Network (ESPN) launched the X-Games, a combination of action-sports and punk music, which expanded to include snowboarding in 1997 (Browne, 2004). By its third year, the X-Games had become “A pop-culture phenomenon... and had put snowboarding squarely in the sights of mainstream America” (Reed, 2005, p.91).

The effect of these competitions on the sport of snowboarding cannot be underestimated. Reed comments how “competition fuelled snowboarding’s meteoric growth from the back hills of Vermont and California to the world stage in comparatively little time and legitimized what many labeled as a passing fad” (Reed, 2005, p.92). However, competitions did not only advance the sport, but by selecting particular events based on their “pace and visual power”(Reed, 2005, p.140), they shaped the way it grew and was perceived.

One example of these influences is certainly the advancement of jumping, both in the ‘half-pipe’ and ‘big-jump’ sections. The early half-pipes were little more than snow covered ditches, but by 2000 the half-pipe had become a ‘super-pipe’ – a 100m long half-pipe with 5m high walls (U.S. Open, 2009). The Olympic standard ‘pipe’ is now even larger, with walls almost 7 metres high, allowing greater air-time and more complex maneuvers than ever before.



Top : **Figure 14** Nokia Air-Style competition

Centre Left: **Figure 15** Tina Basich at competition in 1995

Bottom Left: **Figure 16** Danny Kass on podium at Burton 2009 US Open snowboarding competition

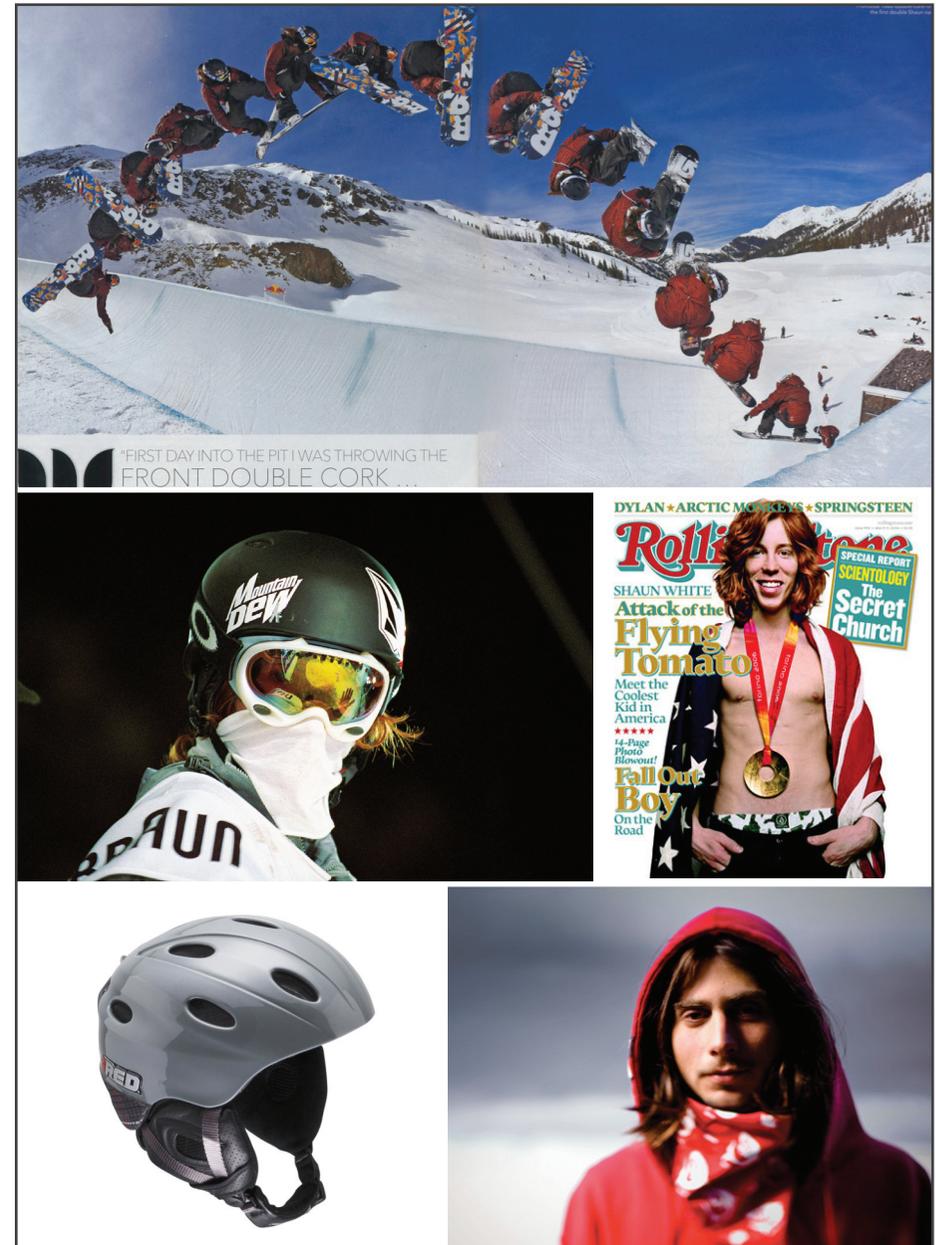
Bottom Right: **Figure 17** Terje White Harkonnen half-pipe in competition

The Rise of the Snowboarding Superstars

This research would be incomplete without considering the influence of the few riders who have risen to stardom and had a great influence on the sport. One example is Danny Kass, a rider from Southern California “with a wise-ass reputation and ultra-hip image” (Reed, 2005, p.125) who won two Olympic Silver medals for halfpipe and numerous US open and X-Games championships. According to Reed(2005), Kass “popularised wearing DJ-style headphones while riding” (p.125), a style that was soon incorporated in the successful Burton Audex helmet, shown in figure 21.

More recently, Shaun White “the prodigy-turned-snowboarding-superstar” (Reed, 2005, p.170) has risen to fame after winning a gold in the halfpipe at the 2006 winter olympics, as well as ten gold X-Games medals in both snowboarding and skateboarding. On his appearance Reed (2005) comments “Shaun White is the guy with the mask tucked snugly under his Oakley goggles like a futuristic gunslinger” (p.170), a unique look which has become synonymous with the rider. See figure 19.

In 2009, White became the first rider to utilize a gymnastics-style foam pit to practice complex aerial maneuvers on a custom-built half-pipe, a move highlighting an omnipresent desire to perform larger, more complex jumps.



Top: **Figure 18** Shaun White training on half-pipe

Centre Left: **Figure 19** Shaun White at Nokia Air-Style competition

Centre Right: **Figure 20** Cover of Rolling Stone featuring Shaun White

Bottom Left: **Figure 21** Burton Audex helmet

Bottom Right: **Figure 22** Danny Kass, inspiration for the Audex helmet

The crossover between Pop-Culture and Board-sports

The first record of the influence of the crossover between pop-culture and board sports was the immortalization of X-Games skating legend Tony Hawk, in the computer game “*Tony Hawk Pro-Skater*” first released in 1999 (Browne, 2004). As the first widely popular game in this genre, the game is considered revolutionary and multiple editions have since been released. The success of this game has translated into snowboarding editions, including the *Shaun White Snowboarding* video game in 2008. Other evidence for this crossover lies in the graphics printed onto the boards themselves, with a number of ‘*Hammer Snowboards*’ designs circa 2002 paying homage to computer games, as illustrated in figure 23.

The latest example of this crossover is the 2009 Adidas *Star Wars* line of sneakers and ‘skateshoes’, with designs such as *Skywalker*, *Stormtrooper*, *Darth Vader* and *Yoda* referencing characters and designs from the original movies (Adidas, 2009). Figure 26 shows the *Skywalker* model, alongside its inspiration from the movies: Luke Skywalker’s X-wing flight suit figure 25.



Top Left: **Figure 23** Crossover of computer games and snowboarding

Top Right: **Figure 24** Shaun White snowboarding cover

Bottom Left: **Figure 25** Luke Skywalker from Stars Wars

Bottom Right: **Figure 26** Adidas Skywalker sneaker

Current fashion

Review of mainstream contemporary snowboarding magazines (*Transworld Snowboarding*, *New Zealand Snowboarder*, et al) and movies (*The High Life & Catch the Vapour*) suggests several common trends:

- Riders are continuing to push the distance, height and complexity of jumps.
- Street-style riding in 'terrain-parks', and public places is common and still associated with a grunge image.
- Riders are incorporating 'big-jump' tricks into off-piste mountain runs, where additional avalanche risks exist.
- Fashion styles are becoming increasingly diverse, with no single overriding style prevalent.

Conclusion

This section has explored the evolution of snowboarding from its conception to present-day, developing an understanding of the influences, trends and values of this sub-culture. However, possibly the most serious trend observation is made by NZ Snowboarder writer Nick Hyne (2006, p.124):

"The size of everything in today's videos and even your local park is increasing. And so is the seriousness of injuries."



Figure 27 Big-Jump trick applied to natural mountain runs

4.1.2 Injury Patterns

Over the past fifteen years there have been numerous studies comparing injuries in snowboarding and skiing, conducted at ski fields all over the world (Donald, Chalmers, & Claude, 2005), (Riyad, 1991), (Davidson, & Lalitos, 1996), et al. The majority of these studies use 'injuries-per-1000 skiing days' as a basis for comparison. A review of previous papers claimed that results ranged from "2 to 3 injuries per 1000 skier days and 4-16 per 1000 snowboarder days" (Donald, Chalmers, & Claude, 2005, p.2) which, given the aerial nature of snowboarding, is understandable.

However, a paper claiming 16 injuries per 1000 days in snowboarders was published in 1991, and acknowledges that its data was based on estimates for the number of skiers vs snowboarders (Riyad, 1991, p.1101). Furthermore, the evolution of snowboarding since 1991 (refer to section 4.1.1) means these early statistics have questionable relevance to this study – bearing in mind that major competitions such as the X-Games weren't introduced until 1997.

Consequently, the authors research was limited to studies published within the past 10 years, to gain an understanding of the injuries caused by the most recent trends in snowboarding – freestyle and park. One of the most recent studies to compare injuries between these groups found a "general injury rate of 2.51 injuries per 1000 skier days for alpine skiing and 5.29 for snowboarding" (Llorens, Espinalt, & Vidal, 2005, p.395) suggesting snowboarders are still considerably more at risk of injury than skiers.

One paper of particular relevance to this study is Snowboarding Injuries: current trends and future directions (Bladin, et al., 2004). It suggests a strong relationship between the riders experience level and their typical injury pattern, commenting that while wrist fractures are common among beginners and younger riders, "intermediate and more experienced snowboarders, particularly men, were more likely to sustain hand, elbow and shoulder injuries" (Bladin, McCrory, & Pogorzelski, 2004, p.34). According to a study of injuries among elite snowboarders, this can be attributed to the "significant differences in riding styles between these groups" (Torjussen & Bahr, 2005, p.271).

"Elite snowboarders suffer fewer wrist fractures because of their higher skill level, increased awareness of risk situations, and falling technique learned after several years of practice (Torjussen & Bahr, 2005, p.271).

In contrast however, their "spectacular jumps, and the introduction of new tricks in the freestyle disciplines may be expected to lead to high-impact injuries"(Torjussen & Bahr, 2005, p. 375) with correlating injury patterns. In the paper *Spinal Injuries in Skiers and Snowboarders*, Tarazi, Dvorak, & Wing (1999) state "77% of snowboarding (spinal) injuries were caused by jumping" (p.180) and for clarity, defines jumping as an intentional jump over 2 metres.

The differences in injury patterns between snowboarders attempting jumping maneuvers versus the general population are significant, and highly relevant to this study. If for example, the study was to focus on reducing wrist injuries, this trend suggests it would be more relevant to target beginner snowboarders than experienced boarders where wrist injuries are rare.

To allow comparison, bar charts (fig. 28) were generated using the most recent data available. One study examined snowboarding injuries on a commercial ski field (Langran & Selvaraj, 2005), while the other looked at a snowboarding world-cup event where jumping was a major component (Torjussen and Bahr, 2006). Injury locations have been compiled into simplified regions to unify naming discrepancies between the papers, eg, tibia versus lower-leg.

There are several obvious differences between these charts:

- Elite snowboarders are far more likely to receive an injury to the lower-body, spine and shoulder.
- Wrist injuries are three times more common in on commercial ski fields.
- Head injuries are far lower among elite snowboarders.

The differences between the charts support Torjussen & Bahr’s (2006) hypothesis that experienced boarders are less likely to suffer wrist injury, but serious injuries to the spine, shoulders and lower limbs are far more prevalent. He comments,

“unsurprisingly, most of these injuries occurred in half pipe, snowboard cross, and big air” (Torjussen & Bahr 2006, p.233), which accords with the following statement by Donald, Chalmers & Claude (2005):

“The practice of jumping and doing tricks in the air whilst snowboarding will inevitably result in a proportion of these being uncontrolled with poor landings” (p.4).

Injuries and Personal Protective Equipment

Figure 29 shows the two most common injury patterns initially identified to begin concept generation. This section presents an overview of the available literature relevant to these injuries and examines the effectiveness of existing PPE products in avoiding them.

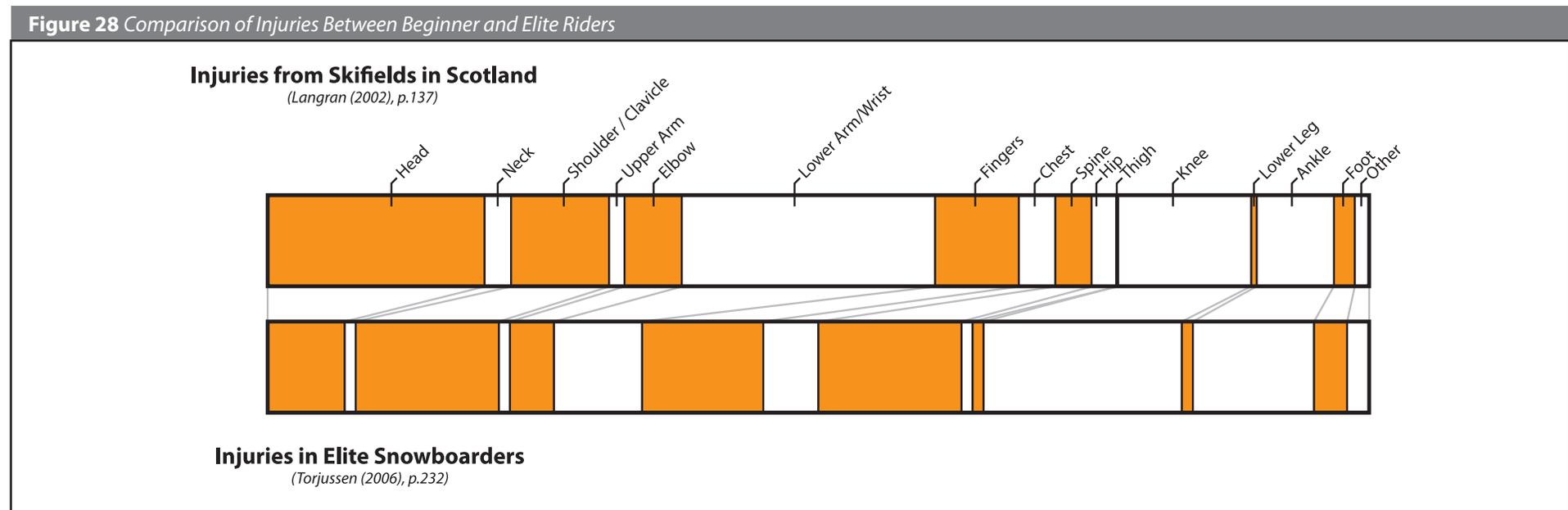
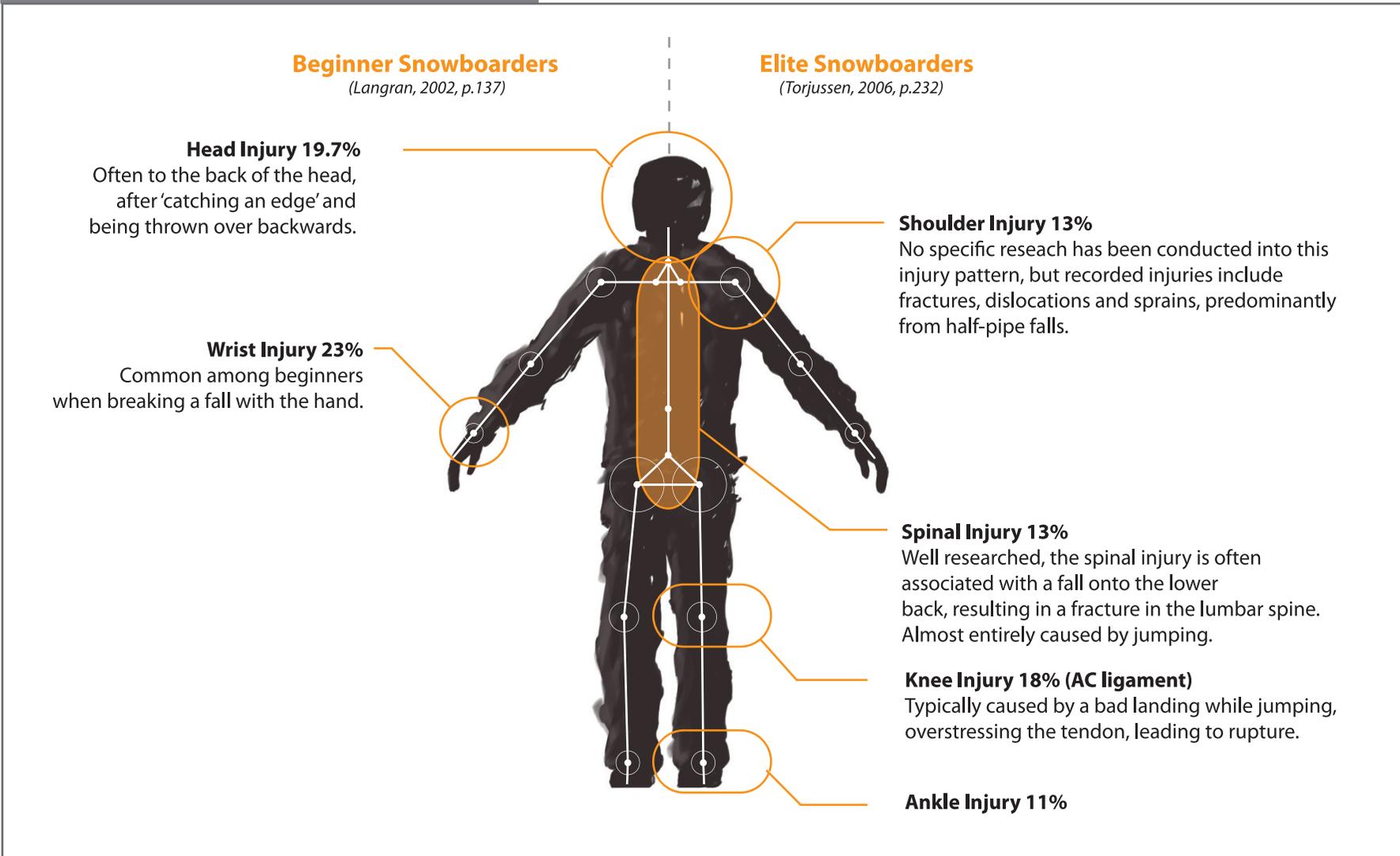


Figure 29 Serious Injury Patterns Among Snowboarders



Beginner Snowboarders

(Langran, 2002, p.137)

Elite Snowboarders

(Torjussen, 2006, p.232)

Head Injury 19.7%
Often to the back of the head, after 'catching an edge' and being thrown over backwards.

Wrist Injury 23%
Common among beginners when breaking a fall with the hand.

Shoulder Injury 13%
No specific research has been conducted into this injury pattern, but recorded injuries include fractures, dislocations and sprains, predominantly from half-pipe falls.

Spinal Injury 13%
Well researched, the spinal injury is often associated with a fall onto the lower back, resulting in a fracture in the lumbar spine. Almost entirely caused by jumping.

Knee Injury 18% (AC ligament)
Typically caused by a bad landing while jumping, oversteering the tendon, leading to rupture.

Ankle Injury 11%

Spinal Injuries

Spinal injuries are undoubtedly one of the most serious injuries facing snowboarders attempting jumps, and several studies have focused on the physiology of these injuries. These studies confirm that the earliest known spinal injury in snowboarding was in 1996, a date which correlates with findings from section 4.1.1 which showed a rise in the popularity of jumping maneuvers occurring at this time. Among modern day snowboarders, the spinal injury rates are estimated to be around 0.04 per 1000 skier days (Tarazi, et al., 1999), four times that seen in skiing. Donald, et al (2005) states the most common spinal injury – a fracture at the junction between upper and lower parts of the spine – is caused when the rider lands with their spine in a vulnerable flexed position, applying great force to the vertebrae at this point.

‘The tendency for (experienced) individuals to undertake more daring jumps, often with the hands holding the board, may result in an inability to break the fall with an outstretched extremity, with consequent transfer of the full force of the impact to the spine’

(Donald, Chalmers, & Claude, 2005, p.2).

Studies have consistently found serious spinal injuries to be more frequent among experienced, competitive snowboarders, a group who typically represent the sponsored riders and role models in the sport (Donald, et al., 2005) (Tarazi, et al., 1999).

Lower-body injury

Lower body injuries are another injury associated with jumping. The proportion of lower to upper body injuries is 1:3 on commercial slopes, but more than 1:2 among experienced snowboarders, suggesting jumping is particularly stressful for this region. Bladin (2004) comments that ‘in contrast to skiing, injuries to the lower limb, particularly the knee, are less likely in snowboarders’ (p.136), however, knee injuries are apparently still relatively common in competitive level snowboarders.

“The knee blowout is quite possibly the most talked about, feared and crippling injury an aspiring snow shredder may come across...The ACL ligament gives your knee stability and doesn’t heal itself when fully blown, meaning surgery and a solid 6 months off the snow” (Hyne, 2006, p.124).

Snowboarding related knee injuries have not been studied to the degree that spinal or wrist injuries have, suggesting that these injuries may be a recent consequence of increasingly large jumps pushing the loading limit of the anterior cruciate ligament (ACL).

Wrist Injuries

For beginners and intermediate level riders, wrist injuries are the most common injury, accounting for 22% of injuries, a 10-fold increase over skiers. (Bladin, et al., 2004). This is predominantly due to the snowboards sideways stance and fixed bindings leaving the outstretched hands to break a fall (Davidson & Lalitos, 1996). Dohjima, Sumi, Ohno, Sumi, & Shimizu (2001) expand on this explaining that “the lack of ski-poles may result in frequent falls onto a hyper extended wrist”(p.659) adding that falls onto a hand placed behind the body were found to cause twice as many fractures.

A number of brands produce wrist protectors to reduce the chances of this injury, and studies have shown that not using one “was associated with an almost 3-fold greater risk” (Bladin, McCrory, & Pogorzelski, 2004, p.134). One particular study involving 5029 snowboarders saw eight injuries in the braced group and 29 in the un-braced control group (Rønning, Rønning, Gerner, & Engebretsen, 2001). While these studies prove the effectiveness of the concept, Rønning et al (2001) point out that “the design and material properties in the brace are important factors for how much energy the brace can absorb” (p.584) with some designs reportedly protecting the wrist while causing greater injury further up the arm. Despite the effectiveness of wrist protectors in greatly reducing the risk of wrist fractures, statistics for their use remain very low. Langran & Selvaraj (2005) estimate that less than 10% of riders use wrist projectors, and among more experienced riders a questionnaire based study found that only 2% used the devices (Torjussen & Bahr, 2006).

Head Injury

Referring to figure 29, it is interesting to note the greatly reduced number of head injuries received among competitive snowboarders, despite the dynamic nature of their riding styles. According to Torjussen (2006), the most likely reason for the low number of head injuries seen in his study is the compulsory use of helmets in competitions. In comparison, recent studies at ski fields show helmet use to

be between 12.9% (Langran & Selvaraj, 2005, p.99) and 19.8% (Brugger, Walter, Fuchs, Gmünder, & Cavegn, 2005, p.100) – a very low percentage considering that snowboarders are estimated to be six times more at risk of head injury than skiers (Fukuda, Takaba, Saito, & Endo, 2001, p.440). This greater risk is predominantly due to the “opposite-edge phenomenon” where the boards edge catches ice or hard snow in a turn, throwing the rider over backwards, often landing on the back of the head (Scher, Richards, & Carhart, 2005). The actual effectiveness of helmets has been studied in a paper from Norway, with results suggesting helmets reduced the risk of head injury by 61%, a result explaining the differences seen in the charts (Sulheim, Ekeland, & Bahr, 2006, p.403)

Discussion

There are two main factors associated with snowboarding injuries:

- **The inherent risks associated with jumping**
- **The demographic**

Jumping clearly poses a high-risk for experienced snowboarders. However snowboarders consider it as an integral part of the sport and therefore unavoidable.

Another factor is the demographic of typical snowboarders receiving injuries: estimated to be about 23 and male (Franz et al., 2008), (Donald et al., 2005), (Torjussen & Bahr, 2006). In comparison, the average skier age is between 31 and 34.5 years (Donald et al., 2005), (Tarazi et al., 1999). It is widely recognized that attempts to ban jumping among this youthful demographic would likely go unnoticed, given their rebellious nature and cavalier attitude to risk-taking: one study points out that large numbers of people are already injured while riding through fenced off or out-of-bounds areas, and statistics indicate that “20% of young people ski closed runs, 60% to 70% ski through the trees at least once a day, and 75% do not use chair lift safety bars” (Tarazi, 1999, p.180)

The conclusion of one paper is that “further research needs to be directed at developing injury-prevention strategies specific to this high-risk group” (Tarazi, Dvorak, & Wing, 1999, p.180). Given snowboarders affinity for self-expressive, ‘cool’ or trend-setting gear, improving the desirability of personal protective equipment may provide a viable solution to this particular need. With many pre-established performance criteria and a defined target demographic, this niche market shows great potential for this study into improving PPE desirability.

4.1.3 Personal Protective Equipment (PPE)

The previous section showed that while personal protective equipment cannot eliminate the possibility of injury, a properly designed and fitted device greatly reduces the risk. However, the low usage suggests there are important factors restricting PPE’s widespread acceptance.

A number of studies have begun to look at the reasons that this equipment is not more widely used, with common results including “(dis)comfort, loss of freedom and ignorance of potential injury” (Brugger et al, 2005, p.100). These factors could account for the low use of these products, however, having gained an appreciation for the value that snowboarders place on individuality, this thesis proposes that perhaps the uniformity of existing products is additional challenge to their acceptance.

Considering that past snowboarders have already show a willingness to sacrifice modern, comfortable ski-wear in favour of “...less-functional baggy jeans and thick flannels made popular by the grunge movement” (Reed, 2005, p.145) it is not improbable that they would also rebel against safety products for the same reasons.

Due to a lack of data specific to snowboarding, the literature review was expanded to examine other studies from the board-sport subculture, especially skateboarding which shares a similar demographic. A study by Cassell et al (2005) used a focus-group setting to explore skateboarder’s reasons for using PPE products, and in doing so, exposing some of the core issues. When asked about their reasons for not using PPE “there were a number of negative comments regarding the ‘uncool’ look of PPE.” PPE was said to “look stupid”, “it’s not a fashion statement” and “it’s not cool to wear it” (Cassell et al, 2005, p.6). This paper proposes that these factors represent the greatest barrier to the widespread use of PPE among snowboarders, and the solution lies in making such products more desirable to this user group.

Figure 31 Examples of Contemporary PPE Products



Perceptual Product Experience Framework

One of the most comprehensive studies into the multiple components of the user-experience is Warell's (2008) 'Perceptual-Product-Experience' framework. Building upon research by Hekkert(2006), this framework provides a language helping to unpack these components so they can be considered individually. The following section presents and explains this framework and its relevance to this research. To avoid confusion with personal protective equipment (PPE), the abbreviated name for Warell's framework will not be used in this thesis. Original diagrams by Warell (2009) have been repackaged for presentation clarity.

Warell considers every product experience to be "multi-modal" (Warell, 2008, p.9), consisting of three components:

- **Sensory mode:** We experience products with all senses: vision, hearing, smell/taste, touch and balance.
- **Cognitive mode:** We process and categorise stimuli and make sense of things.
- **Affective mode:** We feel and think of things when we experience products.

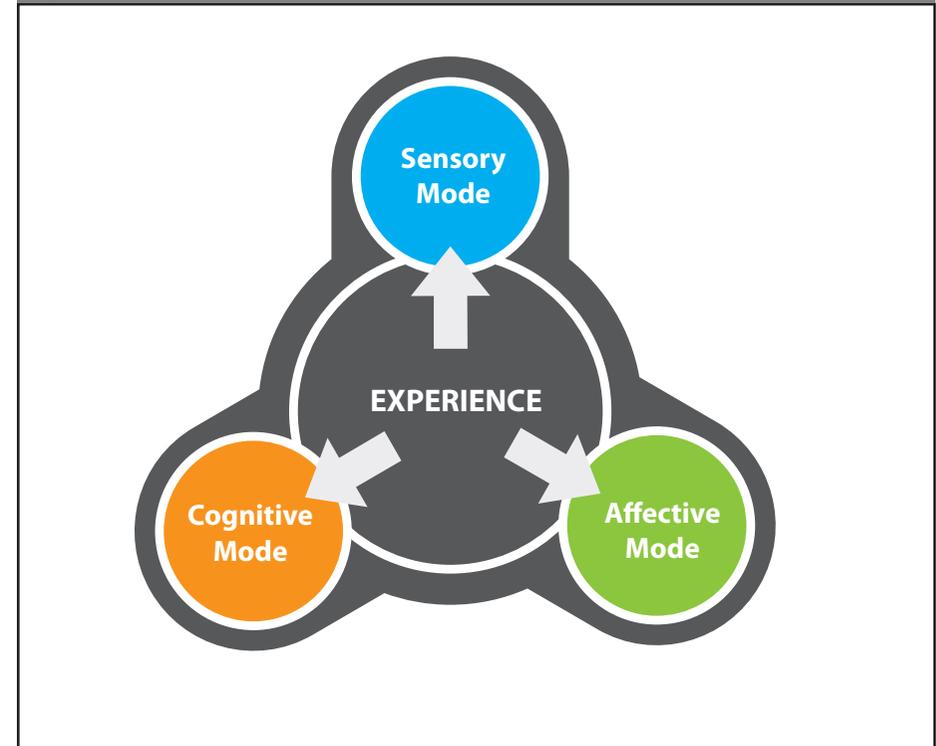
(Warell, 2008, p.9)

In addition, Warell (2008) considers each of these modes to have two sub-categories, the presentational and the representational. This reflects the way we respond to both the product as an object, as well as the personal associations we have with it.

- **"Presentational** – The pleasurable experience" - Our responses to the physical attributes of a product.
- **"Representational** – The meaningful experience" - Our responses to our associations with the product.

(Warell, 2008, p.11)

Figure 32 The Multi-Modal Product Experience



Breaking the overall experience into these two sub-categories, figures 33,34 and 35 on the following pages illustrate the presentational, and representational components of each of the three modes. For example, the sub-components of our sensory mode are 'impression' and 'recognition' as illustrated in figure 33.

Figure 33 Sensory Sub-Components

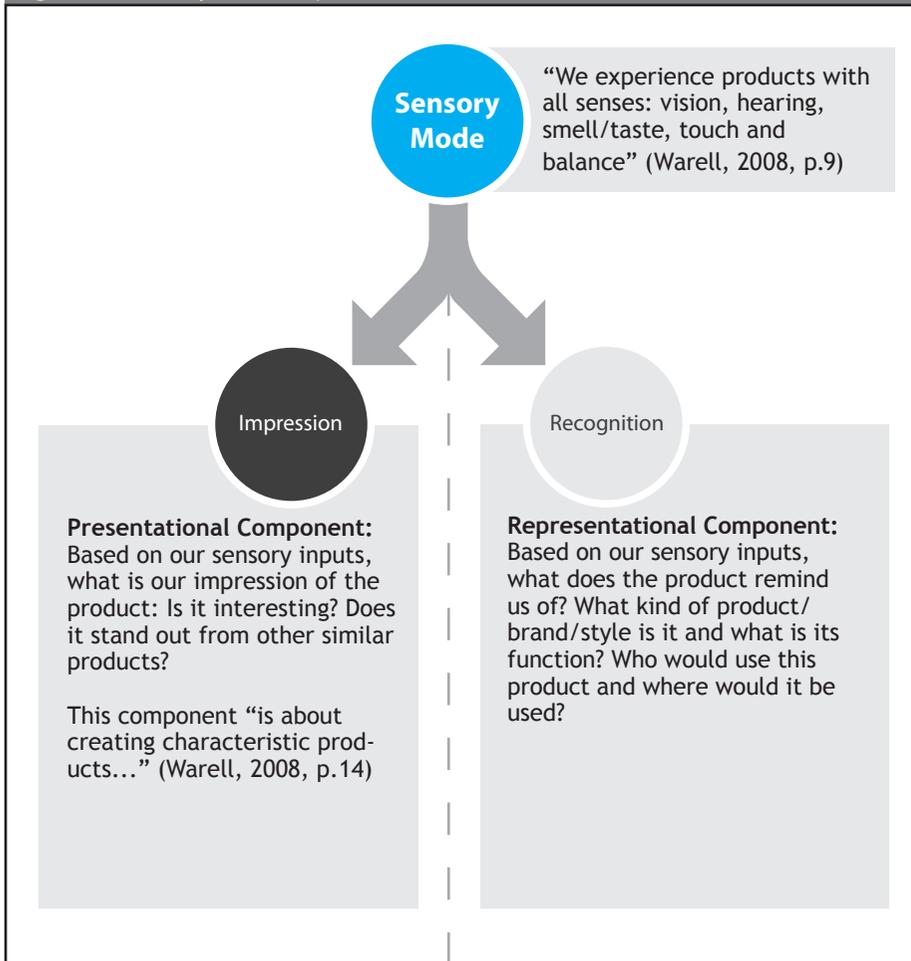


Figure 34 Cognitive Sub-Components

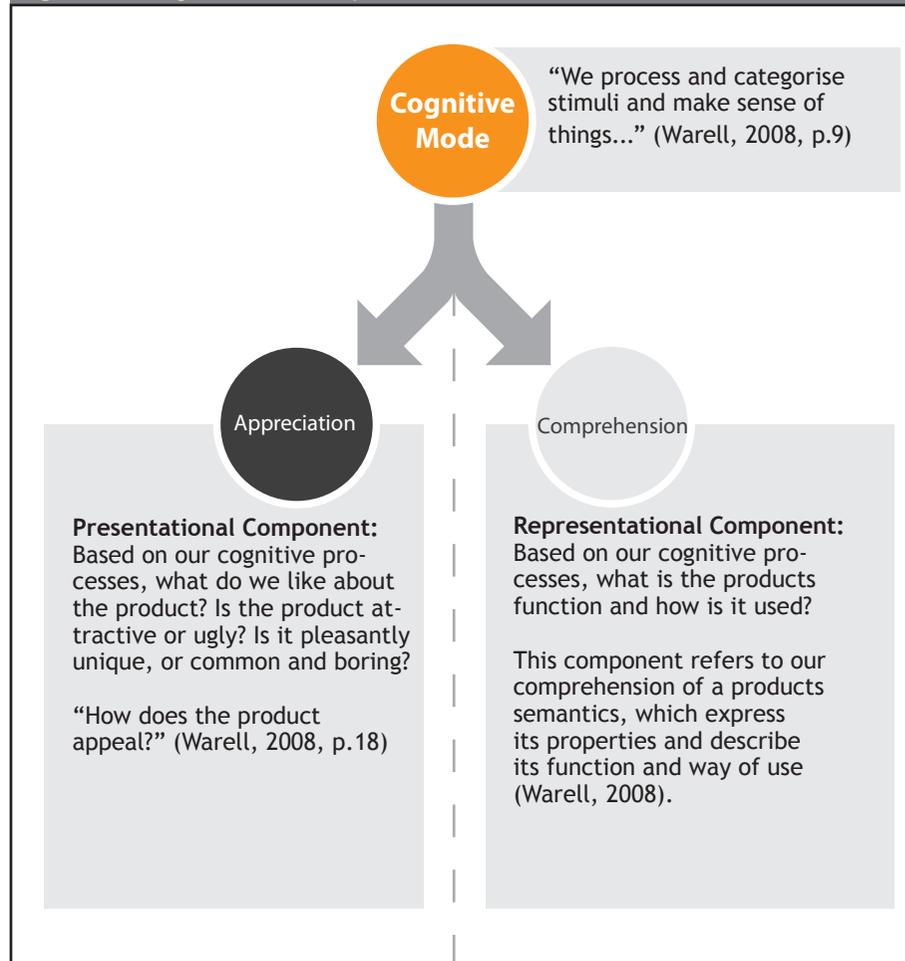


Figure 35 Affective Sub-Components



Impression

This component is focused on the product characteristics which help a product stand out from other similar products.

Your product should not at first glance be:

- **Taken for another product**
- **Overlooked because it is not visually interesting**

(Warell, 2008, p.14)

In addition, Warell(2008) comments how these impressions can change over time, as viewers become accustomed to certain characteristics. Consequently, original designs and characteristics are required to maintain a lead in this area.

Creating a characteristic product must be one of the key requirements of this project: to stand out from other safety and snowboarding products. Failing to meet this requirement will likely mean the product is overlooked as another uncool safety product, or just another snowboarding product. Consequently, developing an understanding of the current product characteristics and evolving from them is a vital step in this research.

Recognition

This component is concerned with users sensual recognition of products. Warell (2008) states that this category:

...includes the recognition of:

- **Product type**
- **Product purpose and (main) function**
- **Intended use, user and context** (Warell, 2008, p.42)
- **Product origin and make**

Warell (2008) refers to the product attributes and characteristics which define these associations as ‘signifiers’ and considers them vital in creating the right associations among a particular demographic.

For this 'design for desirability' project, these 'signifiers' are vital in projecting the right messages to users. They should:

- suggest a new, unique product type and main function or draw associations with other snowboarding products, rather than 'safety product', which by definition are 'uncool'.
- the design should suggest the intended user is an experienced male snowboarder in their late teens or early 20's, not a skier, beginner rider or old person.

Given these specific criteria, it is vital that this study develops an appreciation for the signifiers in snowboarding products, as well as their perceived associations among the target demographic

Appreciation

This component explores the principals which cause us to like or dislike elements of a product. These are referred to as the four appreciation principals:

- **Maximum effect for minimal means**
- **Unity in variety**
- **Preference for prototypes**
- **Optimal match**

'**Maximum effect for minimal means**' refers to our general preference for simple designs which allow quick, economical interaction. Warell (2008) states "if we can see, hear, or decide something faster or with less effort, we will prefer it over the more demanding alternative"(p.19). This principal is clearly applied in minimal products such as Apple's *iPod Touch* (fig 36).

'**Unity in Variety**' refers to our desire to "perceive connections and make relationships... to detect order in chaos or unity in variety" (Warell, 2008, p.19). In application, this principal demands a level of consistency in the design and detailing of an product. For example, the iPods repetition of basic geometric shapes is consistent, both in the physical product and the software interface.



Figure 36: Apple iPod Touch

'**Preference for prototypes**' reflects our preference for designs which strike a balance between being original and unfamiliar (and therefore interesting), while also maintaining familiar elements which we are comfortable with. Hekkert (p.9, 2006) refers to this as the 'most advanced, yet acceptable' principal, referring to our preference for the most advanced design which also retains sufficient familiarity to be accepted.

In the development of a concept product this principal is critical; for the design to be embraced, it must be sufficiently original to be interesting, while retaining enough familiarity for users to relate to it.

Optimal match refers to our preference for products which present similar messages to each of our senses. For example a product which looks and feels soft is preferable to one which looks soft, but when touched is hard.

While these four principals help to define a harmonious product, in the rebellious snowboarding apparel market they are often intentionally broken, resulting in products which appear 'anti-design'. This concept is expanded upon in section 5.6 *PPE products Vs Snowboarding Apparel*.

Comprehension

This component is about "...communicating the messages that help people understand the product and its use" (Warell, 2008, p.50). These messages are communicated by the products semantics, which can be either intuitive - such as the armour plates on a PPE product suggesting protection - or learned, as in the symbolic language of snowboarders, who may see the same armour plates as a sign of personal weakness.

While the intuitive aspects of product design semantics, such as designing clips and fasteners which are simple to use may be second nature to the designer, an appreciation for the learned semantic language of snowboarders must be gained.

Emotion

This component refers to the abstract feelings a product elicits, eg happiness, sadness, love, fear. There are three types of emotions:

- **Instrumental Product Emotions**
- **Aesthetic Product Emotions**
- **Social Product Emotions**

(Warell, 2008, p.32)

Instrumental Product Emotions refers to the desire for products we believe “...can help us accomplish our goals” (Warell, 2008, p.33). Instrumental product emotions can include satisfaction if we consider the product to have functioned correctly, or dissatisfaction if it did not.

When applied to snowboarding products, instrumental product emotions could include the purchase of a specialised snowboard to help a rider improve their jumping. The product purchase was instrumental in achieving this goal, and the rider may be satisfied, or dissatisfied.

Aesthetic Product Emotions reflect our personal attitudes towards product attributes such as colour, shape, material and style.

“Products that correspond with our attitudes are appraised as appealing and will elicit emotions like attraction, (while) products which conflict with our attitudes are appraised as unappealing and will elicit emotions like disgust.”
(Warell, 2008, p.34)

While these attitudes are personal, research into snowboarding culture suggests there are a number of common themes regarding styles, shapes and colours which can be explored.

Social Product Emotions are the emotions which stem from our beliefs about how “things should be and people should act” (Warell, 2008, p.35).

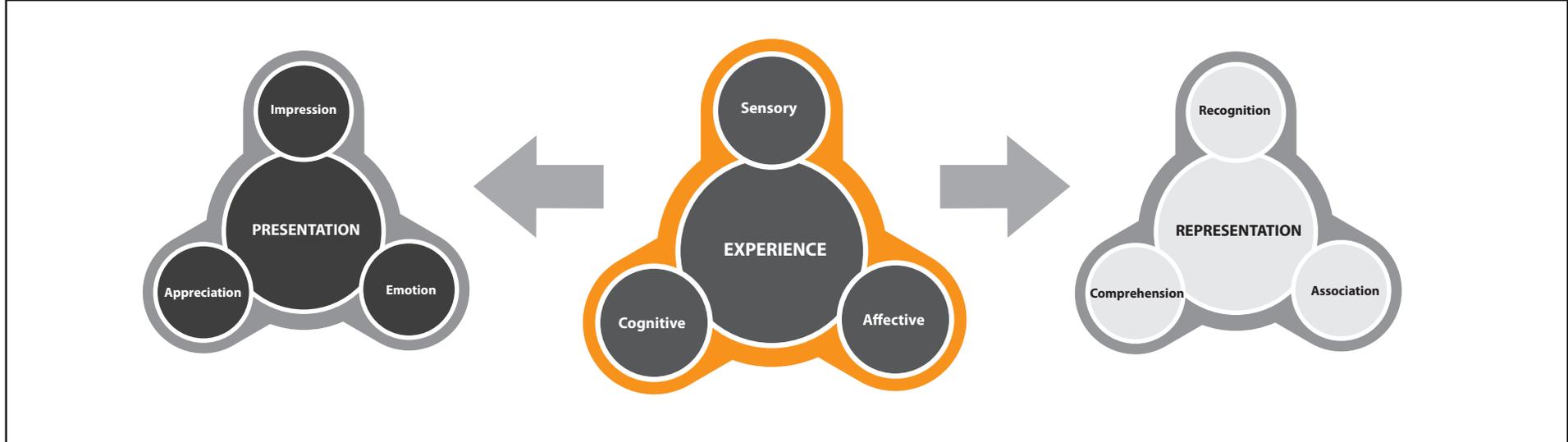
“Because we cannot separate our view on products from our judgements of the people we associated them with, we apply our social standards and norms to products, and appraise product in terms of ‘legitimacy’. Products that are appraised as legitimate elicit emotions like admiration, whereas those that are appraised as illegitimate elicit emotions like indignation.”
(Warell, 2008, p.35)

In the world of snowboarding, these social product emotions are the main reason behind sponsorship of professional riders: people who admire the rider naturally project this admiration onto the products and brands they display. Possibly the most literal applications of this effect are the ‘signature’ product ranges which proudly advertise the ‘hero’ riders name on the product. However, products which become associated with people judged to be ‘uncool’ are likely to share this negative label.

Association

This component is about “communicating values through the design of the product” (Warell, 2008, p.54). These associations are connected to the brands marketing, and may include brand straplines such as Nokias “Connecting people”, or brand values, such as luxury, quality, or reliability (Warell, 2008). Equally, these associations can also be negative, such as unreliable, ‘cheap’ or inefficient.

Figure 37 *Sub-Components of the Experience*



Conclusion

Warell's Perceptual Product Experience framework provides a language helping to unpack the many components affecting a user experience, as shown in its entirety in figure 37. Combined with subsequent research, these components form the foundation for experiential design criteria which address the shortcomings of existing uncool PPE products.

4.2.2 Product Forecasting

The outcome of this research will be a product proposal, or 'concept product' incorporating innovative features and attributes combined with emerging materials and technologies. According to Poyet (personal communication, November, 2008) concept products can be considered on a scale, from 'pre-production prototype' to 'blue-sky' depending on the level of innovation, complexity of manufacturing and market readiness. To illustrate this scale, automotive examples have been utilized in figure 38.

Category 1: Pre-Production Prototype

This kind of concept product is conventional in its design, utilizing incremental advancements in technology and styling. Its design is not challenging to the market (consumers) and typically utilizes established manufacturing approaches. This example presented is the Audi 'Le Mans' concept car, which was subsequently released as the R8.

Category 2: Innovative Concept

This category utilizes existing, but immature materials and technologies to add additional features and benefits which begin to challenge established conventions in the market. These products are rarely intended for production, but serve to build brand image and/or present a design probe, to explore potential in new markets. The car example for this category is the Citron 'C Cactus', an electric car with a highly patterned interior.

Category 3: Future Vision

This level of concept is often considered 'blue sky' and provides designers with the freedom to explore concepts taking great technological leaps. Often the realm of science fiction movies or design probe projects, these concepts typically reinvent the way we perceive existing products. The example for this category is the BMW 'Gina', which utilizes a lightweight fabric shell in place of the rigid metal panels on conventional automobiles.

Discussion

To be successful in reinventing a PPE product as something desirable, it is important that the design visually disassociates itself from existing safety products, and potentially, existing PPE product categories. Consequently, this project focuses on the second or third categories which allow greater freedom to explore emerging materials, alternative product typologies, and additional features and attributes.

Figure 38 Categories of Concept Products

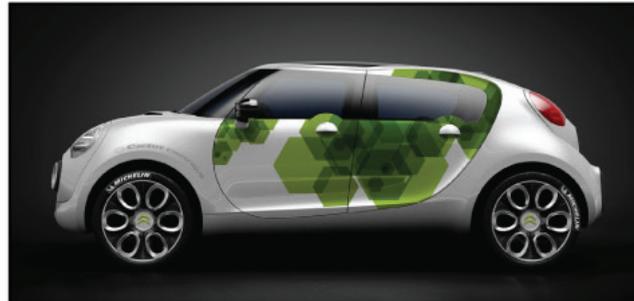
Category 1: Pre-Production Prototype

- Based on existing technology.
- Fits within an established category in the market:
eg, sportscar or people carrier.
- Potentially marketable within 2 years.



Category 2: Innovative Concept

- Based on existing but immature technology.
- Begins to challenge the market: may explore new product categories or niche markets.
- Challenges current manufacturing capabilities.
- Potentially marketable within 5-10 years.



Category 3: Future Vision

- Requires new technologies and manufacturing techniques.
- Challenges the market: may not fit within existing product categories or consumer perceptions about how things should look.
- Greater than 10 years out - 'Blue Sky'



4.3 Emerging Materials and Technologies

Supporting the forecasting element of this project, this section aims to present an overview of contemporary and emerging materials potentially relevant to the design of sports apparel. The cutting-edge of this field lies in reactive or 'smart' materials (Jordan, 2008).

"Reactive garments or fabrics have integrated technologies that make them react to various stimuli, be it light, touch or heat."

(Jordan, 2008, p.79)

Within this field, materials have been divided by the properties deeming them as 'smart':

- Material properties
- Integrated electronics

The following sections cover these materials in greater detail.

2.3.1 Material Properties

Many modern high-performance textiles can be considered 'smart' with "superior abilities to insulate, cool, wick-dry, resist fire or hold a shape" (Jordan, 2008, p.81) but for the purposes of this research into PPE, it is the materials capable of mitigating impacts which offer the most potential.

These materials are typically soft and flexible until struck by a high-impact force, when the materials properties cause it to stiffen instantaneously. There are currently two commercially available materials in the category:

- D30's injection moldable 'foam' (D30, 2009) *fig. 39*
- DowCorning's 'active protection system' fabric (DowCorning, 2009) *fig.40*

While these materials differ in appearance, their performance is similar and offers several benefits over traditional hard armour:

- The materials are flexible in a normal state, allowing their use in applications requiring a great freedom of movement.

- The materials show a superior effectiveness at absorbing and distributing the impact force over hard armour.
- "The protection is activated earlier and lasts more than twice as long as rigid protective systems" (DowCorning, 2009).
- Fabrics can be layered to provide additional protection, are washable and simple to implement in garment design.

However, these materials offer limited abrasion resistance, requiring the protection of an outer shell material. A number of products currently utilizing these materials are presented in section 4.4.

Figure 39 D30 Impact Material

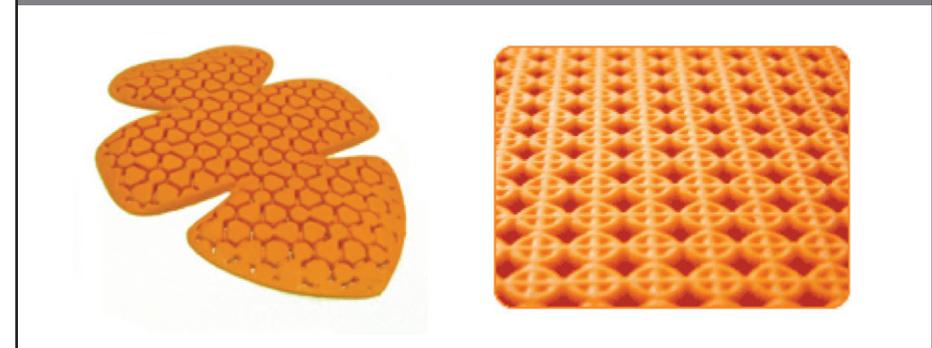
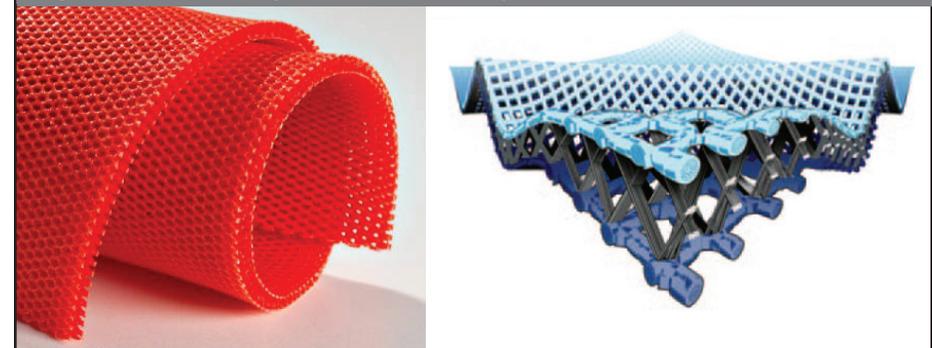


Figure 40 DowCorning's 'Active Protection System' Fabric



4.3.2 Integrated Electronics

This section presents a range of materials and concepts following a recent trend towards 'soft electronics'. Philips pioneered this trend in the mid 1990's (Jordan, 2008) and is now represented by a number of commercially available products and experimental concepts developed by sources ranging from high-fashion designers to military development centers.

The purpose of this section is to explore the possibilities of these materials and technologies in order to stimulate creativity in the design phase. Consequently, research is focused on innovative examples and applications rather than the present-day engineering and technical limitations.

Philips Research

Philips most recent 'design probe' in this field is titled *Skin* and presents two garments which respond to changes in their surrounding with light. This research follows programme-director Clive Van Heerder's belief that "the interaction between the human body, apparel and the near environment is going to be one of the next big challenges" (Jordan, 2008, p.79).

"Bubelle's fabric is embedded with sensors that react to bio-signals, such as temperature, moisture and heartbeat. Containing 18 mini-projectors, it turns the wearer into what van Heerden describes as "a human light bulb," telegraphing her feelings and psychological state via "blushing" colour and light changes". (Jordan, 2008, p.79)

Instead of responding to changes in the users body *Frission*, the second garment presented in the *Skin* project, responds to the near environment. When brushed or blown-on the fine LED's covering the garments surface illuminate (Jordan, 2008).

Top Left: **Figure 41** Phillips Bubelle dress

Top Right: **Figure 42** Phillips Bubelle dress illuminated

Bottom Left: **Figure 43** Phillips Frission dress

In addition to their design probe projects, Philips have also launched their *Lumalive*



“event-gear” (Lumalive, 2009), a commercial product for advertising events. Utilizing flexible LED technology integrated into t-shirts, *Lumalive* allows clothing to “display full color animations, text messages and visual effects, bringing textiles alive while retaining their soft look and feel”(Lumalive, 2009).

Hussein Chalayan

British fashion designer Hussein Chalayan featured several garments utilizing active materials in his 2006/7 *Airborne* Collection (www.husseinchalayan.com). These included the ‘video-dress’ – a garment covered in led ‘pixels’ allowing the display of colour video across its entire surface. A number of other garments utilize motors and integrated circuits to ‘animate’ dresses, raising and lowering components and transforming the garments (Regine, 2006). While both these garments utilize existing hard-electronics and relatively simple components, they simulate the effects possible with emerging materials.



Top Left: **Figure 45** Hussein Chalayan dress basic configuration, *Airborne* collection

Top Right: **Figure 46** Hussein Chalayan dress activated

Center Left: **Figure 47** Hussein Chalayan video dress screen capture

Bottom: **Figure 48 & 49** Hussein Chalayan video dress *Airborne* collection

Military Applications

According to Hibbert (2004) military scientists at Massachusetts Institute of Technology MIT are developing their own versions of Chalayan's 'Video-dress' technology as a form of optical camouflage for future battle uniforms. Hibbert (2004) proposes that tiny video cameras combined with liquid crystal or electro chromatic fabrics could make a soldier appear transparent by mimicking the exact colour and texture of surroundings.

Smart Materials in Pop-Culture

A number of movies and computer games have presented forms of smart materials, ranging from the active camouflage presented in the 1987 science fiction movie 'Predator' to a colour change suit worn by the main character in 'Ultraviolet'. Computer games including applications of these materials include *Halo* and *Fallout 3*, as presented in figure 50.

Discussion

This section highlighted a number of state-of the-art and emerging materials offering great potential in the design of sports apparel. Hibbert (2004) believes this market will be particularly receptive to these advances, with customers accustomed to searching for new functions that can improve performance and comfort and lower the chance of injury. In addition, the desire for original and unique styles and aesthetics in the snowboarding apparel industry means these users will likely have a low resistance to this technology.



Top Left: **Figure 50** Example of active camouflage in 'Fallout 3' computer game

Top Right: **Figure 51** Active camouflage on Predator

Bottom: **Figure 52** Ultraviolet movie

4.4 Competing Products

There are a number of commercially available apparel products specifically designed for snow sports which utilize 'smart' materials and/or additional features. This section presents a snapshot of these products, followed by a discussion on their relevance to this research.

RED (Burton) and Skullcandy Earpads. *Figure 53 top left*

A partnership project between RED and Skullcandy, these headphones are designed as an optional add-on for the 2009 range of RED snowboarding helmets, replacing the standard padded earpads.

Willy Bogners ski-suit. *Figure 54 top right*

A ski-suit was designed to accentuate skiers at night and was "presented as part of Munich's bid to host the 2018 winter Olympics" (Jordan, 2008, p.81).

Head Ski-Suit. *Figure 55 bottom left*

The Head 'Black Magic' jacket and 'Timber' pants contain 7mm D3O components protecting the shoulders, elbows and knees with an additional supporting back panel. Commercially available in 2009/10 (D3O, 2009).

Spyder Race Suit. *Figure 56 bottom right*

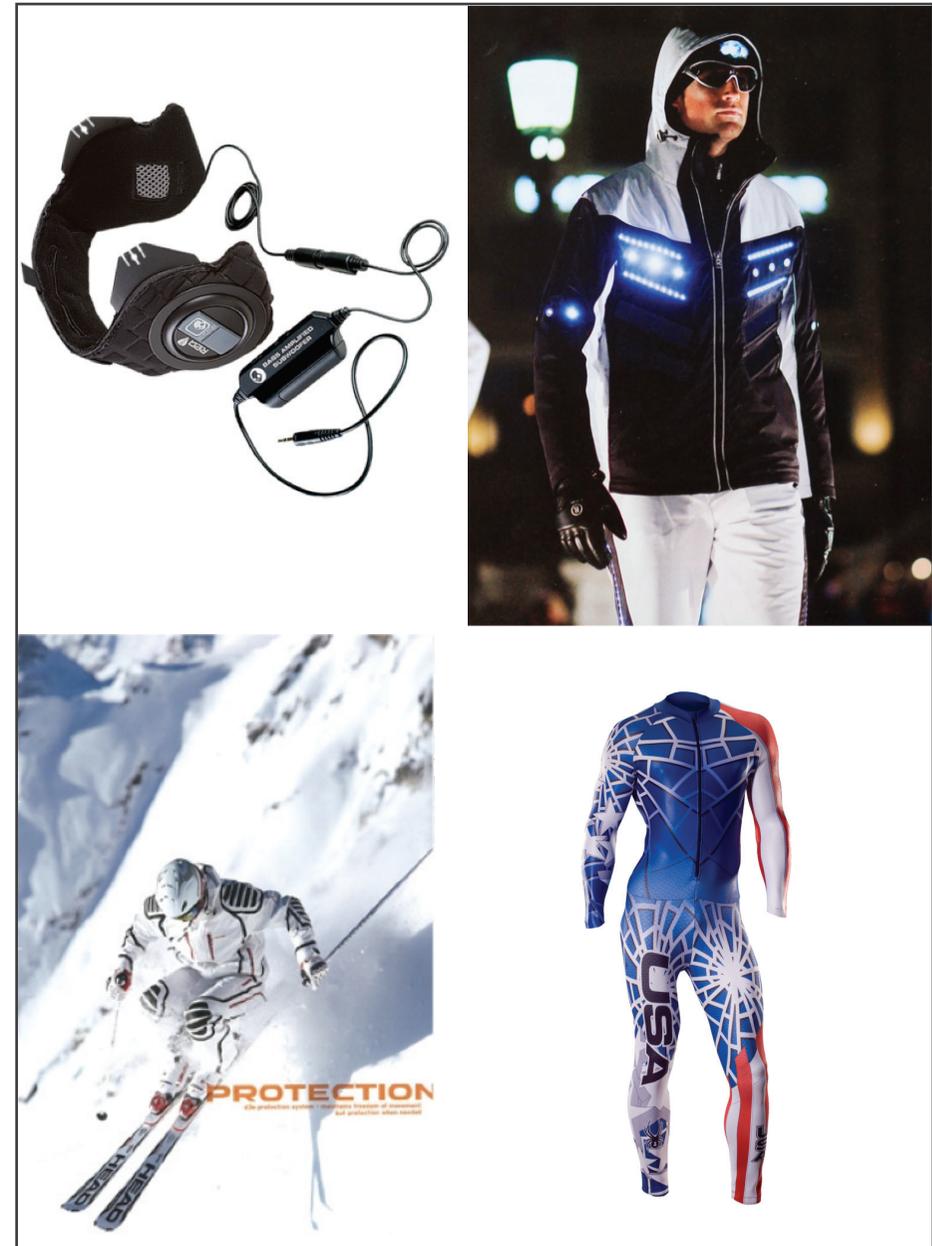
Designed for and worn by the US ski team at the Winter Olympics in Turin, these race suits incorporate D3O in the Elbows and Thighs. (D3O, 2009).

Schoeffel Protector S2. *Figure 57 opposite page right.*

A Ski-jacket integrating a number of high-tech materials including d3o back-protector, elbow and shoulder protectors. (D3O, 2009).

Burton/Motorola Audex Jacket. *Figure 58 opposite page far right.*

The Audex jacket integrates bluetooth cellphone connectivity into a snowboarding jacket, allowing riders to make calls and play music via the hood-integrated speakers. A control module with caller ID display and mp3 controls is concealed under a flap on the jackets sleeve (Motorola, 2009).



Top Right: **Figure 53** Burton (RED) and Skullcandy earpads

Top Left: **Figure 54** Willy Bogners ski-suit

Bottom Left: **Figure 55** Head ski-suit

Bottom Right: **Figure 56** Spyder race suit for the USA ski-team

Discussion

There are a number of snow-sport products currently utilizing 'smart' materials and/or integrated electronics to enhance the user experience. From the products researched it is apparent that the majority of the apparel is for the skiing market, with snowboarding specific products designed to fit underneath other products. While this solution may allow protective products to be hidden, and utilized under any fashionable snowboarding jacket or pant, it limits the design of PPE products to their basic utilitarian function. Based on this observation, there are two possible concept directions improving the desirability of PPE products:

- A concept incorporating PPE products within an expressive, fashionable apparel product for snowboarders.
- A new product typology proudly displaying PPE as an additional fashionable snowboarding accessory.

Exploration into these directions is presented in section 7.0, 'Research Through Design'.



Top Left: **Figure 57** Schoffel Protector S2 jacket

Top Right: **Figure 58** Burton/Motorola Audex jacket

4.5 Visual References

A number of streams of visual references were collected to aid the research through design phase. Images were clustered around particular themes predicted to be relevant to this research. The design of PPE had many parallels with armour design, both ancient, contemporary and fictional, so these formed one area of research. There were also many PPE products designed for other sports which provided a parallel for reference. The basis for other categories came from research in section 4.1.1 'Snowboarding Evolution: A Visual History', for example the link between video games and snowboarding. In practice, many of these images were collected and utilized in parallel with concept generation and development. This section utilizes imagery to present an overview of these basic themes.

Amour Designs

High-Tech Suits

Pop-Culture Video Game and Movie influences

Martial Influences

Protective Products from Other Sports

Protective Designs in Nature

Figure 59 Pop-Culture Influences

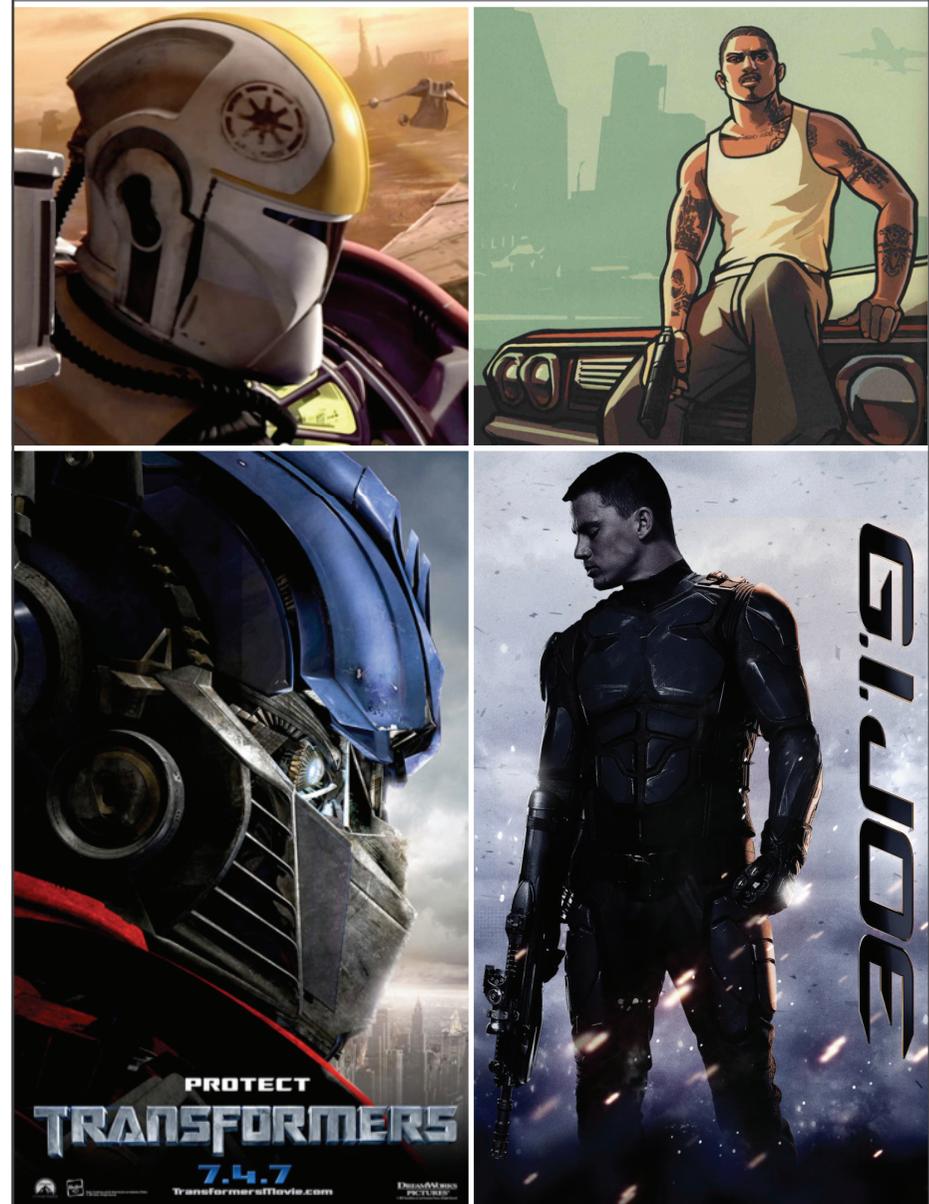


Figure 60 Martial Influences



Figure 61 Historical Armour Design



Figure 62 Science Fiction Armour Design



Figure 63 High-Tech Suits



Figure 64 Performance Sports Products

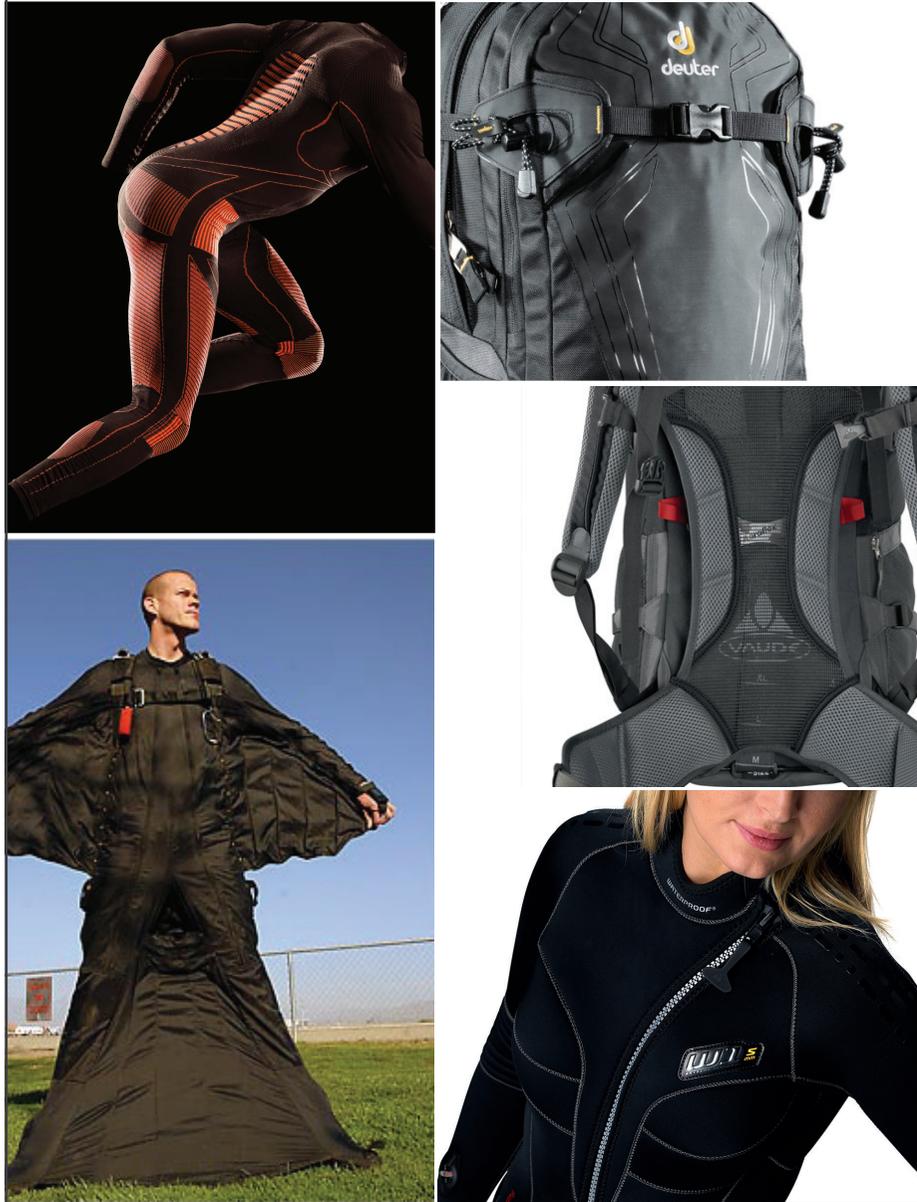


Figure 65 Sports PPE Products



5.0 Research For Design

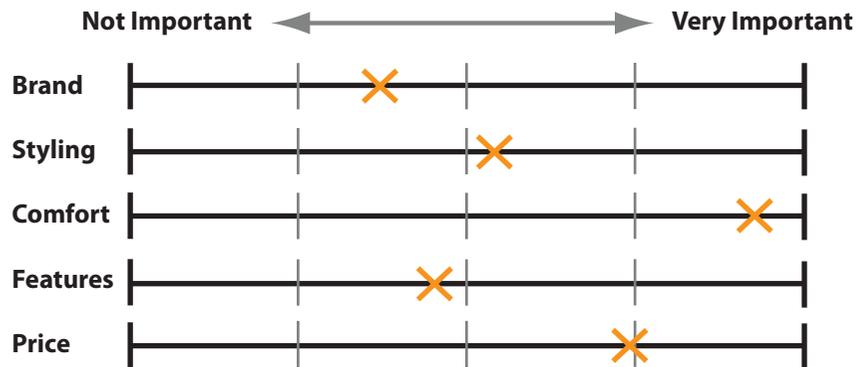
This section presents the findings from research methods which sought to define design criteria and gain a holistic appreciation of snowboarding's sub-culture, latent user needs, and design opportunities.

5.1 Questionnaire Results

This section presents a summary of the in-store questionnaire results, which sought to gain an appreciation of user perceptions regarding PPE products and styles.

Part 1: Buyer Values When Choosing A PPE Product

Participants were asked to indicate the importance of the following buyer values on a scale. The following charts indicate the mean responses.



Part 2: Product Personality Profiling

Participants were asked to look at an image of a product, and answer a number of questions based on their personal perceptions.

Product 1: RED (Burton) Hi-Fi Helmet (fig. 66)

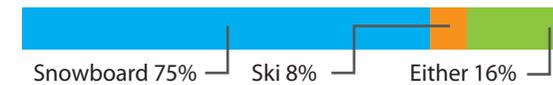


Mean user age range: 16 -24

Perceived user sex



Skiier, Snowboarder or either



Word Associations

Army, colour, different, trendy, teenager, park, halfpipe, skater, boarder

Perceived skill level



Part of skifield most likely to be seen on:

Park and jumps

Stereotypes:

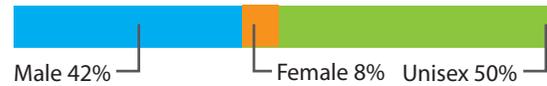
"Listens to 'emo' music" "Wannabe/try-hard" "Likes punk music" "Stoner" "Style before substance", "For skiers who like tricks and jumps"

Product 2: Giro Audio Helmet (fig. 67)



Mean user age range: 26 - 37

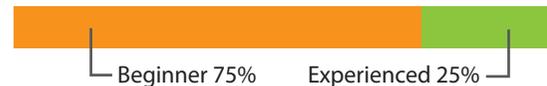
Perceived user sex



Skier, Snowboarder or either



Perceived skill level



Part of skifield most likely to be seen on:

"Everywhere but the park", Beginner slopes, off-piste.

Stereotypes:

*"Safety and comfort conscious" "Student or banker",
"Accountant", "Arrogant prat" "Top sales man"
"Wanker" "Business-person"*

Word Associations
*Old, safe, basic, cheap,
oldie, uncool, bicycle-
helmet, aerodynamic,
sterile, family, parent,
safety, older*

Product 3: RED (Burton) Mutiny Helmet (fig.68)



Mean user age range: 18 -25

Perceived user sex



Skier, Snowboarder or either?



Perceived skill level



Part of skifield most likely to be seen on:

Terrain park, halfpipe, jumps.

Stereotypes:

"Works in a boardshop" "extreme, yet laid back"

Word Associations
*Simple, stylish, army,
safe, skateboard,
young, trendy, tough,
badass, german,
boarder, jumps,
halfpipe*

Product 4: PocSki Helmet (fig. 69)



Mean user age range: 24 -34

Perceived user sex



Skier, Snowboarder or either?



Perceived skill level



Part of skifield most likely to be seen on:

Backcountry, slopes, off-piste, slopes

Stereotypes:

"Older woman"; "When not snowboarding this person does something well paid"; "High maintainence"; "Speed freak"

Word Associations

Pro, function, safety, fast, expensive, motocross, lawyer, speed, "cool running's", fashionable, high-tech, comfortable, racing, aerodynamic

Product 5: Burton Audex padded Hat (fig.70)



Mean user age range: 16 -23

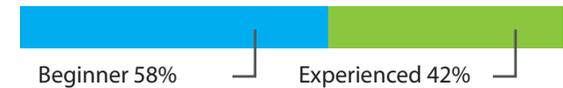
Perceived user sex



Skier, Snowboarder or either?



Perceived skill level



Part of skifield most likely to be seen on:

Anywhere, jumps, slopes

Stereotypes:

"Chilled out"; "Social boarder"; "Poser"; "Ditsy"; "Spends more time in bar/cafe than boarding"

Word Associations

Chilled, style, not safe, distracted, awful, ugly, teen, girly, poser, laid-back, comfortable, fun, relaxed, stylish, hot.

Questionnaire Discussion

The personality profiling section of this questionnaire highlighted the depth and power of association among users in the snowboarding market. While users initially claimed that styling was of relatively low importance when choosing a PPE product, it is almost inconceivable that these strong perceived associations have so little effect in their decision-making.

Regarding product styling, it is interesting to note user associations with the *POC* helmet. This model shares a similar clean, white, designedly aesthetic with their iF design-award winning back protector, presented in figure 71. While participants recognized a number of positive qualities of this design, its aesthetic was associated with an older demographic, and 'skiing', suggesting this minimal, aerodynamic aesthetic is unsuited to this projects target demographic.

Fig 71 *POC* helmet and iF design-award winning back protector



In contrast, the expressive designs of Burtons Hi-Fi and Mutiny helmets (fig 72) were an almost perfect match to the target demographic. While there are a number of variations between these designs, they share a number of common qualities:

- Application of a graphic as ornamentation.
- Visually unique appearances
- Martial references and associations
- Non-streamlined appearances
- Durable, low-tech materials and detailing (in comparison to the sleek, sophisticated materials and detailing of the *POC* helmet)

Fig 72 RED (Burton) Hi-Fi and Mutiny Helmets



Conclusion

The findings from this section highlight the importance of Warell's (2008) 'associative' qualities as part of the product experience and begin to define product qualities or 'signifiers' which snowboarders associate or disassociate themselves with. It is also important to note that while the minimal, streamlined aesthetic presented in the *POC* helmet is officially recognised as 'good' design, this same quality makes it undesirable to this projects target demographic. In somewhat of a rebellion against the *POC*'s clean, streamlined aesthetic, the RED designs are highly ornamented, with a durable, martial styling clearly associated with snowboarders.

5.2 Fashion in Snowboarding

Cultural research in section 4.1.1 has highlighted the importance of self-expression among snowboarders, but what does this mean when applied to apparel? This section helps to answer two questions:

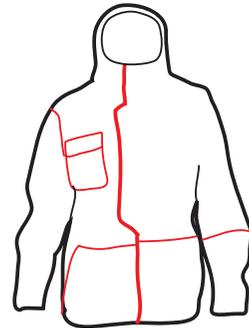
- *What qualities or signifiers set a snowboarding jacket apart from other jackets?*
- *Within the snowboarding apparel market, what are the dominant themes?*

While seeking the answers to these questions, the researcher became aware of two elements which define these products.

- **Categories of ornamentation** (section 5.2.1): The common design elements adding visual interest to a product, eg, asymmetrical design accentuated details and brand labels.
- **Contemporary snowboarding fashion styles** (section 5.2.2): These styles define whether the product is gold and shiny, or dull camouflage print and reflect the personal taste of individuals.

Figure 73 shows an example of a snowboarding jacket unpacked into these two categories. In this case, the jacket utilizes two kinds of ornamentation, asymmetry and bold patterning, while its fashion style fits within the *'future tech'* theme to be covered on page 66. The following sections explore these components, defining specific categories and developing an appreciation of their subtleties and associations.

Figure 73 Analysis of Snowboarding Apparel



Asymmetry



Bold Pattern



Future Tech

Snowboarding Jacket

Types of Ornamentation

Fashion Style

5.2.1 Categories of Ornamentation

One way to highlight the unique qualities of snowboarding apparel is to compare it with performance driven products, such as mountaineering apparel. Both products are designed for use in exposed alpine conditions, and often utilize the same materials, but the comparison highlights a key difference: ornamentation. The following section uses jackets as an example, but the same principals can be applied to pants, boots, backpacks and other snowboarding apparel.

The design ethos of the alpine jacket is clearly to maximise the jackets performance, while the snowboarding jacket is designed to appear visually unique, employing ornamentation at the expense of performance features (eg, greater material bulk and weight, more complex stitching for water to seep through, no breathable patches).

However, this ornamentation is a critical element of virtually all-contemporary snowboarding apparel products and serves to fulfill snowboarders desire to uniquely define themselves. Figure 75 *Scale of Ornamentation* expands on this concept, presenting a random sampling of jackets from alpine and snow sport manufacturers, ordered from low to high levels of ornamentation:

- Basic solid colours
- Colour breaks for function
- Colour breaks for decoration
- Assymmetrical colour breaks
- Bold patterns

Figure 74 Ornamentation Vs Function



	Snowboarding Jacket	Mountaineering Jacket
Pattern	Complex patterns	Solid colour
Symmetry	Asymmetrical	Symmetrical
Fitting of Jacket	Loose/Baggy	Fitted
Fabric selection	A single fabric to accentuate style	Multiple fabrics to maximise freedom of movement, breathability and minimize weight
Fixatives (Velcro, poppers, zips)	Accentuate style – visual details	Reduce weight and simplify use

Figure 75 Scale Of Ornamentation



Figure 76 Scale Of Ornamentation



If the associated sports are overlaid (fig. 76) it becomes evident how snowboarders desire for self-expression has affected the styling of products, with greatly increased levels of ornamentation. However, while skiers have typically been represented by an older, more conservative demographic, skifield observations suggest a shift towards greater ornamentation in this category. This development will undoubtedly instigate a shift in snowboarding fashion, which has a history of disassociating itself from the skiing majority.

It is important to note that this scale does not represent the level of fashion, as many of the mountaineering jackets in the second category may be considered very fashionable in that market. Rather, it represents the level of ornamentation manufacturers have risen to, to capture the desires of their individual market.

Identifying the specific qualities of these categories (fig. 77) begins to answer the first question:

- *What qualities set a snowboarding jacket apart from other jackets?*

Figure 77 A Scale Of Ornamentation



Colour breaks on existing seam lines: no unconventional cuts or stylistic expression.



Minimal, function driven detailing



Accentuated closures to enhance style



Bold or flamboyant patterning



Colour breaks on functional areas



Material breaks for enhanced function. Eg, enhanced breathability and freedom of motion.



Material breaks for visual effect, but no functional gain.



Non-functional detailing for stylistic expression.

Not only does figure 77 highlight several qualities defining contemporary snowboarding apparel, but by looking at the qualities which define skiing and hiking jackets, it illustrates a number of styles not suitable for snowboarding apparel. The following pages discuss the qualities which define snowboarding apparel and present other contemporary product examples.

Bold or Flamboyant Patterning

Reflecting the general trend towards increasingly complex ornamentation, these bold patterns provide infinite variations and opportunities for unique expression. While the olive camouflage pattern of the grunge era is still common, there are many contemporary takes, typically utilizing graffiti-stenciled logos to replicate a similar effect, but in bold colours. Another interesting observation is the resurgence of baroque patterning in the Burton 'Love' series of jackets (bottom right image in figure 78) and pants, possibly representing a new level of sophistication in pattern beyond the omnipresent 'visual noise' prints.



Right: **Figure 78** *Examples of bold or flamboyant patterning*

Asymmetric Design

This type of ornamentation can range from basic print to complete asymmetry in the jackets structure. From an aesthetic perspective, this asymmetry adds visual dynamism to products, helping them stand out against other products. Given the relatively uncommon nature of the style, it also adds a kind of product exclusivity, with a number of professional riders such as Shaun White utilizing this in their signature product lines.



Right: **Figure 79** *Examples of asymmetric design*

Non-Functional Detailing

This type of detailing ranges from logo integration to superfluous leather patches and pockets, and serves the purpose of adding unique visual details.



Right: **Figure 80** *Examples of non-functional detailing*

Accentuated Closures to Enhance Style

The design of closure systems also reflects the trend towards ornamentation, with these components becoming central design details in some product lines. While their application occasionally serves no functional purpose, in others the accentuated closures improve usability, particularly while wearing gloves.



Right: **Figure 81** *Examples of accentuated closures*

Discussion

The styles presented in this section are self-explanatory, and can be utilized as a palette of ornamentation for consideration during the research-through-design phase. However, figure 84 also provides an insight into long term snowboarding fashion trends, suggesting that recent shifts in skiing apparel may drive a growing level of ornamentation in snowboarding apparel. Further supporting this hypothesis is a review of cutting-edge snowboarding apparel circa 1997, as illustrated in figures 82 and 83. With material breaks for visual effect, but no bold patterning or asymmetric designs, these products clearly fit within the central section of the ornamentation scale. This trend raises the question:

If snowboarding apparel is moving further up the scale of ornamentation, what will these products look like in 5-10 years?

Figure 84 illustrates a potentially higher level of ornamentation, however with current levels of flamboyant patterning and aesthetic detailing, a complete rebellion against ornamentation is equally plausible. This question is explored through design practice, with possible outcomes presented in the concepts in section 7.0.



 <p>BOLLE JACKET Model name: Insulated Jacket Style: B53 Sizes: XS-S-M-L-XL Colours: Green, Blue, Burgundy, Navy Rec Retail Price: \$310</p> <p>PANT Model name: Protective Overall Style: B40 Sizes: S-M-L-XL Colours: Burgundy, Black, Yellow, Navy, Brick Rec Retail Price: \$250</p>	 <p>BURTON JACKET Model name: Outland Convertible Style: High end technical Sizes: S-M-L-XL (mens/womens) Colours: Assorted Rec Retail Price: \$599.95</p> <p>PANT Model name: Biolight Vent Style: Terje's own Sizes: S-M-L-XL (mens/womens) Colours: Assorted Rec Retail Price: \$329.95</p>	 <p>CAPPEL JACKET Model name: Terrain Classic Jacket Style: Hipora 2000, taped, and mesh lined Sizes: Full range of sizes Colours: Smoke, Sage, Cement, Oyster Rec Retail Price: T.B.A.</p> <p>PANT Model name: Terrain Khaki Pant Style: Hipora 2000, taped. Sizes: Full range of sizes Colours: Smoke, Sage, Cement, Oyster Rec Retail Price: T.B.A.</p>
 <p>COLUMBIA JACKET Model name: Relap Jacket Style: Pile insulated jacket Sizes: S-M-L-XL Colours: Sand/coast, Jungle/jumice, Dill/black Rec Retail Price: \$249.95</p> <p>PANT Model name: Crystal Riage Style: Shell pants Sizes: S-M-L-XL Colours: Black, Midnight, Petrol Rec Retail Price: \$124.95</p>	 <p>CONCEPT JACKET Model name: Polar Style: Technical Jacket Sizes: S-M-L-XL Colours: Seafoam/black/bone (featured), Steel/black/beige, Beige/spruce/taupe, Navy/beige/navy. Rec Retail Price: \$449</p> <p>PANT Model name: Chino Style: Technical Pant Sizes: S-M-L-XL Colours: Olive, Black, Slate, Brown. Rec Retail Price: \$249</p>	 <p>FRUITION JACKET Model name: Eskimo Sizes: XS-S-M-L-XL Colours: Butter mustard/rust, Cape cod grey/aspen green, Federal blue/slate grey, Sky blue/rust Rec Retail Price: \$312</p> <p>PANT Model name: Trackie Style: S-M-L-XL Colours: Rust/butter mustard, Aspen green/slate grey, Federal blue/cape cod grey, Sky blue/federal blue Rec Retail Price: \$238</p>

Top: **Figure 82** Oakley jacket advertising, circa 1997

Bottom: **Figure 83** Outwear, circa 1997

Figure 84 A Higher Level Of Ornamentation?



5.2.2 Fashion Styles in Snowboarding

The previous section outlined several categories of ornamentation helping define contemporary snowboarding apparel products. Expanding on these ideas, this section explores contemporary fashion styles, seeking to answer the second question:

- *Within the snowboarding apparel market, what are the dominant themes?*

The method used in this analysis is referred to as a 'mood-board' and utilizes images to present common themes and ideas. While the interpretation of the imagery in these mood boards is subjective, by creating specific categories within the boards, the definitions become far more explicit. Figure 85 shows a template for this analysis, structured into five categories loosely based on a system developed by Klenner (personal communication, December 15, 2007).

- Snowboard products
- Product detailing
- Colour / Material / Pattern
- Associated graphics
- Perceived influences

In creating these mood boards, the researcher began by clustering snowboarding products around reoccurring themes observed during the context review section. From these themes, four dominant groups were identified and named:

- *Contemporary Grunge*
- *Visual Noise*
- *Future Tech*
- *Luxury*

The following pages present these mood-boards alongside a written summary of their unique qualities.

Right: **Figure 85** *Style-board description*

Snowboarding Products

What snowboarding products form the basis for this style?

Product Detailing

How are these products detailed?
Are the details accentuated, or hidden?
Are they rectangular or organic shape?

Colour / Material / Pattern

What colours, materials and patterns are typical of products in this style?

Perceived Influences

Based on an understanding of snowboarding development and surrounding pop-culture, what are the areas of influence in this style?

Associated Graphics

How is this style translated into graphics for print? This can include both print on products, magazines and web sources.

Contemporary Grunge // Punk-rock / Ex-army/ Heavy-duty

This style draws from the early 90's influences of street-skating and punk-rock music, and while becoming far more sophisticated in execution, these products retain much of the original 'worn-jeans and ex-army jacket' feeling.

Snowboarding products

The products in this category are typically durable and heavy duty feeling, with drab colours and limited patterning.

Product detailing

Detailing is often exaggerated, often with a heavy duty 'ex-army' feeling. Frayed, worn fabrics and military style prints are also common.

Colour/ Material / Pattern

Heavy-duty materials such as canvas, leather, nylon webbing and denim fit this trend, along with metal closures, studs and camouflage prints.

Associated graphics

Graphics borrow heavily from graffiti and stencil art, often utilizing paint splatters and simple two-tone prints.

Perceived influences

In addition to the early 90's street-skating, punk-rock influences, there are definite links to pop-culture video games such as *Grand Theft Auto*, and *Tony Hawk Pro-Skater*.

Right: **Figure 86** Contemporary grunge

Snowboarding Products



Product Detailing



Colour / Material / Pattern



Perceived Influences



Associated Graphics



Visual Noise // Neon / Bright / Inelegant

This trend emerged around 2007/08 and draws from the neon era of early snowboarding days. Possibly a rebellion against the drab olives and tones of the grunge style or simply the next level in ornamentation, this style is about standing out, through clashing colours, complex psychedelic patterns and bright neon's.

Snowboarding products

The products in this category typically utilize bright (often unusual) colours and complex, random patterning for strong visual effect. This randomness often gives these products a crude, inelegant feeling which contrasts other styles.

Product detailing

The abundance of colour and pattern tends to obscure any product details, and as a result, these are typically unadorned and often camouflaged among the surrounding materials.

Colour/ Material / Pattern

The brighter, the more psychedelic and epilepsy-inducing, the better. Patterns often assume a neo-camouflage feeling, but the use of colours adds a completely new feeling. There appears to be no limits in this category.

Associated graphics

Graffiti style paint-splatters and stencil art is common, along with complex vector patterns.

Perceived influences

This style appears to borrow heavily from early snowboarding days of neon-skiwear and rebellion against establishment and conformity.

Snowboarding Products



Product Detailing



Colour / Material / Pattern



Perceived Influences



Associated Graphics



Future Tech // Performance / Sci-Fi / 'Star Wars'

With restrained colour palette and patterning, products in this style are comparatively minimal, with designs often accentuating their modern materials and performance details.

Snowboarding products

The products in this category typically accentuate their materials and unique design over distracting prints. High quality materials are utilized with a focus on performance.

Product detailing

Details are accentuated as visual features, adding visual interest to these products.

Colour/ Material / Pattern

Modern performance materials such as carbon fiber, aluminium and glossy, unpainted plastics are common, with geometric patterns used sparingly.

Associated graphics

Vector graphics are typical of this style, ranging from simple insignias to highly complex 'explosions' of vector shapes.

Perceived influences

This style draws influence from the science fiction movies and video games of popular-culture and elements of futuristic military hardware. Visual references include movies such as *Halo*, *Star Wars* and older classics like *Tron*.

Snowboarding Products



Product Detailing



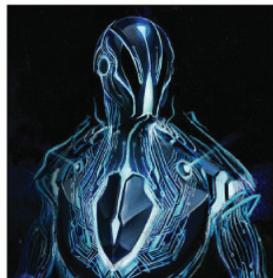
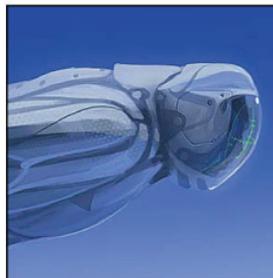
Colour / Material / Pattern



Perceived Influences



Associated Graphics



Luxury // Sophisticated / Bling / High-fashion

This style incorporates elements of contemporary street fashion and showy or ostentatious elements, or 'bling', incorporating luxurious materials and a sophisticated use of patterns and colours.

Snowboarding products

The products in this category are luxurious in their design, utilizing unconventional materials, a limited colour palette and patterning on limited areas.

Product detailing

Details play a crucial role in adding sophistication to these products, whether through gold 'bling', brand 'labels' or simple ornamentation.

Colour/ Material / Pattern

This style utilizes a range of unconventional, luxurious materials such as leather, 'vintage' style shell fabrics and pure 'Ipod' white plastics. Colours are typically limited to white, with gold or tan accents, while patterns are simple and used to great effect. Pin striping, snakeskin, sand-dune and other textured patterns are common and add to the luxury feeling.

Associated graphics

Graphics are relatively simple, with single badges – military insignias, coat-of-arms or fleur-de-lis – over subtle background patterns.

Perceived influences

This style draws influence from the 'bling' badges and labels of high-fashion, combined with a contemporary take on medieval symbols and insignias.

Snowboarding Products



Associated Graphics



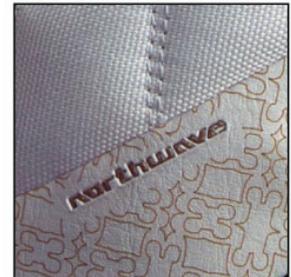
Product Detailing



Perceived Influences



Colour / Material / Pattern



Summary

The previous section sought to answer two key questions:

- *What qualities set a snowboarding jacket apart from other jackets?*
- *Within the snowboarding apparel market, what are the dominant themes?*

By unpacking the analysis of these products into two subcategories, a number of conclusions could be drawn. Through a scale of ornamentation, it was discovered that several styles of ornamentation were relatively specific to snowboarding jackets:

- *Asymmetric design*
- *Bold or flamboyant patterning*
- *Non-functional detailing*
- *Accentuated closures to enhance style*

In addition, it suggested that several styles may have negative associations with skiing or mountaineering jackets:

- *Minimal function driven detailing*
- *Basic colour breaks along seam lines / Solid colour*
- *Colour Breaks on functional areas*
- *Material breaks for enhanced function*

Through a mood-board analysis, four dominant themes were identified within the snowboarding apparel market:

- *Contemporary Grunge*
- *Visual Noise*
- *Future Tech*
- *Luxury*

Together these elements and their sub-categories define a visual language which helps develop an understanding of the complexities of the design of snowboarding apparel. This understanding outlines a number of experiential design criteria, and provides an invaluable reference for further exploration in the research through design phase.

5.3 Immersive Research Observations

This section presents a number of observations from research conducted at Turoa skifield, as described in section 3.1.3.

Helmet Use

Observed helmet use among snowboarders on the slopes was far higher than previously recorded in clinical studies, with almost 50% of riders utilizing some form of helmet. There are several factors possibly causing this discrepancy:

- The most recent studies were based on observations from 2006 and helmet use may have increased since this date.
- On the days I visited the skifield, snow conditions at Turoa were particularly icy and may have influenced a localized increase in helmet use.

However, on the area of the skifield set aside for jumps and park features, and presumably used by more experienced riders, the level of helmet use was far closer to previously recorded figures, falling to around one quarter or less. This possibly reflects a particular resistance to safety equipment in this more experienced rider demographic who, judging by their careful choice of outfits are in general more image-conscious.



Top: **Figure 90** Riding the chairlift, Turoa Skifield 2009

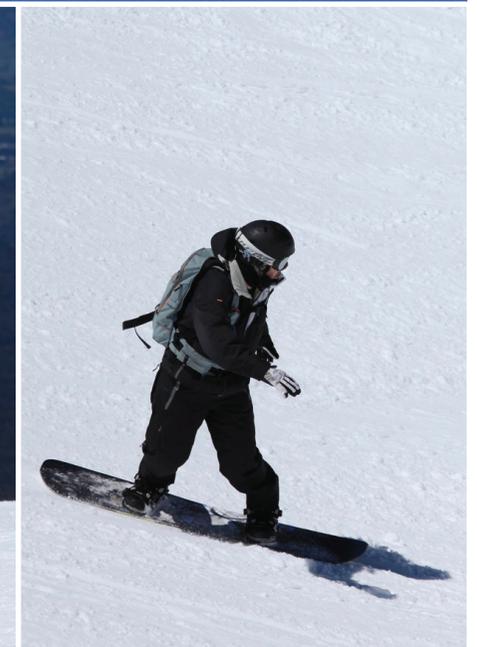
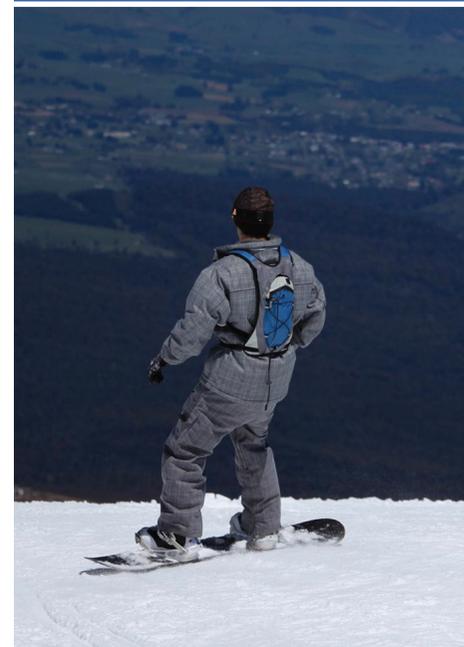
Bottom: **Figure 91** Snowboarder jumping in terrain park

The Social Aspect

For an independent sport such as snowboarding, it was somewhat surprising to observe the number of groups of snowboarders riding together, watching each other jumping and cajoling each other to attempt tricks. The other riders also served as stand-in camera people, recording jumps by the other members. This group observation raises a number of design opportunities, from simplifying group visual identification to improving communication methods between riders.

Use of Backpacks/'Camelbacks'

In a sport placing great value on freedom of movement, it was a surprise to observe the number of riders in the jumping section of the skifield wearing backpacks or camelback style water bladders. Observations suggest these are predominantly used to carry small items such as drink-bottles, cellphones and snack foods.



Top: **Figure 92** Riders on chair-lift

Bottom: **Figure 93 & 94** Riders wearing a camelback and backpack

A lot of people are falling

Any short ride on the ski-lifts will undoubtedly show a number of snowboarders falling. Personal experience with an injury also suggests that injury statistics based on hospital figures may only represent the most serious injuries – “where a rider could not walk away from the accident” - with the majority of injuries going unreported and unrecorded. While this observation has little impact on the serious injury statistics investigated in this study, it supports an argument for improved impact protection across the following areas:

- Arms: the outside of the forearms, points of elbows and shoulders
- Legs: particularly the outside of the thighs and backside
- Chest: to protect ribs against falls when catching an edge, or running into other riders/obstacles.



Right: **Figure 95** *Snowboarders falling*

5.4 The Experience of Snowboarding

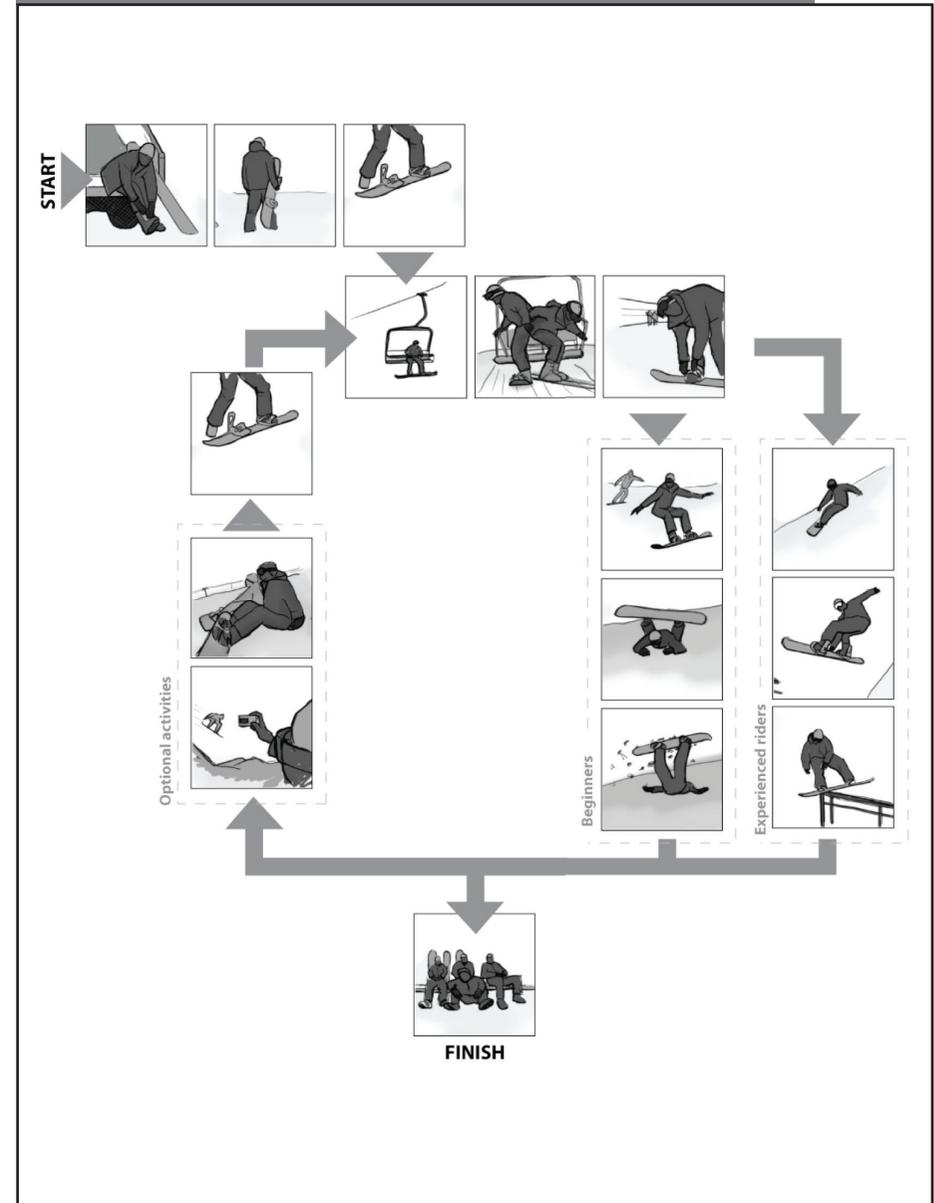
This section utilizes storyboards to analyze ski-field observations of snowboarder activities, identifying emotional and performance criteria and areas for exploration through design. The first section looks at general ski-field activities, while the second is focused on jumping and the performance requirements of this group.

Storyboarding

The storyboarding exercise sought to break down the snowboarding experience into the various activities to identify experiential criteria and latent opportunities. Through this process, the following criteria and opportunities were identified:

- Snowboarders spend a lot of time sitting while riding ski lifts and waiting for friends. Any kind of rigid back-protector needs to allow for this.
- The process of stepping into bindings and tightening clips before riding can be a critical stage in gaining focus – getting ‘in the zone’ – and represents an area with great potential for product development. With safety products, these adjustments have the added psychological bonus which comes from feeling protected and ‘invincible’.
- Having jumps and tricks photographed to review later is clearly a shared desire which could be explored through design.
- Non-serious falls are common, particularly among beginners on the slopes, and intermediate riders learning to jump.
- Snowboarders often ride in small groups. Features improving the ease of communication and identification could be explored – for the latter, both between group members and to other non-members on the field.

Figure 96: Typical Snowboarding Activities



5.5 Performance Requirements

The purpose of this section was to determine the design limitations required to allow a snowboarder to ride and perform jumping maneuvers. Given the forecasting focus of this project, some of the performance details such as fabric breathability and heat retention were considered a low priority. However it was vital that the design appeared feasible in the eyes of snowboarders, who would discredit a design obviously hindering their riding. While this requirement may be obvious, it is not uncommon to see impossibly bulky, or restrictive concept designs for film and video games, as presented in section 4.5 *Visual references*. To ensure these basic requirements were met in this study, a visual analysis of snowboarders riding, jumping and attempting tricks on 'snow park' features such as rails was conducted. While these activities were easily observed at the ski field, the beginner to intermediate skill levels of these riders meant observations were limited to comparatively simple maneuvers.

To supplement these observations, magazine images of elite riders were utilized, in particular freeze frame photographs as in figure 97. This type of image allowed step-by-step analysis of the motions required while performing jumping maneuvers, which led to a number of performance criteria:

- Product bulk and weight should not drastically affect the balance or aerial motion of the rider any more than existing baggy clothing.
- The arms are critical to balance and the performance of aerial maneuvers and must be free to move unobstructed.

The parallel nature of the concept development and research meant that by this stage of the research, concepts were focused around a spine protector. Consequently, a number of performance criteria were specific to this device.

- Any spine protection device must be sufficiently flexible to allow for the following motions:
 - Twisting along the spine axis
 - Bending from side to side
 - Crouching and bending forward to touch toes
- The spine protectors design should mitigate impacts, particularly those to the lower back

In addition, the product proposal must not exclude the use of existing PPE products unless it replaces them. Eg, helmets for competition use.

These design limitations are translated into performance design criteria and listed in section 6.0 Design Criteria.

5.6 PPE Products Vs Snowboarding Apparel

As a conclusion to the research through design phase, this section utilizes the language of Warell's perceptual product experience framework as a basis for examining the strengths and weaknesses of contemporary PPE and apparel products. This exercise takes advantage of the researchers qualitative understanding of snowboarders and snowboard culture gleaned in the previous research methods, and aims to identify the following:

- Identify experiential needs not being met by existing products
- Highlight positive attributes of apparel products which may provide a basis for improving the user-product experience with PPE products.

The table on the following pages presents two clusters of product images, representing a range of PPE products and snowboarding apparel.



Figure 97 Visual Analysis of Professional Snowboarder

PPE Vs Snowboarding Apparel

Product Examples



Impression

- A lack of colour and dominant characteristics means most designs fail to stand out.
- With the exception of the *POC* product, designs are generally un-interesting, lacking detailing and sophistication.

- Despite the vast number of snowboarding brands and products available, designs stand out with bold colours, unique patterns and original shapes.
- Designs are visually interesting, with detailing, use of varied materials and sophisticated form consideration.

Appreciation

- While varied in form and function, designs generally fail to provide sufficient originality to inspire appreciation.
- With the exception of the *POC* product, designs lack consideration of the appreciation principals.

- Each winter season represents an original range of products, maintaining an effective balance between familiarity and originality.
- Designs often intentionally break principals of appreciation to great effect: While Warell (2008) suggests we generally prefer simple designs, in snowboarding apparel, products often utilize complex patterns, asymmetrical cuts, colour breaks and non-functional detailing to intentionally confuse designs and add visual interest. The Burton one-piece suit presented above is a good example, almost devoid of detailing, the design utilizes a nauseating pattern of blurred 'pixels'.

Top Left: **Figure 98** PPE products

Top Right: **Figure 99** Snowboarding apparel

PPE Vs Snowboarding Apparel		
Emotion: <i>Instrumental</i>	<ul style="list-style-type: none"> • Designs meet two instrumental needs: <ul style="list-style-type: none"> • To reduce the risk of injury • To bring confidence while riding (a bi-product of feeling protected) 	<ul style="list-style-type: none"> • Designs fulfill a number of instrumental needs: <ul style="list-style-type: none"> • They empower users to make a statement about their individuality • They camouflage the users identity allowing the reinvention of a personal avatar. • They often enhance the users ability to jump and perform tricks. • Particular models/designs can advertise to others on the skifield their commitment/dedication to their sport and inspire admiration, e.g., signature range, limited edition, expensive brands or the latest designs.
Emotion: <i>Aesthetic</i>	<ul style="list-style-type: none"> • Products (even <i>Burton's</i> own) are isolated from contemporary snowboarding fashion themes/styles, and are therefore unlikely to inspire emotions like attraction or desire. 	<ul style="list-style-type: none"> • Products fit within a constantly evolving series of snowboarding styles or themes which provide sufficient variety to allow for varied attitudes and personal tastes. These products are evidently highly desirable to this demographic.
Emotion: <i>Social</i>	<ul style="list-style-type: none"> • When not compulsory, safety products tend to be worn by beginners, conservative or older users, not the trendy, image conscious riders in the park or professional 'role model' riders presented in magazines - consequently, PPE products are often associated with these 'uncool' users. 	<ul style="list-style-type: none"> • Professional/sponsored riders who typically represent the riders presented in snowboarding magazines and movies present the latest unique designs, eliciting admiration for these products.
Recognition	<ul style="list-style-type: none"> • Products are readily recognisable as protective products however designs lack snowboarding specific signifiers - the same products could apply to skateboarding or skiing. 	<ul style="list-style-type: none"> • Products are readily recognisable as snowboarding products - both through their styles and characteristics, as presented in section 5.2 <i>Fashion in Snowboarding</i>.
Comprehension	<ul style="list-style-type: none"> • Product operation is generally simple to comprehend, due to use of simple clips and fasteners, e.g., velcro. 	<ul style="list-style-type: none"> • Products are sometimes complex to operate with adjustments hidden or non-standard for visual effect. These often require instruction or learned semantics - how to correctly tighten a binding for example.

6.0 Design Criteria

The 'research for design' section served to compile and analyze data from context review and immersive research, identifying a series of design criteria as a basis for the 'research through design' phase. This section presents these criteria in a table format, with individual criteria rated either 'required', 'highly desirable' or 'moderately desirable' depending on their perceived value to the project.

6.1 Experiential Design Criteria			
Importance	Required	Highly Desirable	Moderately Desirable
Impression			
Design stands out from other similar products	●		
Design is visually interesting, incorporating characteristic features and attributes: It makes a fashion statement.	●		
Appreciation			
Product styling represents a leap beyond contemporary products and styles.	●		
Product experience stimulates as many senses as possible, while maintaining a consistent message.		●	
Emotion			
Design reflects basic snowboarding instrumental emotional needs: to make a statement about ones identity, to ride and jump better (and for longer), to be admired and respected.	●		
Product styling acknowledges contemporary themes and attitudes in snowboarding - e.g., <i>contemporary grunge, future-tech, luxury or visual noise</i>		●	
Products design, detailing and materials inspire confidence in products quality and durability.		●	
Recognition			
Design utilizes forms of ornamentation as signifiers. E.g., asymmetric design, bold patterning, accentuated fixtures, non-fuctional detailing or other original elements	●		
Products primary function is not immediately recognisable as 'safety'.		●	
Product type is either recognisable as a unique product category, or part of an existing, accepted genre.		●	
Products intended user is recognisable as a male, experienced snowboarder in late-teens or early 20's.			●
Product draws associations with park-riding and jumping.			●

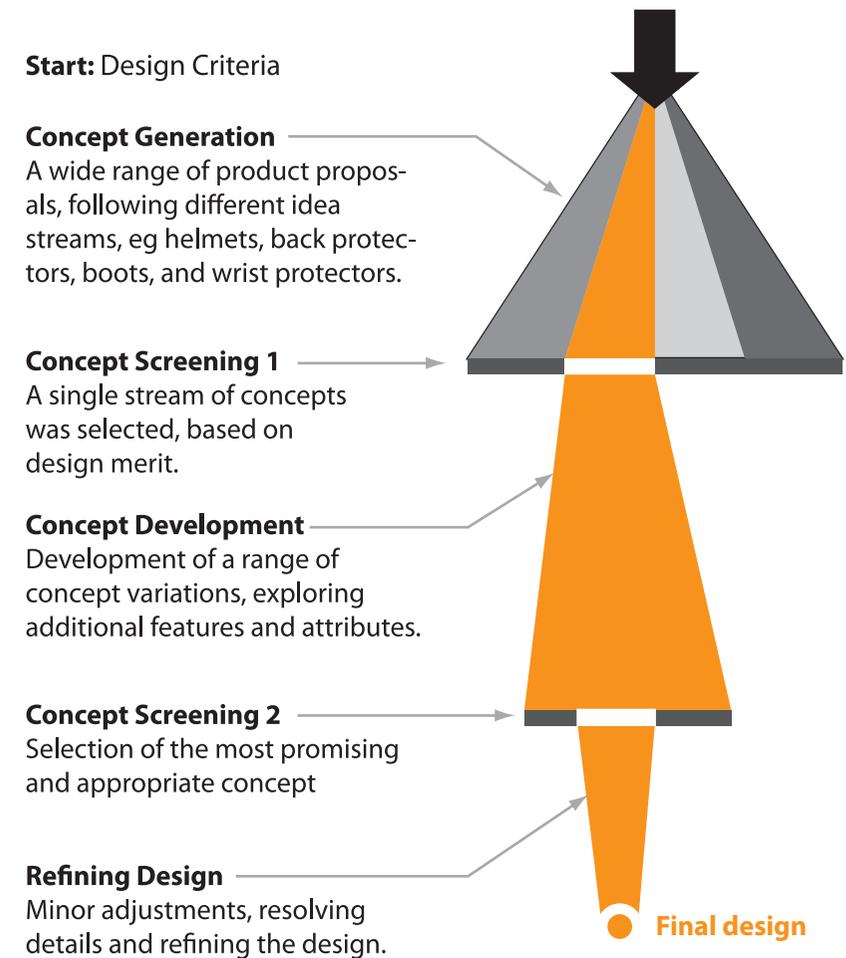
6.1 Experiential Design Criteria			
Importance	Required	Highly Desirable	Moderately Desirable
Comprehension			
Product semantics make use and adjustment intuitive to new users.		●	
Association			
Visual dis-association from existing 'uncool' PPE products.	●		
6.2 Performance Design Criteria (Design Limitations)			
Product does not encumber rider with excessive weight	●		
Product does not restrict riders ability to bend forward and touch toes, crouch, and sit.	●		
Product does not restrict arm motion in such a way which limits the riders ability to balance with them.	●		
Design mitigates fall-related impacts on at least one of the following body areas:			
Head – impact protection, particularly on the rear of the skull.			●
Shoulders – impact mitigation reducing risk of fractures to shoulder blade and clavicle.		●	
Spine – both rigid protection to prevent over-extension and impact protection to prevent blunt impacts.		●	
Knee and Ankle – mitigation of impact force during landings, reducing dynamic loading on AC ligament.		●	
Torso/limb protection from non-serious falls.		●	
Product is easily adjustable to suit varying body shapes and sizes.	●		
Product does not exclude the use of other snowboarding apparel products such as helmets, backpacks, hydration bladders, etc unless it replaces them.		●	

7.0 'Research Through Design'

The purpose of this phase was to generate affective and experiential features improving the desirability of PPE products.

In response to this objective, research began by exploring a wide range of product typologies. Utilizing design criteria as a screen, research was then narrowed to a single product typology, as illustrated in figure 100. This approach added complexity to the design research, but provided freedom to explore new product typologies and make a decision based on design merit, rather than established conventions.

Figure 100 Overview Of 'Research Through Design' Process

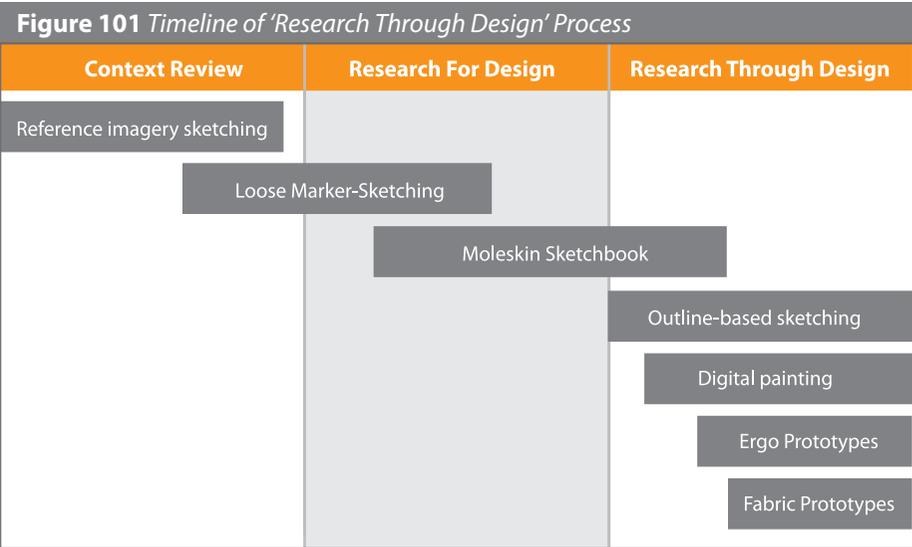


7.1 'Research Through Design' Methods

To maximize efficiency and creativity during the project, a number of creative approaches and mediums were utilized.

- Reference imagery sketching
- Loose marker-sketching
- Portable sketchbook
- Outline-based conceiving
- Digital painting
- Ergonomic prototypes
- Fabric prototypes

While these methods fit under the 'research through design' phase, in reality they ran in parallel to the earlier research phases, drawing inspiration as the project progressed. Figure 101 shows the order these methods were utilized, while the table opposite expands on these methods, identifying their unique advantages and disadvantages.



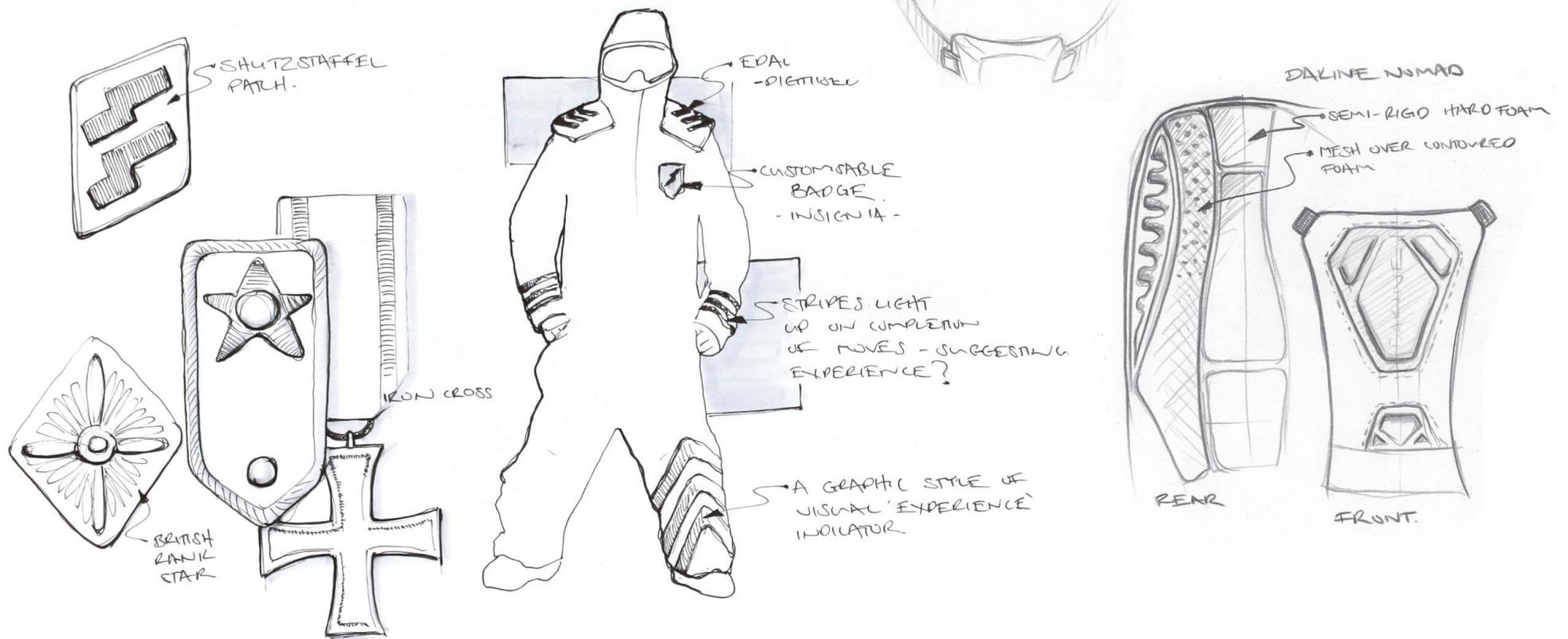
Description Of Approach	Example Image	Drawing Medium	Quality	Advantages	Disadvantages
<p>Reference imagery sketching. A method of studying existing products to explore forms and interesting details.</p>		Pen/A3 paper	Representational	Helps the designer develop a feeling for a particular style or theme. Useful for recording interesting forms and details from other products.	Much slower than a photograph or scan.
<p>Loose marker-sketching. Loose, expressive drawings on large sheets of paper using a light, thick marker.</p>		Thick Marker - 20% Grey / A1 Paper	Highly Expressive	Large paper-size and light markers encourage an expressive drawing style. Layering of light marker allows concepts to evolve through multiple overlapping sketches. Sketches capture emotive qualities.	Sketches are highly subjective and can be hard to translate into an actual concept.
<p>Moleskin sketchbook A carry-everywhere Moleskin sketchbook used to record concepts and observations during research phase.</p>		Pencil/A5 paper	Explorative	Always present when required.	Limitation of small page size and fine medium excludes expressive design.
<p>Outline-based concepting. Concept generation over a basic jacket outline.</p>		Marker/pencil/A3 paper	Exploring detailing	Allows drawing to focus on the jacket detailing rather than the correct form/dimensions. Quick and simple View are identical, allows simple concept comparison.	Forces the designer to work within an existing jacket form.
<p>Digital Painting. Utilizing a wacom tablet and Photoshop software to visualise sketch concepts.</p>		Photoshop software, Wacom tablet	Representative	Very fast Allows quick application of patterns and colours. Useful for resolving design details.	Requires practice to be effective. Drawing over a basic silhouette can limit creativity.
<p>Ergonomic prototypes. Quick models to evaluate ergonomics of designs in parallel with sketching.</p>		Fabric, webbing, foam, pins	Evaluative	Facilitates evaluation of concepts.	Limited to functional evaluation.
<p>Fabric prototyping Translating 2D details into 3D fabric prototypes to verify concepts and resolve manufacture of details.</p>		Fabric, thread	Exploring detailing	Allows exploration in 3-dimensions and enables full size evaluation of form and detail.	Takes time and external resources.

7.2 Concept Generation

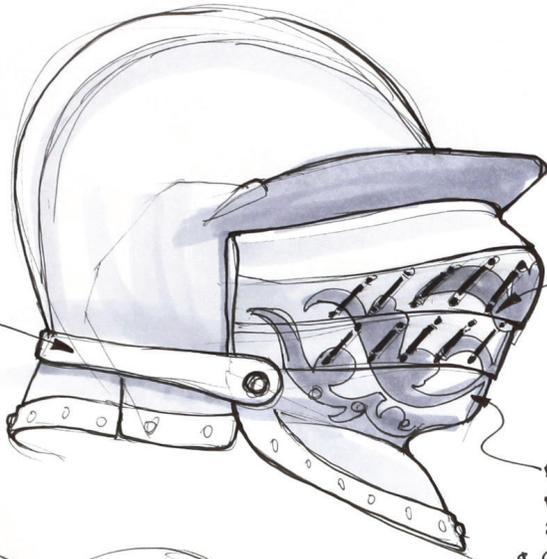
The following section presents an overview of the 'research through design' phase, highlighting key steps of the process as it developed.

Reference imagery sketching

These sketches were generated early in the project before a particular product typology had been selected. To begin with, they explored a range of themes including medieval armour, military insignia and modern military hardware, applied to potential snowboarding products.



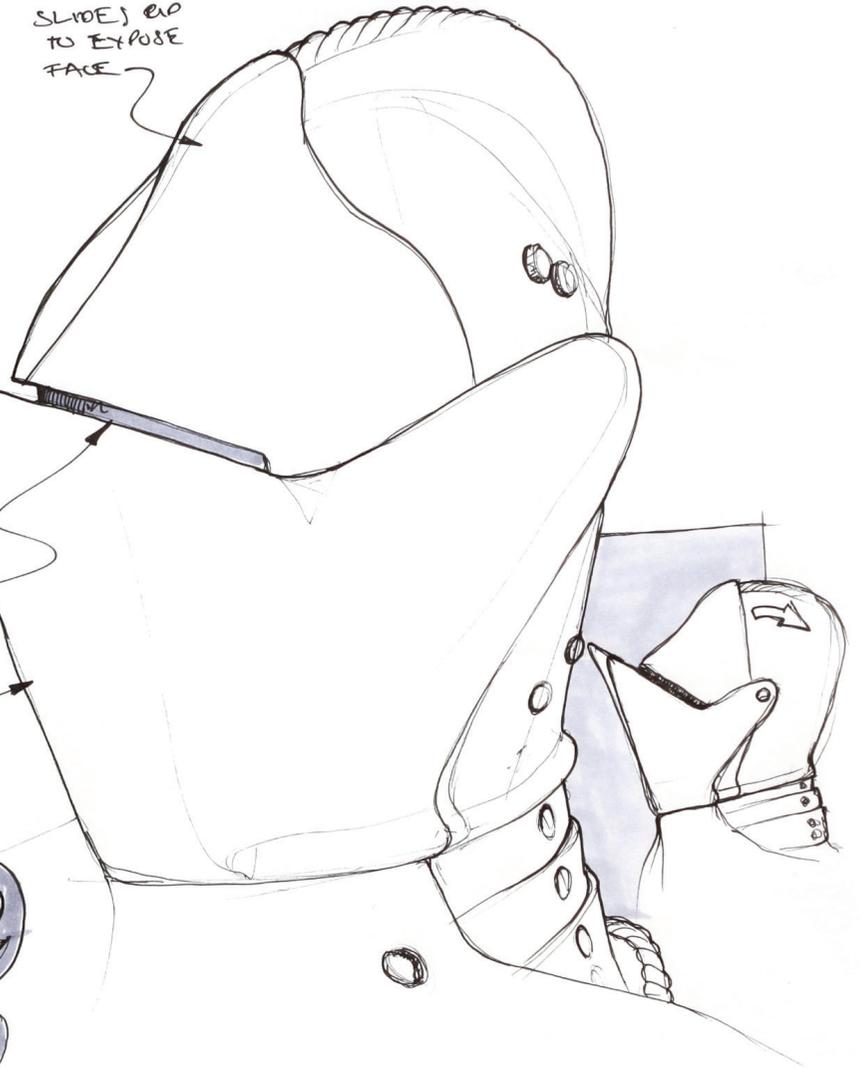
LEATHER STRAP HOLDS MASK IN PLACE



THE FACE MASK IS SIMILAR TO THE DESIGN WORN BY SHANN WHITE

BROUQUE STYLE PATTERN VERY SIMILAR TO POLCE & GABBANA?

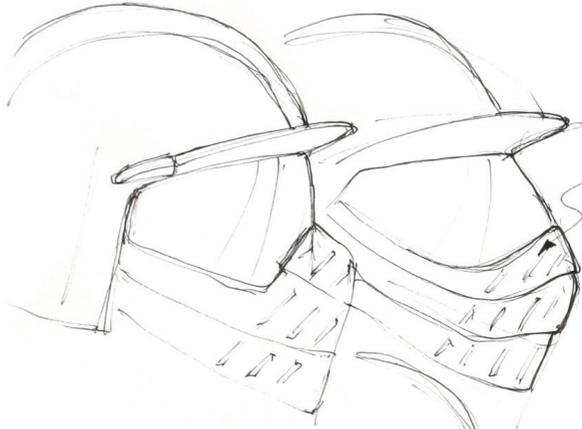
VISOR PART SLIDES UP TO EXPOSE FACE



VISION SLOT

BLADE LIKE FRONT

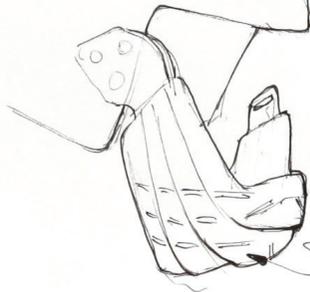
FACE COVER INTEGRATED INTO HELMET

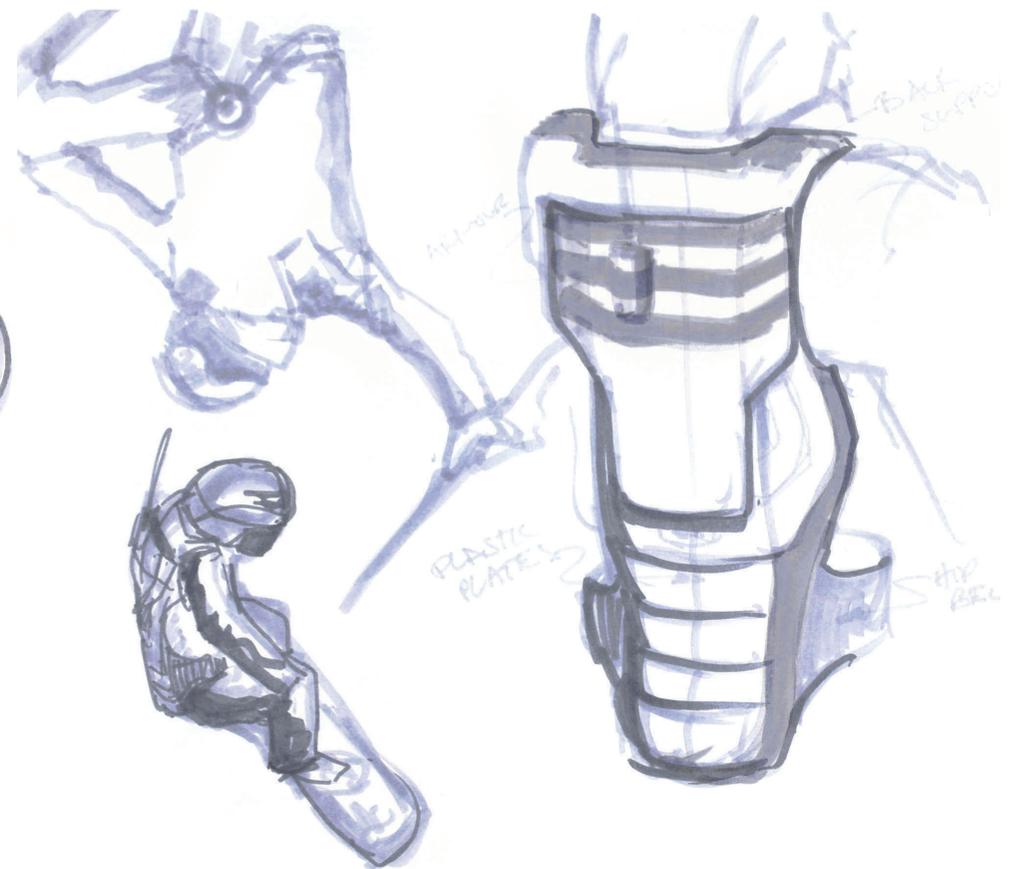
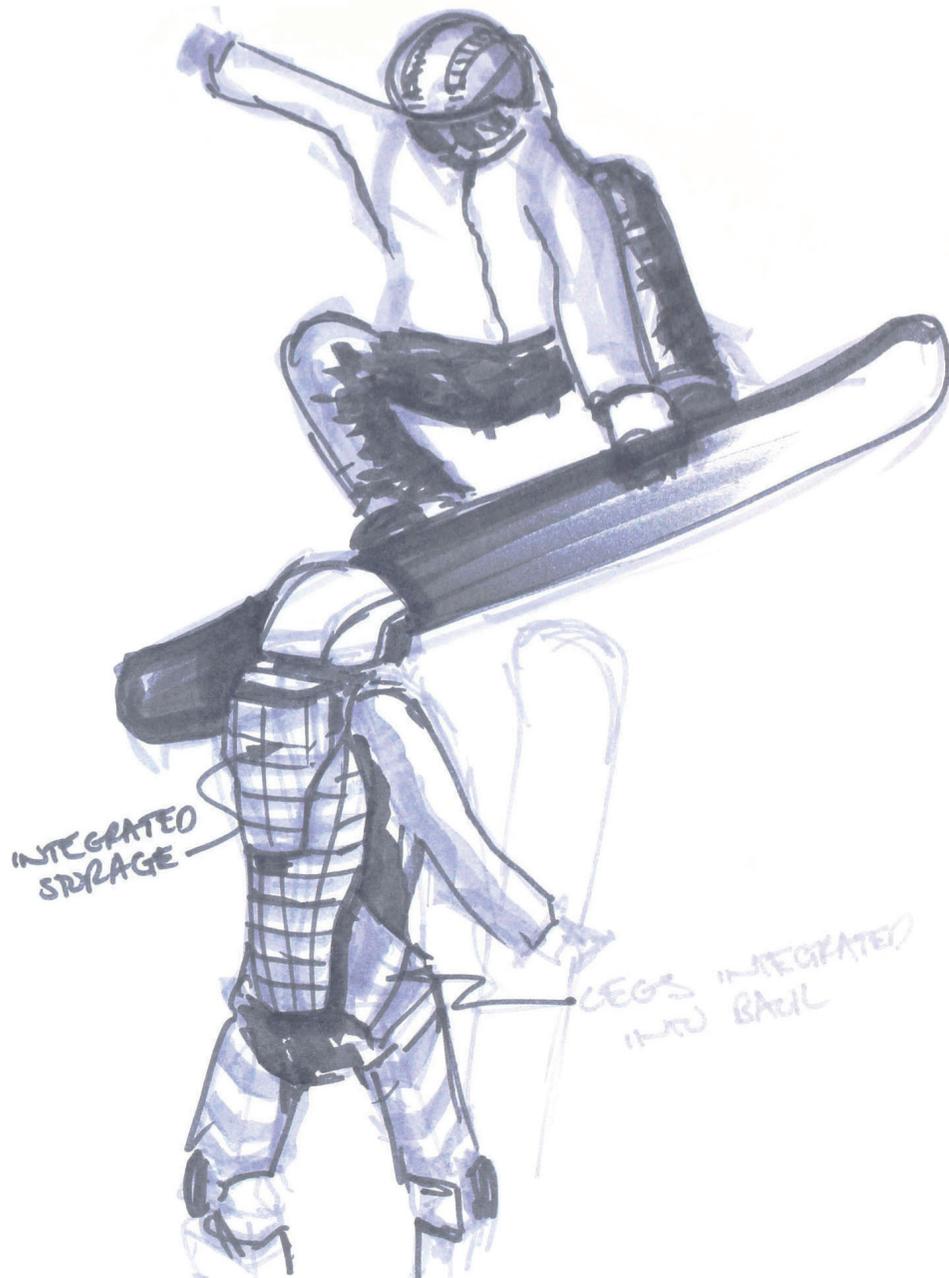


PATTERN FROM AUSTRIAN HELMET CIRCA 1550.



REMOVABLE FACE COVER - PROPS OUT LIKE O2 MASK IN PILOTS HELMET.



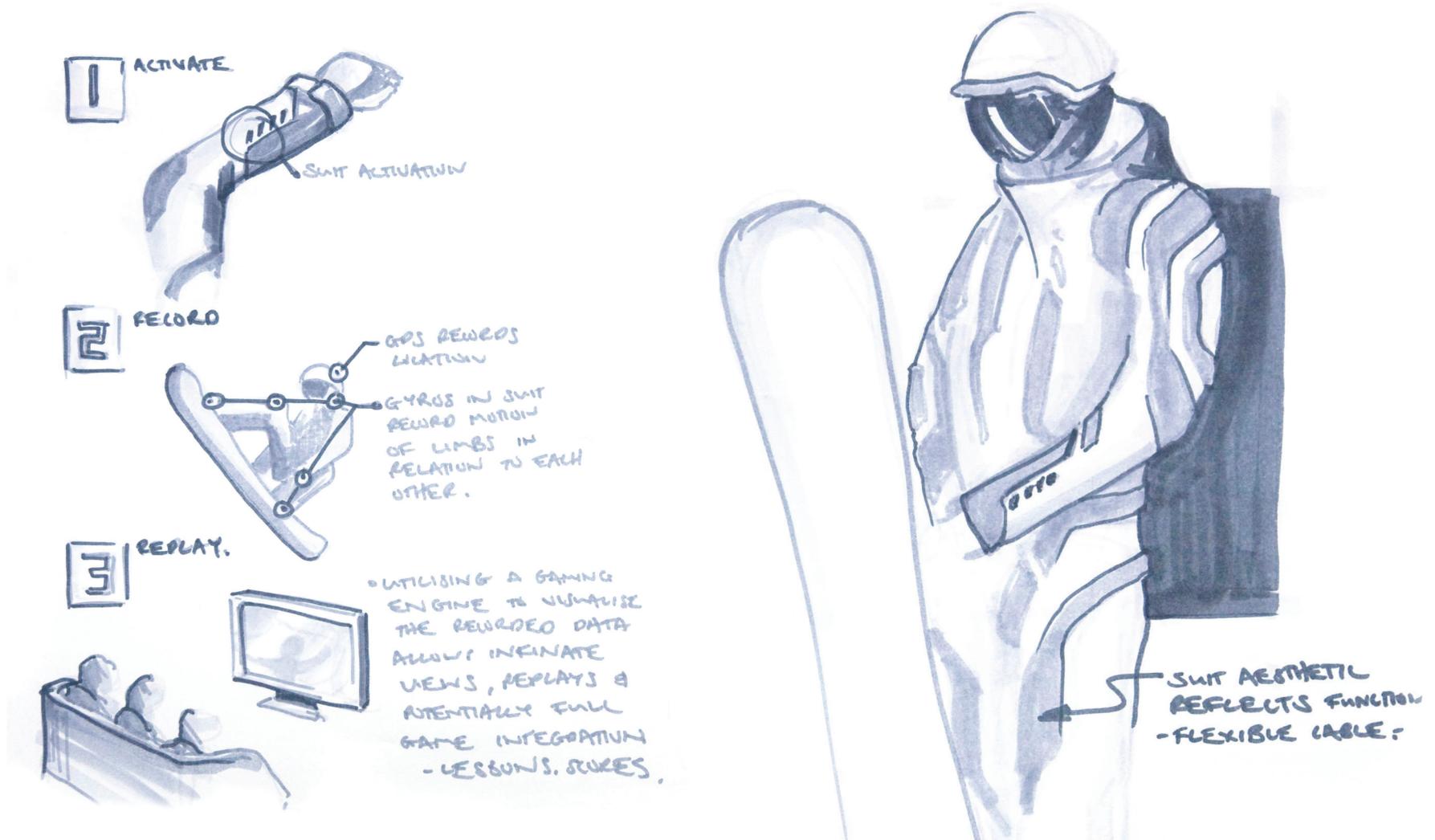


Loose Marker Sketching

This phase sought to generate as many varied and unconventional concepts as possible. The individualistic nature of snowboarders was a clear requirement for the project, so concepts initially focused on highly expressive themes. This section presents the most promising concepts, with brief descriptions of the concept behind each...

Concept 1: Pack + Back Protector

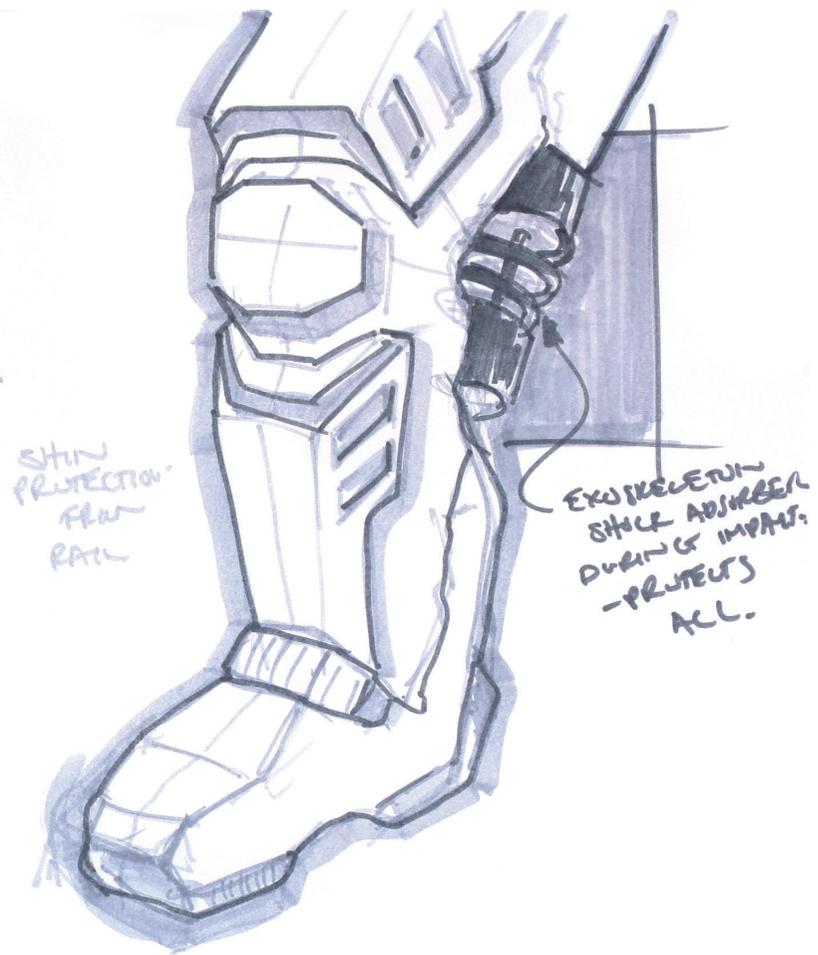
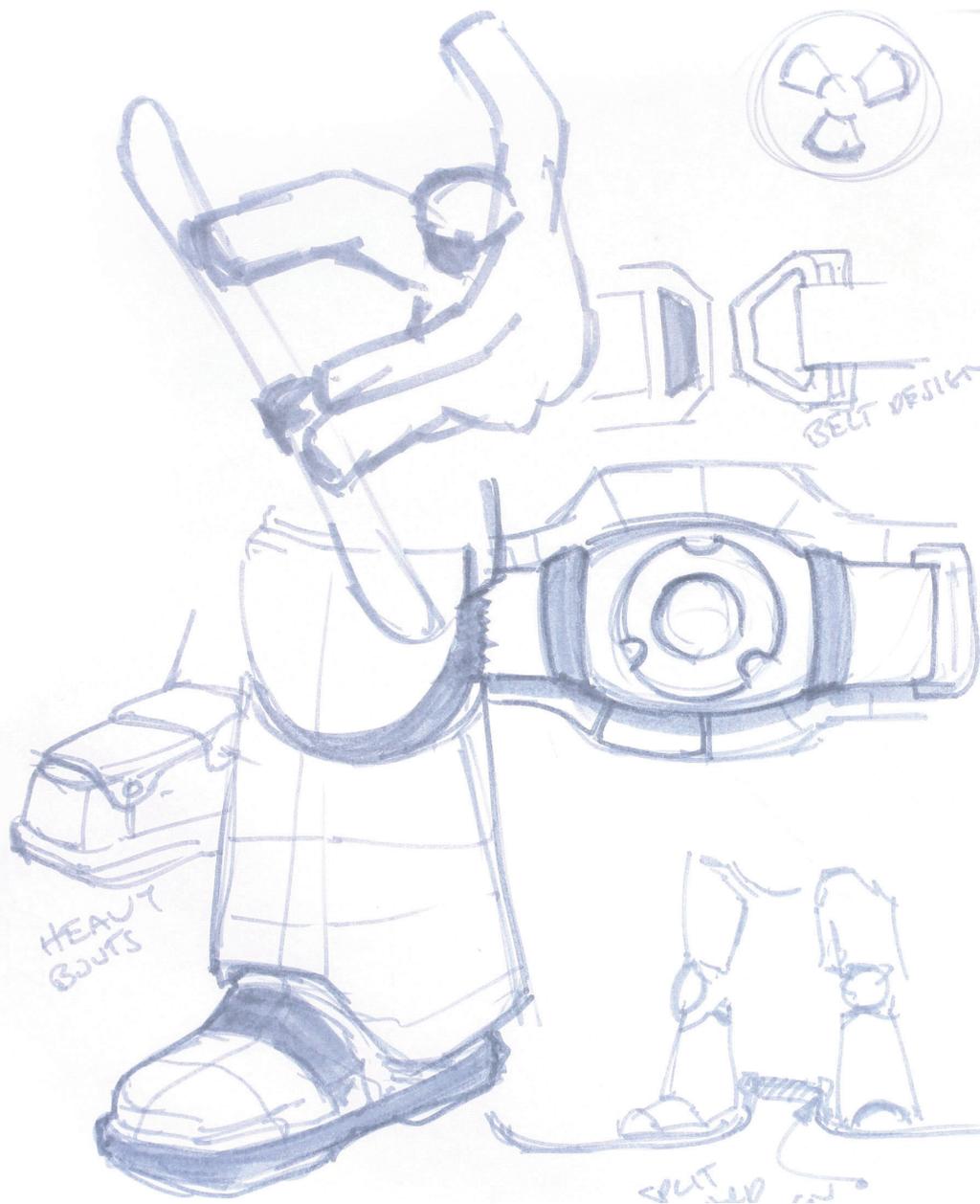
This concept explored the possibility of incorporating a spine projector into a pack, upgrading an existing product to provide protection.



Concept 2: Convergence

The crossover of computer games and board-sports has been commercially exploited in a series of successful video games such as Tony Hawk pro-skater. This concept represents the next step in this convergence, utilizing motion detectors similar to those found in the Nintendo Wii controller intergrated into a suit. Wearing this suit a rider can record a run, then replay the action on

their video console, utilizing the games rendering engine to turn the data into streaming video. This feedback not only allows learners to watch and improve on their own technique, but also builds upon the social aspect of snowboarding and allows riders to replay each others wipeouts from infinite angles.



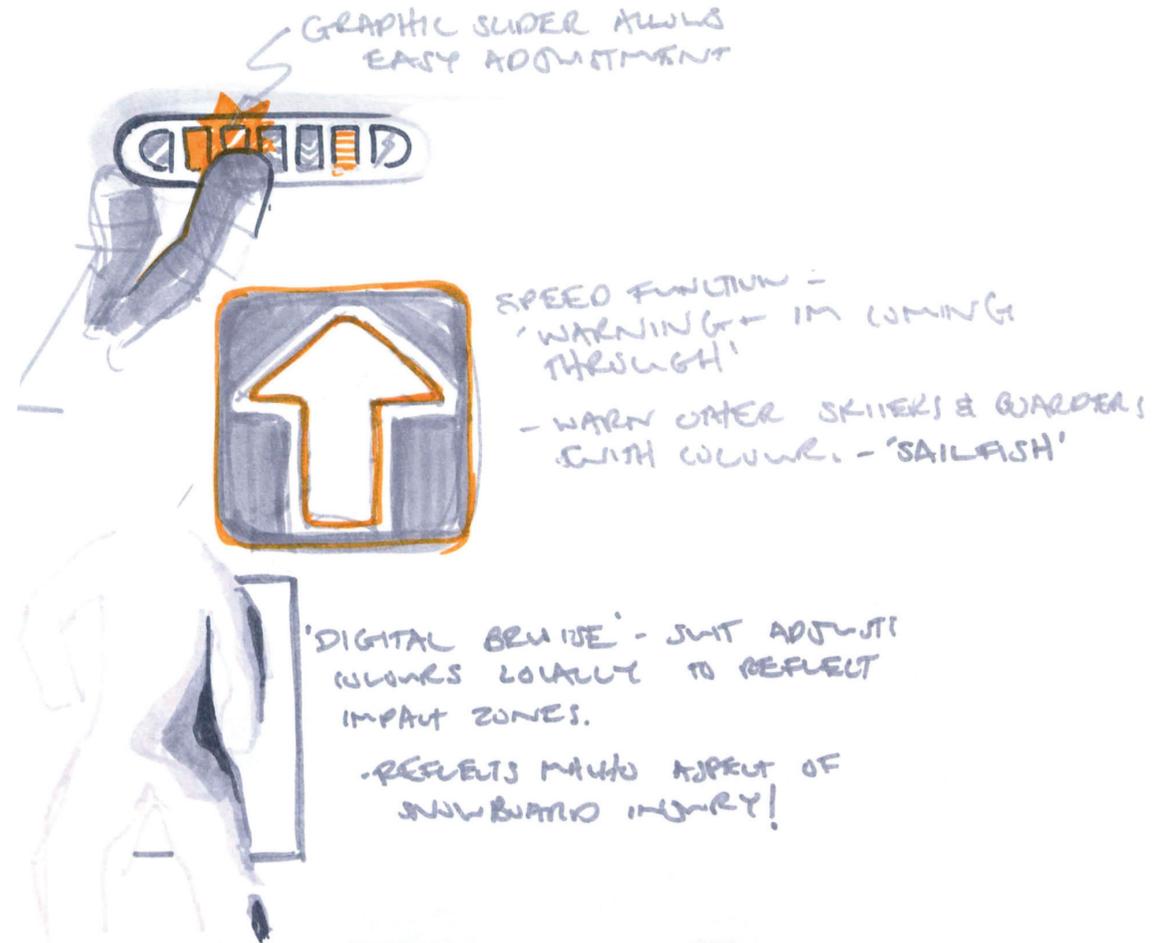
Concept 3: The exoskeleton

Responding to a need for improved knee and ankle bracing, this concept explores the potential for an exo-skeleton boot. This concept builds on the martial styling of existing products, while drawing inspiration from science fiction movies.



Concept 4: Crumple Zones

This design considers applications for dynamic fabrics which can be stiffened to create crumple areas. In application, riding faster would cause the fabric to stiffen, raising fins or a cell-like structure which can then absorb energy in the event of an impact. With a dynamic, visual effect and unique styling, this concept offers an alternative to hidden or integrated protection.



Concept 5: Chameleon suit

In response to snowboarders desire to define their own unique identity, this snowsuit allows users to upload a range of personalized graphics and patterns then switch through them as desired. Riders can switch to a bright neon colour when attempting tricks, then change to white camouflage when they 'wipe-out', to avoid embarrassment.

The capacity to alter suit colour also offers other potential benefits, such as responding to increased speed by brightening the suit colour as a warning or display to other riders. Another possible addition is the Digital Bruise, which recognizes the macho aspect of snowboarding, displaying a bruise pattern on areas of the suit which have adsorbed an impact.

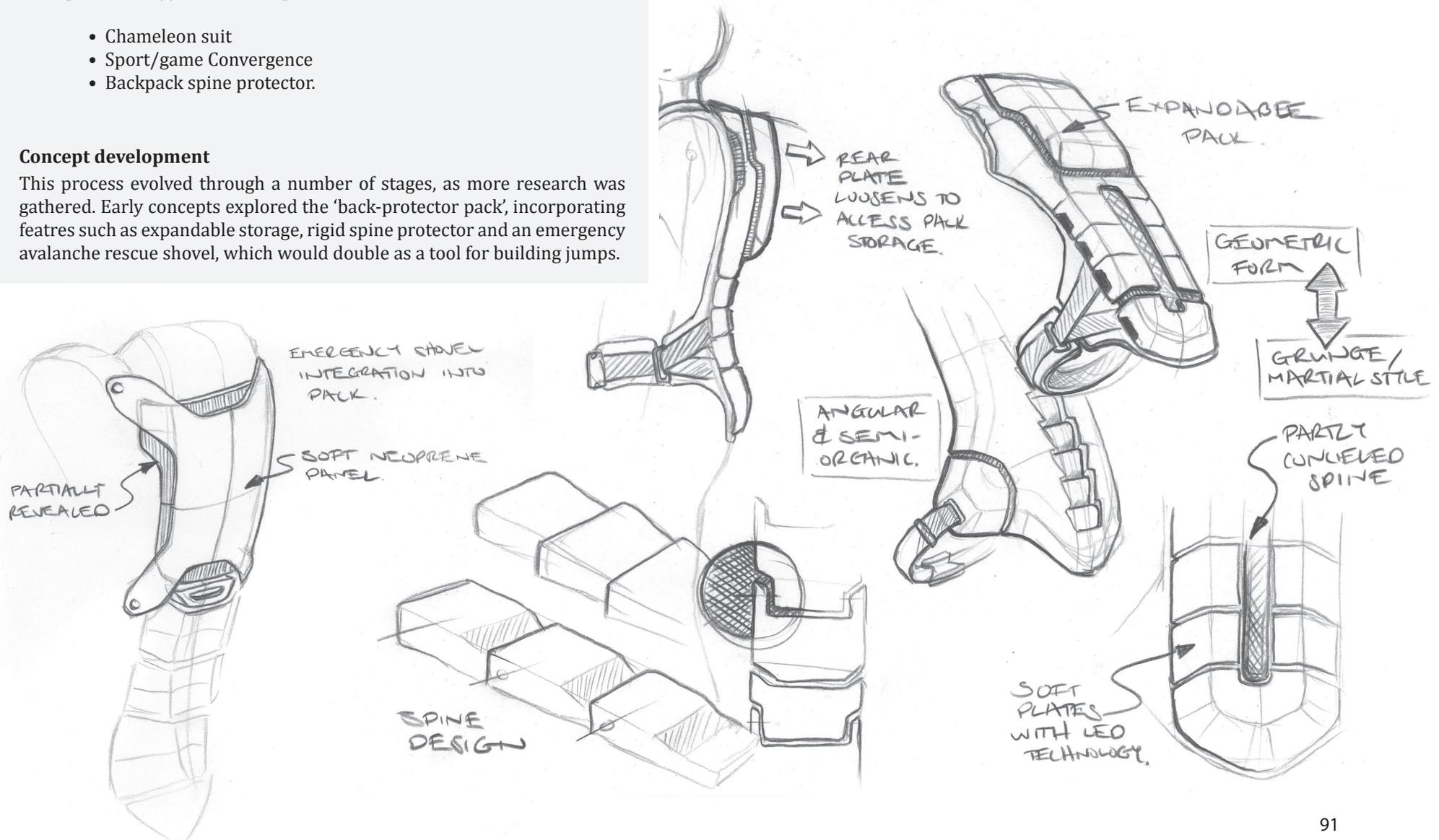
Concept screening

Based on design criteria and feedback from critique sessions, the following concepts were tagged for development:

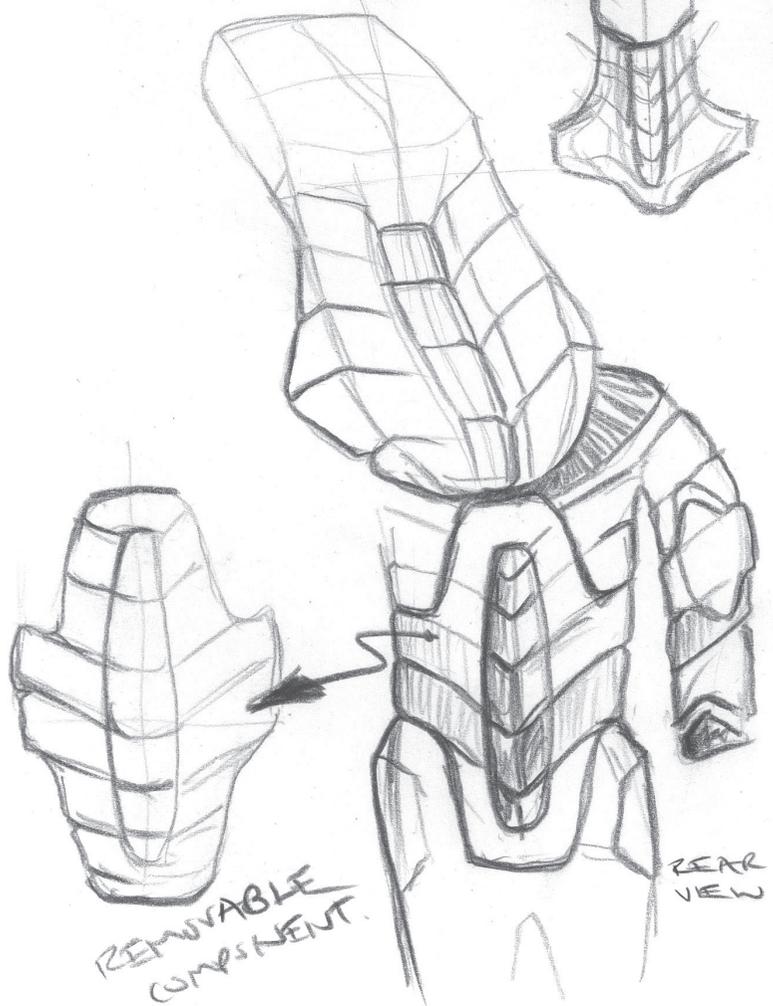
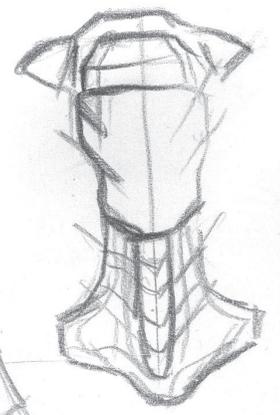
- Chameleon suit
- Sport/game Convergence
- Backpack spine protector.

Concept development

This process evolved through a number of stages, as more research was gathered. Early concepts explored the 'back-protector pack', incorporating features such as expandable storage, rigid spine protector and an emergency avalanche rescue shovel, which would double as a tool for building jumps.

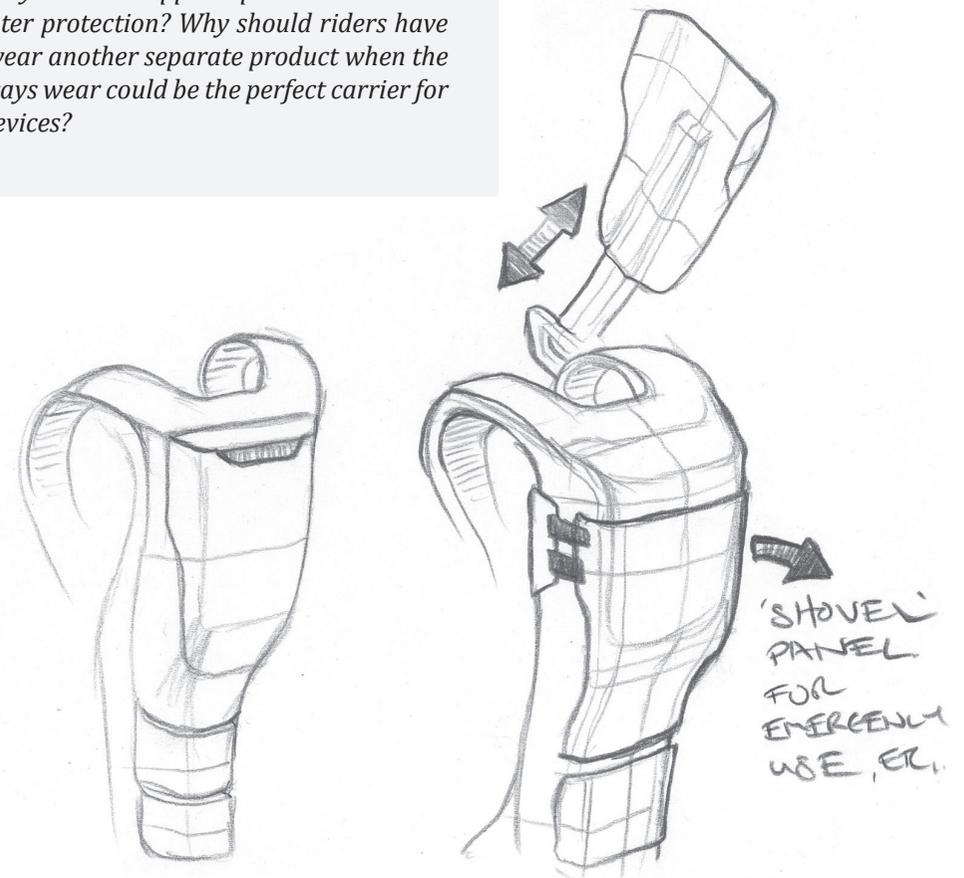


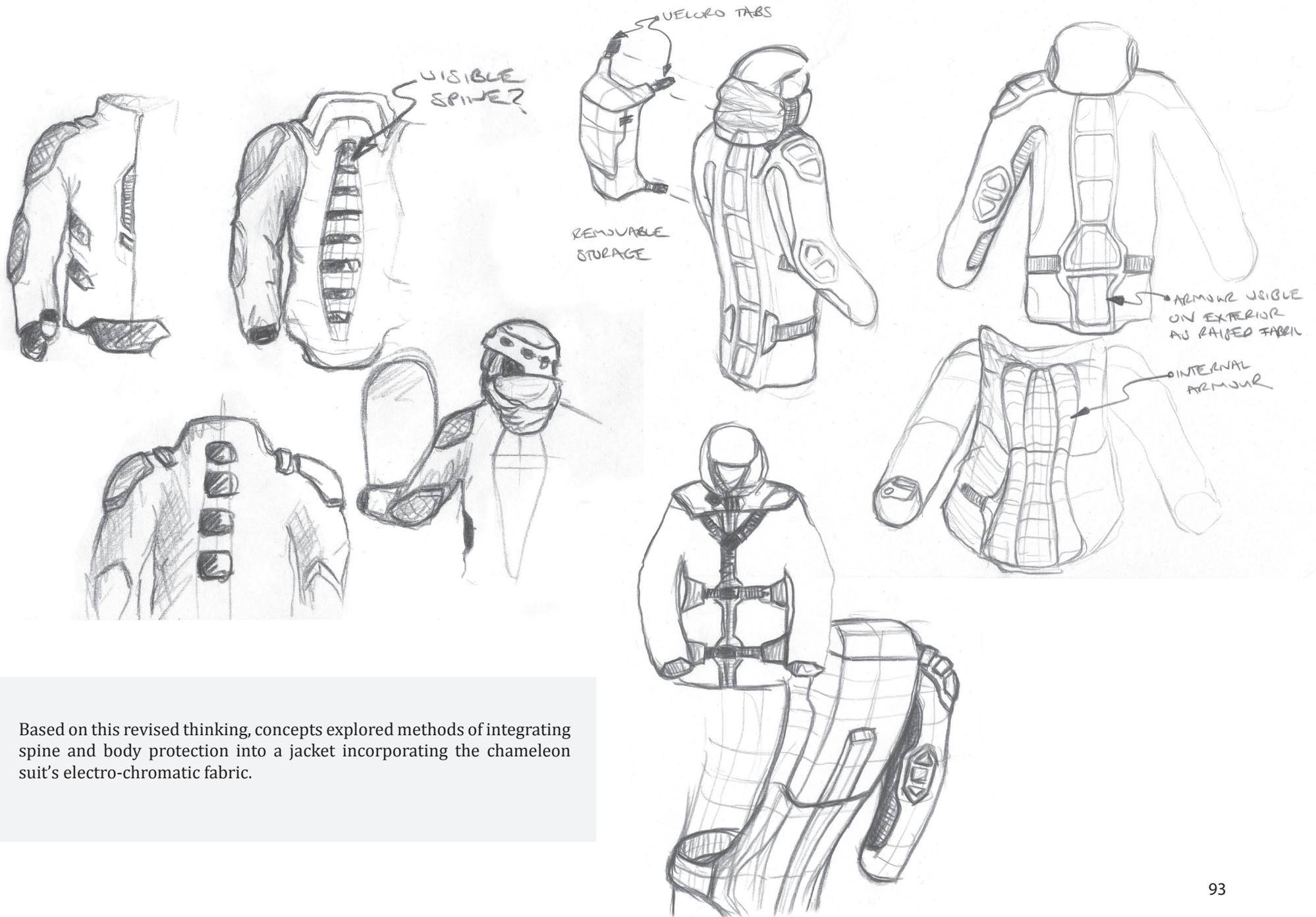
THE PACK AS A COMPONENT OF THE SUIT?



However, skifield research suggested that while a number of users were wearing a pack while riding, a pack integrated protector would greatly limit the products acceptance among those who preferred not to ride with one. At the same time, the researcher began to ask the questions:

Snowboarding jackets are already designed to protect riders from wind, cold and basic abrasion. With the trend towards larger jumps and more injury risk, why shouldn't apparel products evolve to include greater protection? Why should riders have to buy and wear another separate product when the one they always wear could be the perfect carrier for protective devices?





Based on this revised thinking, concepts explored methods of integrating spine and body protection into a jacket incorporating the chameleon suit's electro-chromatic fabric.



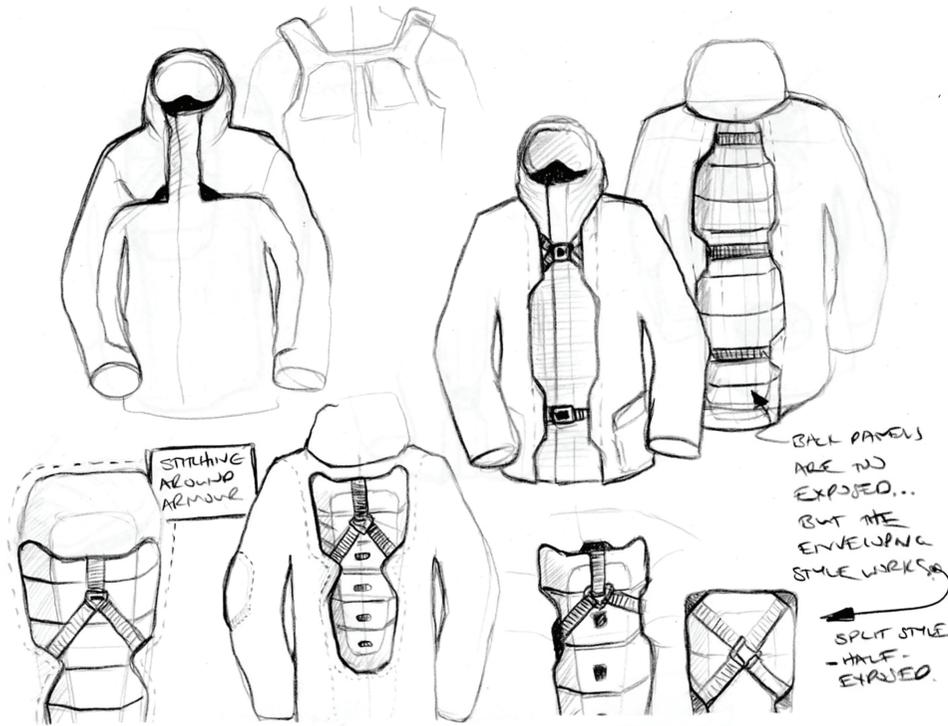


Digital Painting

As a means of quickly adding colour, texture and environment to concepts, expressive digital painting techniques utilizing a wacom tablet and photoshop were explored and practiced. Skills developed through the copying of examples (far left) were quickly translated back onto snowboarders and snowboarding products.

SEMI RIGID HOOD ACTS AS HELMET TO PROTECT BACK OF HEAD
 SOFT PLATES OF COWHIDE FABRIC.
 FLEXIBLE & STRETCHY BLACK FABRIC.





Utilizing quick photoshop painting techniques alongside conventional sketching, a number of concepts were developed and refined into a the concept presented above. This design incorporated a concealed internal harness system to support a partially-exposed spine projector, while retaining a baggy jacket style.





THE CHEST
AREA IS
WORKING

NOT SURE
ABOUT
POCKETS?

MILITARY
STYLE
POCKETS



EXPOSE LOWER
SPINE PROTECTOR?



In parallel to the jackets development, a number of jacket visuals were explored:

- Olive camouflage*
- Digital damage (suit displays 'virtual rips' after falls)*
- Digital bruising*
- Tartan*
- Snow Camouflage*
- Ninja*

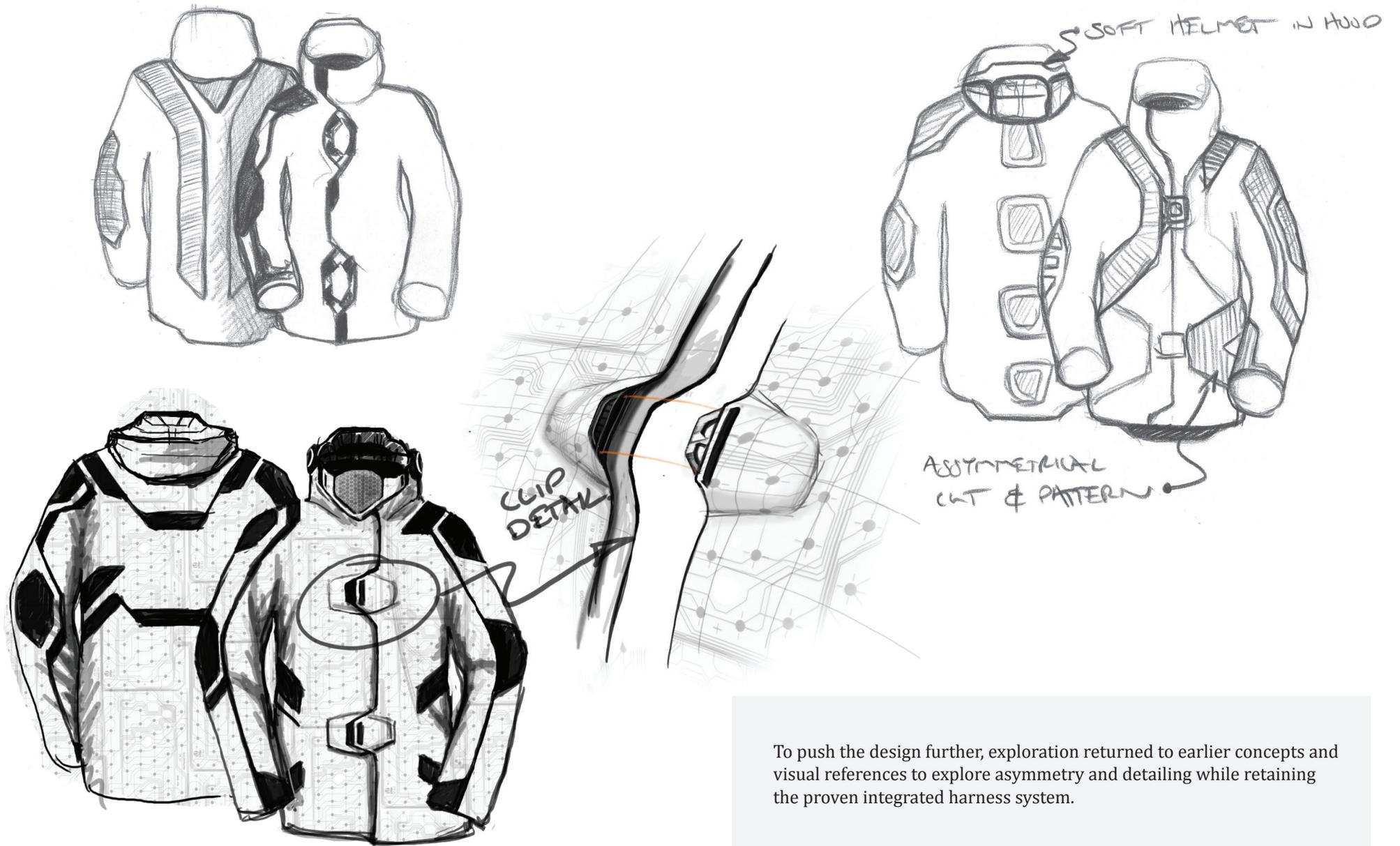
Based on feedback that the earlier design lacked sophistication, a series of concepts explored other variations based on the harness system and spine projector.



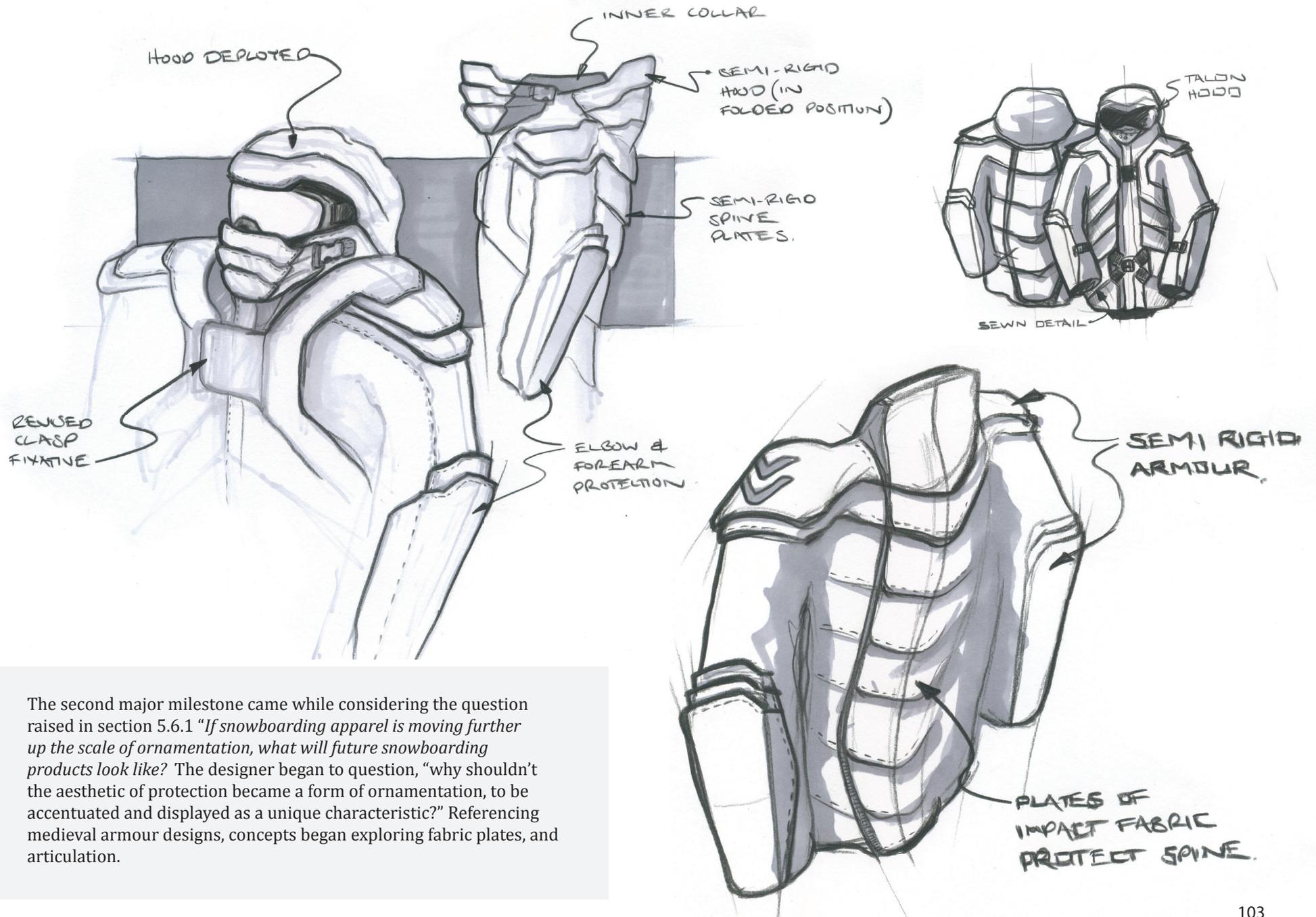
To verify the harness system would not limit the users ability to sit, crouch and touch their toes, a prototype was constructed from nylon webbing and pack components.

By this stage in the jackets development, the hard components of the jacket had been internalised, hiding the harness system and creating a more sophisticated appearance. However, the new design now appeared too familiar, looking similar to many contemporary jackets.

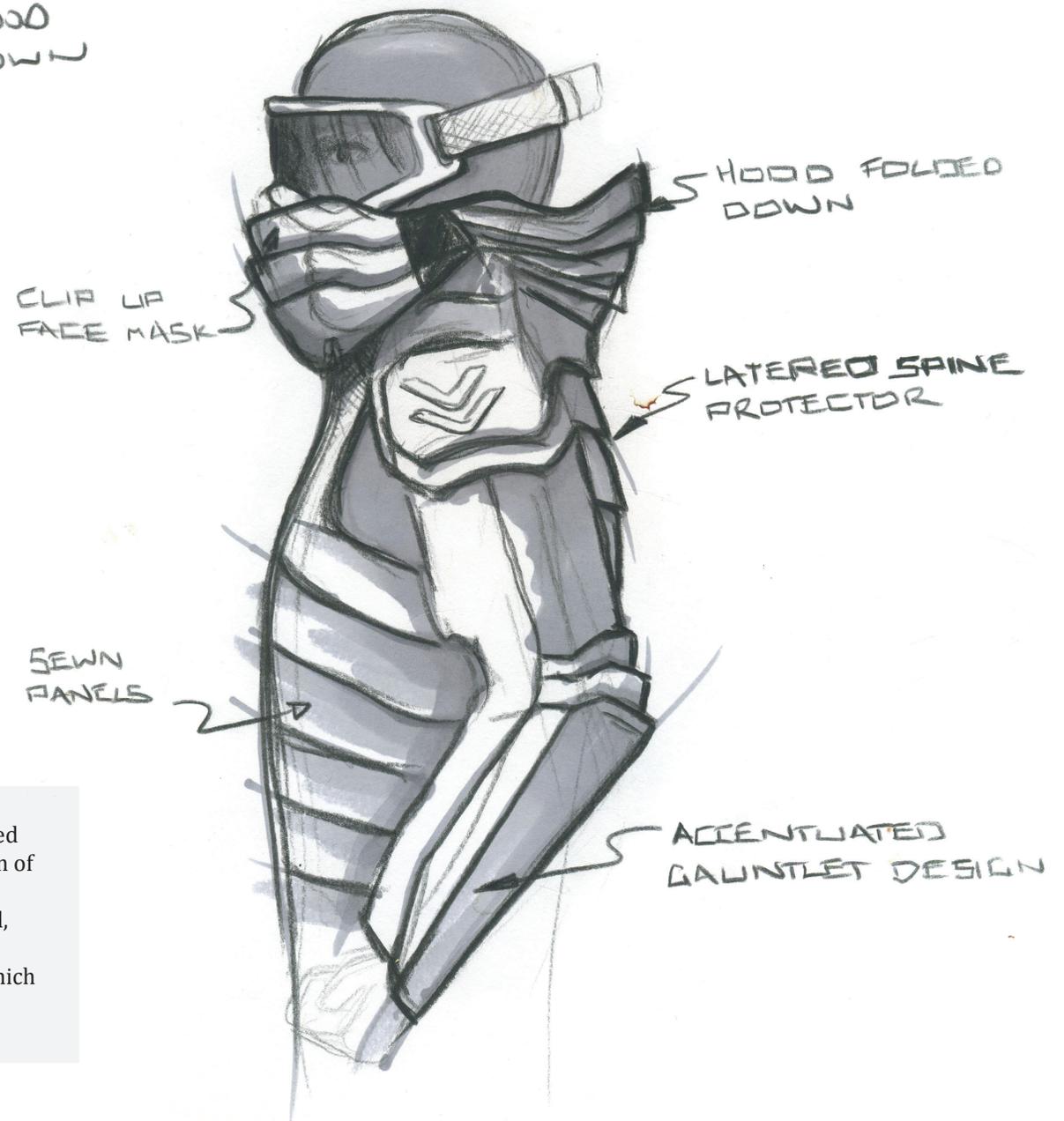
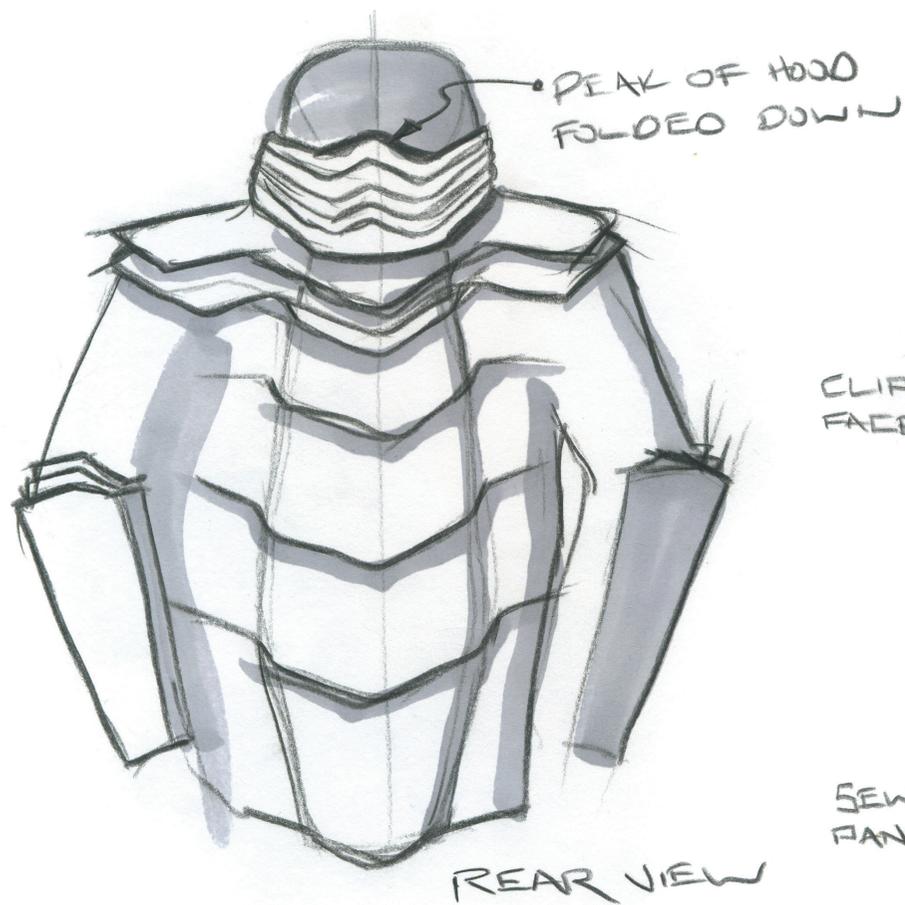




To push the design further, exploration returned to earlier concepts and visual references to explore asymmetry and detailing while retaining the proven integrated harness system.

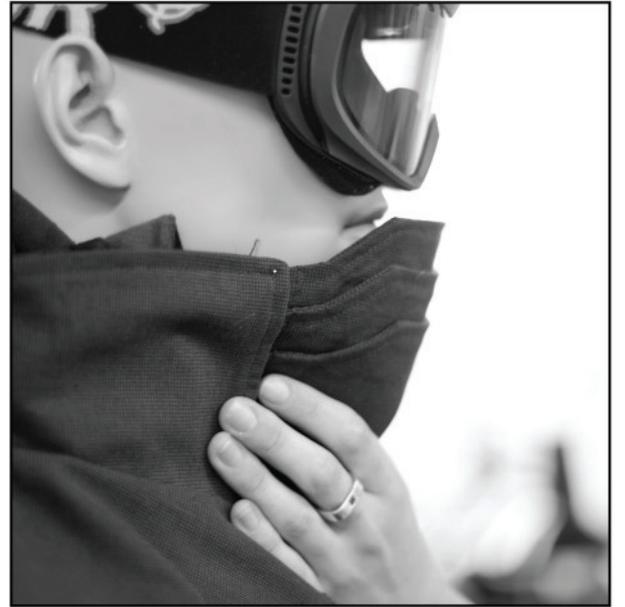


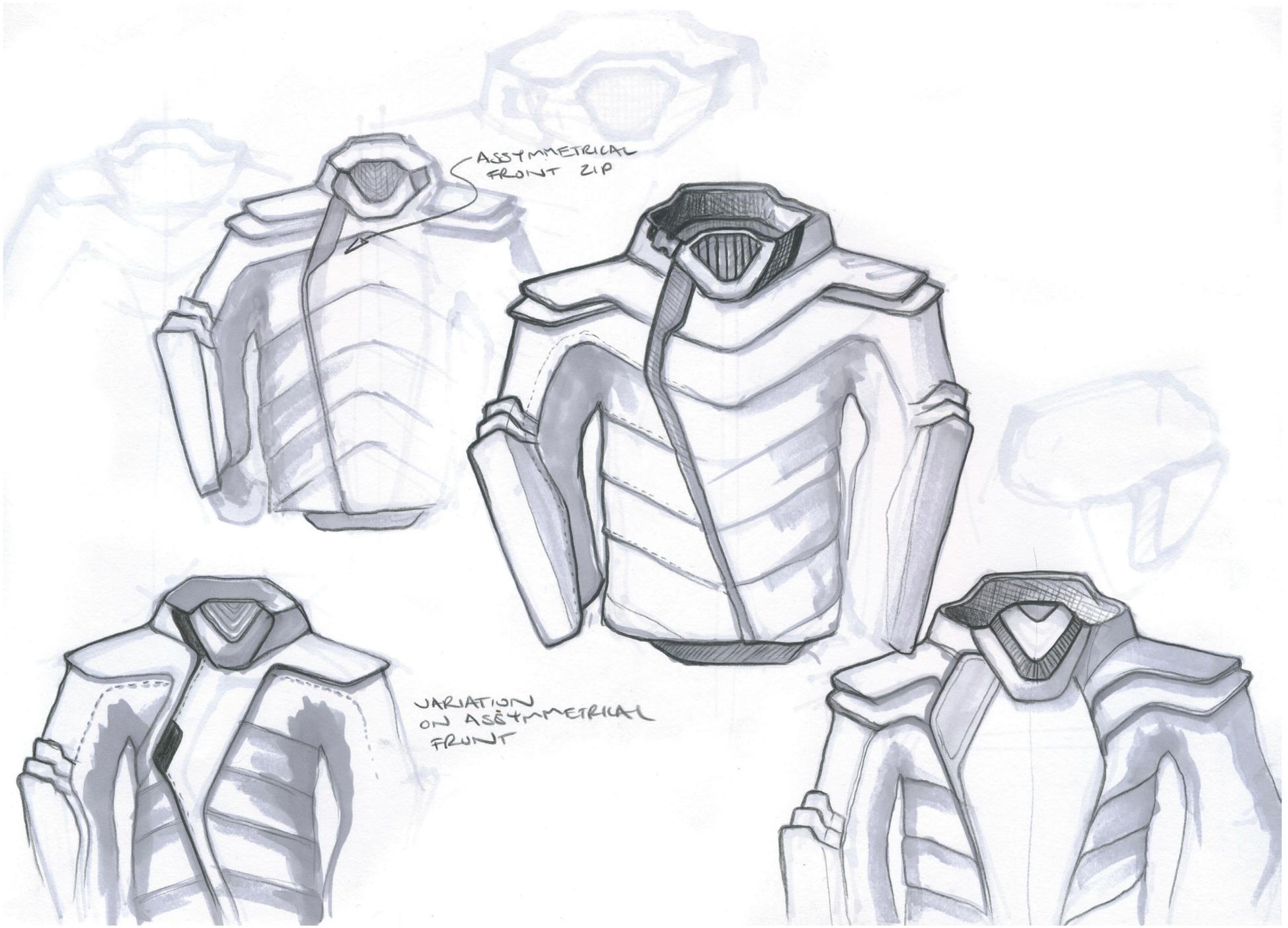
The second major milestone came while considering the question raised in section 5.6.1 “If snowboarding apparel is moving further up the scale of ornamentation, what will future snowboarding products look like? The designer began to question, “why shouldn’t the aesthetic of protection become a form of ornamentation, to be accentuated and displayed as a unique characteristic?” Referencing medieval armour designs, concepts began exploring fabric plates, and articulation.



In parallel to sketching, fabric prototypes were generated and utilized in a 3 dimensional collage style, exploring details and the integration of the harness.

Through this technique a series of original concepts were developed, embracing the aesthetic of protection: aggressive styling with articulating fabric plates, gauntlets, a clip up face-mask and hood which formed a narrow knights 'helm' style viewing slot.





ASYMMETRICAL
FRONT ZIP

VARIATION
ON ASYMMETRICAL
FRONT

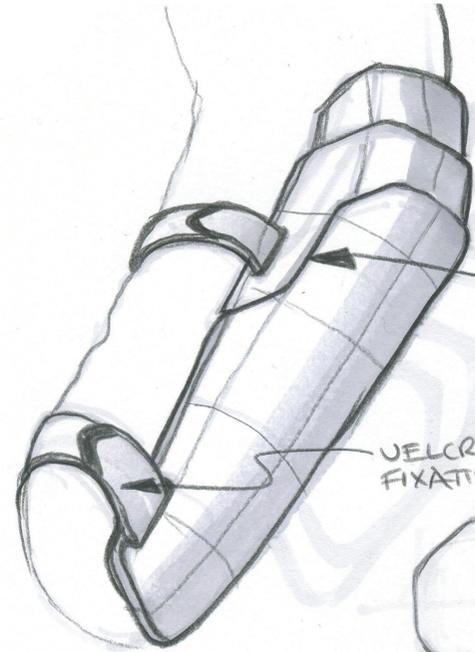
ASYMMETRIC
CLIP DESIGN



FIXED STRAPS

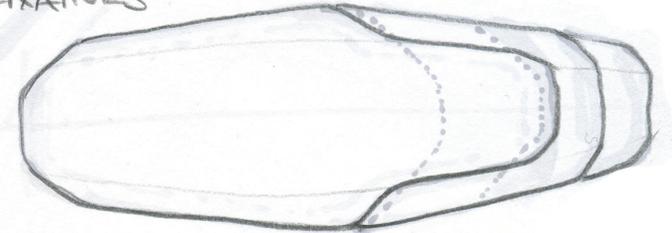
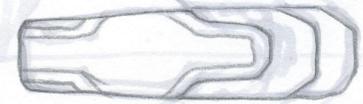
ZIP BEHIND
THE SEAM

CHEST PLATE
OPENS FROM
LEFT SIDE...



VARIATION ON
WRIST GAUNTLET
DESIGN

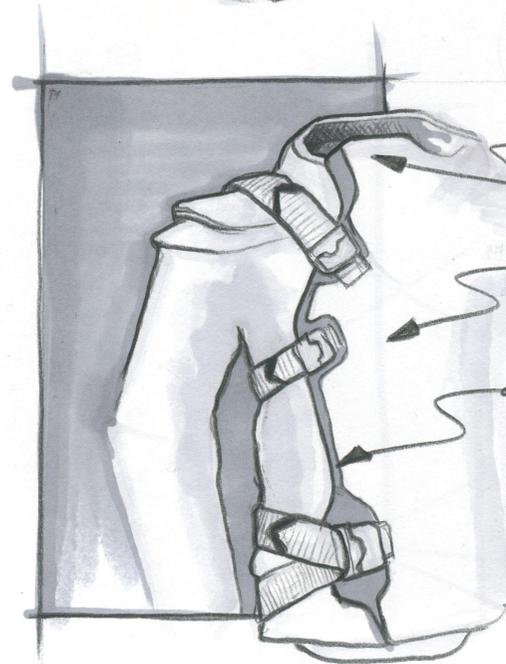
VELCRO
FIXATIVES



CHIN MASK
INTEGRATED
INTO JACKET

ASYMMETRICAL
FRONT

SEMI-RIGID
FABRIC ALONG
EDGE



Based on this new aesthetic, designs began to explore asymmetric designs for the front. Early concepts had struggled with asymmetry due to its incompatibility with the existing harness system, however this was solved by adding clips where the asymmetric break crossed the existing harness, resulting in the 3-clip designs presented on these pages.

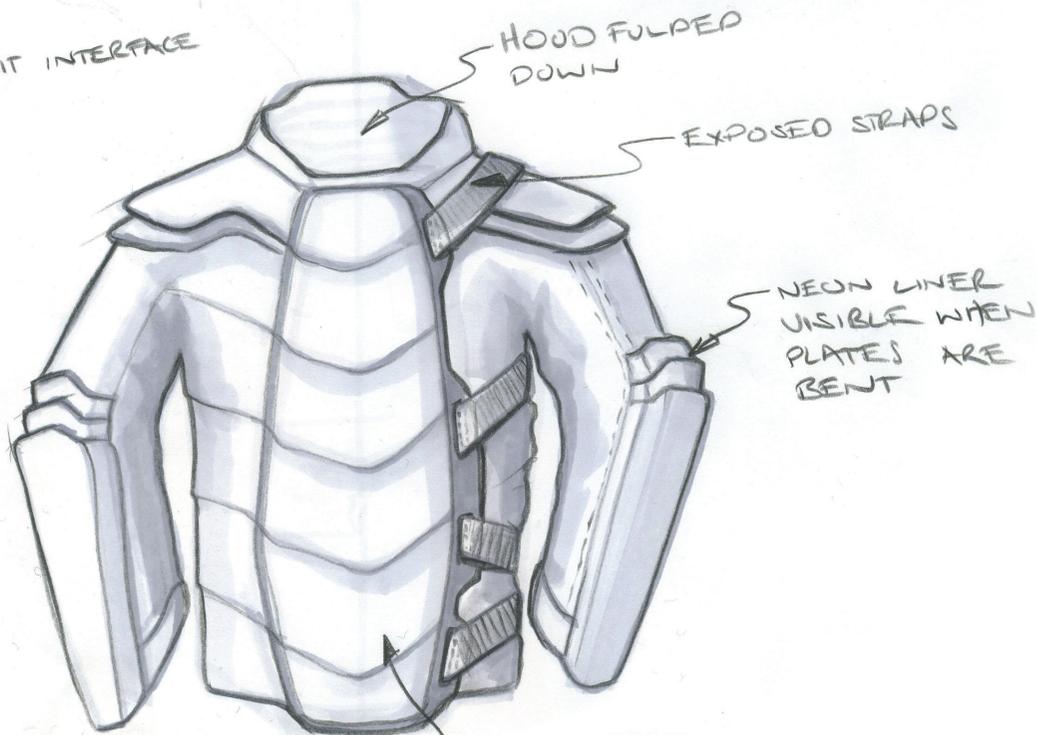


FACE MASK INTEGRATED INTO JACKET

SWIT INTERFACE

ADJUSTMENT VIA VELCRO STRAPS

CONCEALED ZIP UP SEAM

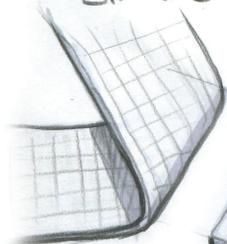


HOOD FULPED DOWN

EXPOSED STRAPS

NEON LINER VISIBLE WHEN PLATES ARE BENT

D30 SPINE PROTECTOR

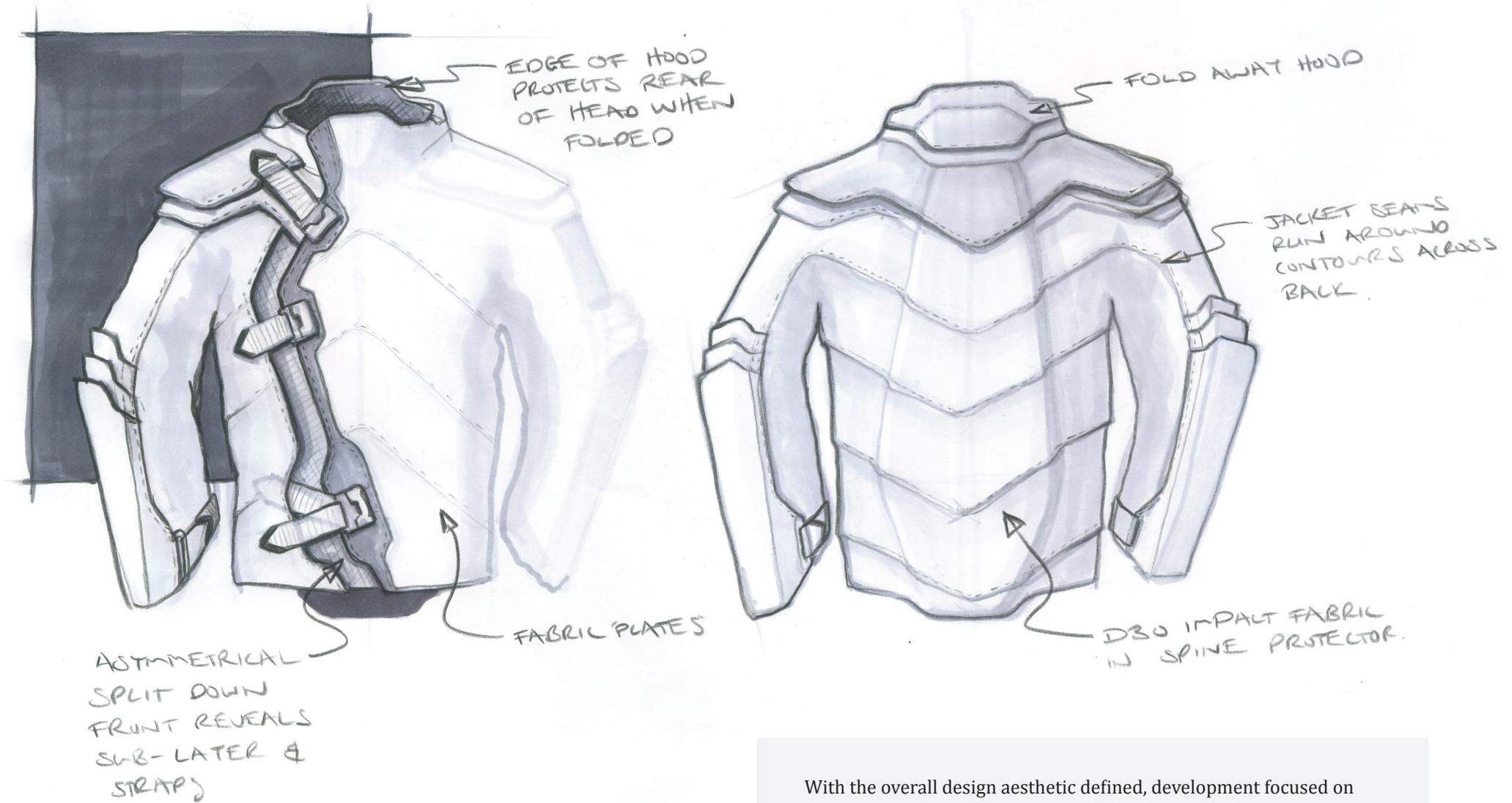


FOLDED STAINLESS STEEL CLIP

RECEIVER

CLASP

NYLON WEBBING



With the overall design aesthetic defined, development focused on detailing, exploring variations on the buckles and adjustment system.

alias

► VARIATION IN MICROGRAMMA FONT

STITCHING OF DETAILS - RATHER THAN SOLID PRINTING - ALLOWS SUB MATERIAL TO SHOW THROUGH.

UNIFICATION OF BRAND & TECHNOLOGY INTERFACE

BRAND LABEL

PATTERN OR 'ALIAS' SELECTION

REPETITION OF SHAPE FROM ARMOUR PANELS

FABRIC SEAM DOWN SLEEVE

alias THEMES



DIGITAL
BRUISE



INK BLOT
AVATAR



DIGITAL
DAMAGE



ANARCHY



BADGE OF
HONOR.



ASSYMMETRICAL
GRAPHIC

Interface Design

The interface was required to allow users to switch patterns or animated themes while riding and wearing gloves. Consequently, it needed to be large, and located in an easily accessible location.

From the outset it was decided that the interface needed to fit within the jacket's soft-armour appearance. Instead of hard LCD panels and buttons, the desired results would be achieved through fabric properties - conductive fabrics, fabric switches and electro-chromatic materials.

The resolved design utilizes a system of 'tags' sewn into the cuffs of the arm, to display both the jacket name (at this stage 'Alias') and a swatch of each theme on a touch sensitive label.



External Input

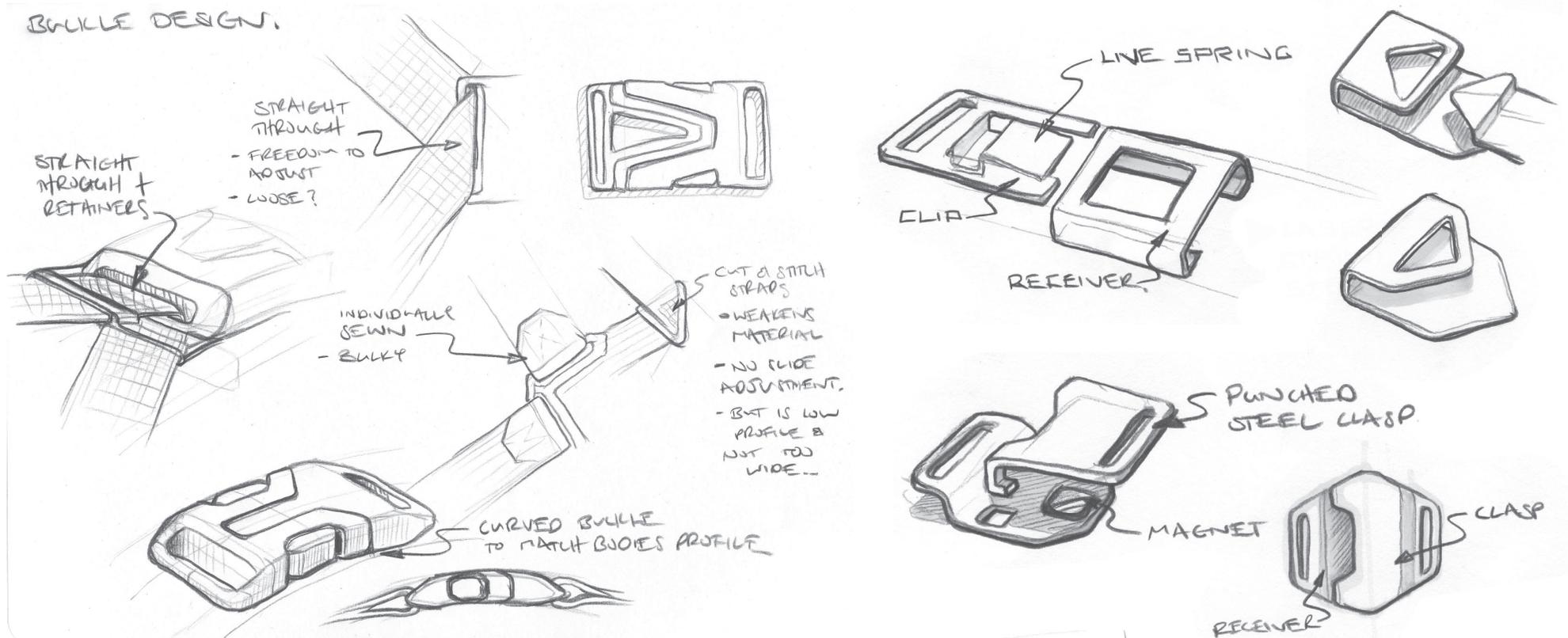
Asked to explore various possible suit patterns, *Weta* designer Edward Denton presented a series of concepts based on the gaming concept of levels, 'unlocked' by performing particularly difficult tricks or maneuvers. In experiential terms, this concept provides additional 'instrumental emotional' potential - with the suit functioning as a signifier of a riders skill, eliciting admiration and respect from others on the field.

Denton also suggests a number of possibilities utilising user generated content, and an upgrade to include 'augmented reality' goggles as a training and 'game' device.

Figure 102: Suit animation concepts.



BUCKLE DESIGN.

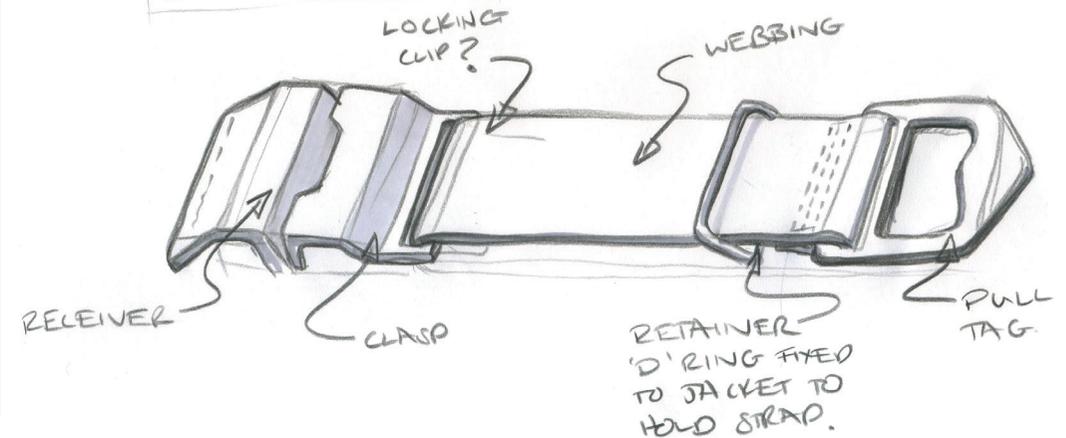


Buckle Design

The buckles have been a prominent feature of the jacket since the conception of the harness system. Early clip designs explored variations on a standard plastic pack clip, but as the design progressed these appeared too generic, lacking any specific snowboarding signifiers or unique characteristics.

Drawing inspiration from the clips on military belts, a simple design created from punched stainless steel components was developed. Utilizing interlocking hooks and a magnet to prevent unintentional unclipping, the design pays homage to the contemporary grunge theme, and 'accentuated closures' category of ornamentation.

STRAP DETAILING.



7.3 Design Outcome: 'Spectre' Jacket

This section presents an overview of the design's key features and attributes. These are also covered in greater depth in section 8.0 Design Validation.

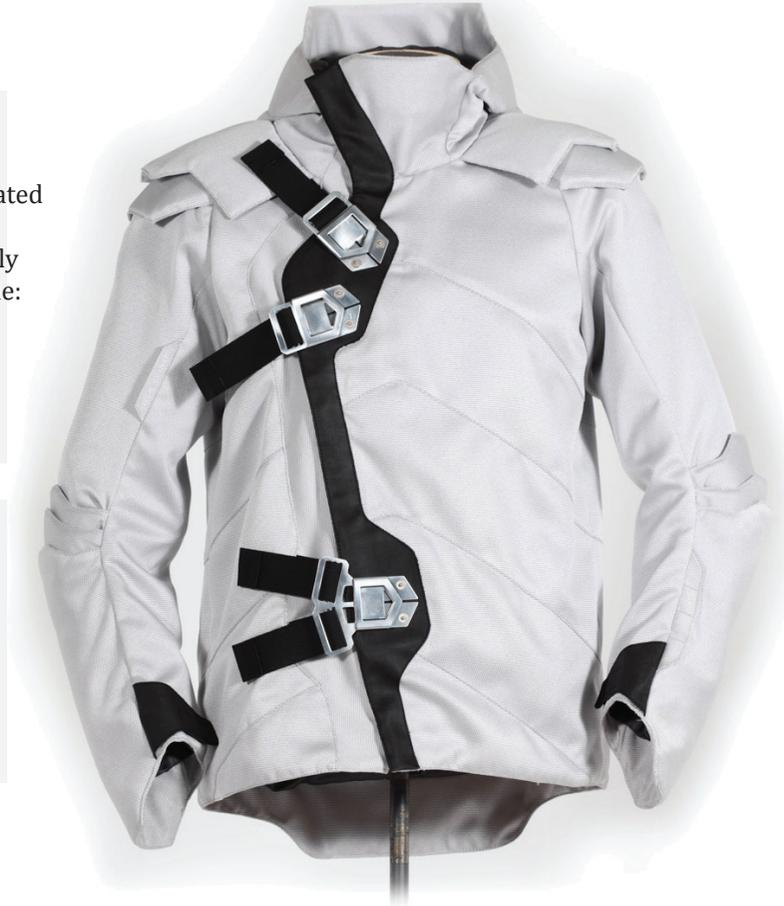
Electrochromatic Fabric

Colour-change fabric, activated by electrical current allows coloured patterns to be animated across the jackets main surfaces, allowing unique customisation and previously impossible moving patterns. Patterns include:

- Ink-Blot animation (displayed)
- Digital Bruising
- Digital Damage

Internal Harness

An internal harness system holds the back protector in position, while allowing the jacket to hang loosely away from the body. Durable metal clips and adjustments are exposed down the front, allowing ease of access and use.



Product Name Tag

The jackets name, *Spectre* reflects the designs ethereal animated patterns, which are constantly shifting and changing.

Suit Interface

A touch based selector utilising the fabrics electrochromatic quality to display preview swatches of each theme.

Armour Aesthetic

While reflecting an evolution from existing fashion styles, the armour aesthetic includes fabric 'plates' and articulated panels, presenting a unique form of ornamentation.

Impact-Fabric Spine Protector

Utilizing multiple layers of impact fabric, the spine protector provides protection to the spine during falls particularly those onto the lower back.



Impact-Fabric Hood 'Peak'

Provides protection for the rear of the head when folded down, while providing rigidity to the hood when raised.

Forearm protectors

Embracing the aesthetic of protection, the gauntlet style forearm protectors minimise impacts to the forearms during falls, while encouraging riders into the habit of not falling onto the wrists.

8.0 Design Validation

This study aimed to explore how affective or experiential features and attributes can improve the desirability of a forecast personal protective equipment product. Utilizing a range of creative 'research through design' methods, a range of concepts were explored, and refined into a single forecasted PPE product, representing the culmination of this research. To verify this design has fulfilled the aim of improving desirability of a PPE product over existing designs, it is necessary to establish an appropriate means of validation. However, due to the forecasting nature of this project, gaining feedback from consumers is likely to generate inconclusive results: When experienced snowboarder and boardshop employee Warwick Henty was questioned regarding the styling of the design he responded:

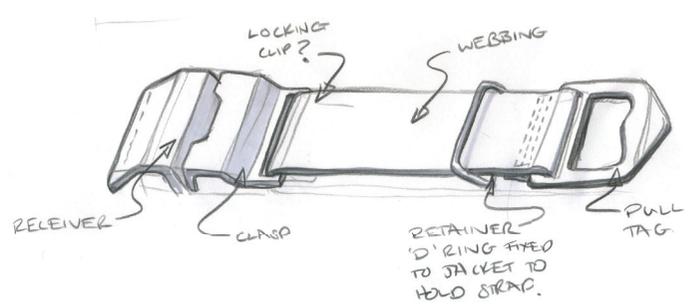
"I've been working in snowboarding retail for eight years. Eight years ago, if somebody had shown me the products we are selling today, I'd have said there's no way they would sell"

(2010, January 24, personal communication)

Even with experimental products for the present-day market, design researchers Ravasi & Lojcono (2005) recognise this challenge, concluding that "it is only when (these) products are finally put on the market that the validity (of product sales predictions) can be assessed" (p.65).

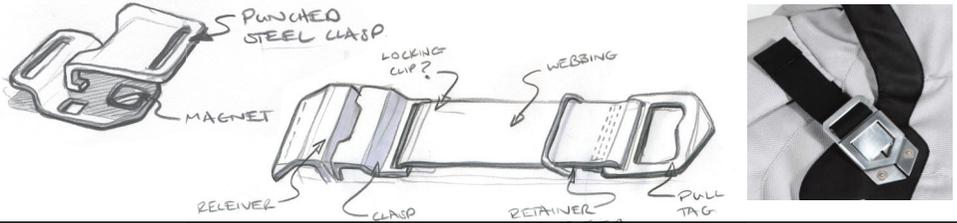
Consequently, this study will refer to the experiential design criteria derived from Warell's(2008) perceptual product experience framework to provide design validation.

8.1 Experiential Design Criteria			
Criteria Description	Design Validation	Criteria Met or Exceeded	Criteria Only Partially Met or Unfulfilled
Impression			
<i>Design stands out from other similar products</i>	<p>The jacket is greatly different to previously examined PPE products. However, with the products reinterpretation as an apparel/PPE product, its real validation is that it also stands out alongside these expressive products.</p> 	●	
<i>Design is visually interesting, incorporating characteristic features and attributes: It makes a fashion statement.</i>	<p>The design incorporates 3 main characteristic elements:</p>  <p>An 'Armour Aesthetic', derived from the plates of medieval armour, this style accentuated protective elements as a form of ornamentation. Visually outstanding alongside traditional baggy jackets, this styling makes a unique fashion statement.</p>  <p>While electrochromatic fabrics have previous been applied in military and fashion genres, this research is the first identifiable source exploring its potential in the sports apparel market. The range of patterns presented are not only unique, but by utilizing the fabrics potential to present them as moving graphics, they become a characteristic feature.</p>  <p>The asymmetric front design creates a dynamic visual element, accentuated by oversized harness clasps which bridge the gap between plates. While asymmetry is increasingly common on contemporary jackets, its unique execution on this design is visually characteristic.</p>	●	

8.1 Experiential Design Criteria			
Criteria Description	Design Validation	Criteria Met or Exceeded	Criteria Only Partially Met or Unfulfilled
Appreciation			
<i>Product styling represents a leap beyond contemporary products and styles.</i>	The <i>Spectre</i> jacket presents a number of unique characteristics which visually separate it from existing products. However, it also retains many stylistic elements derived from the contemporary-grunge fashion style, including rugged closures, heavy, durable fabrics, use of nylon webbing and animated patterns reminiscent of traditional camouflage prints.	●	
<i>Product experience stimulates as many senses as possible, while maintaining a consistent message.</i>	The jackets design embodies a theme of rugged protection across all facets of the design, while involving at least 3 senses during its operation. For example, the rugged, punched metal clasps are visually simple and durable, a theme consistent with the tactile and audial feedback during their use: heavy, solid components utilizing a basic mechanical action and closing with a solid click as the magnets engage. Likewise, the jackets protective aesthetic is reflected in the sensory mode where the harness system and hugging back protector bring a feeling of protection. 	●	

8.1 Experiential Design Criteria			
Criteria Description	Design Validation	Criteria Met or Exceeded	Criteria Only Partially Met or Unfulfilled
Emotion			
<i>Design reflects basic snowboarding instrumental emotional needs: to make a statement about ones identity, to ride and jump better (and for longer), to be admired and respected.</i>	<p>Combining many of the benefits of PPE products and Apparel products, the Spectre jacket addresses the following basic instrumental emotional needs:</p> <ul style="list-style-type: none"> • To reduce the risk of injury through protective armour. • To bring confidence while riding, a bi-product of feeling protected. • To empower users in making a statement about their individuality, by allowing users to personalise colour schemes and animations. • To elicit admiration and desire from others - The design is unique and characteristic in a similar fashion to current signature range products. 	●	
<i>Product styling acknowledges contemporary themes and attitudes in snowboarding - e.g., contemporary grunge, future-tech, luxury or visual noise</i>	<p>The products styling pays homage to the 'contemporary grunge' fashion style presented in section 5.6.2. Images drawn from this mood board highlight a number of similarities, including the heavy fabrics with visible stitching, clasps inspired by army-belt buckles and a martial aesthetic.</p> 	●	
<i>Products design, detailing and materials inspire confidence in products quality and durability.</i>	<p>Materials and fixtures are rugged and durable, with details based on mood board examples: e.g., exposed stitching and use of webbing fabric.</p>	●	

8.1 Experiential Design Criteria			
Criteria Description	Design Validation	Criteria Met or Exceeded	Criteria Only Partially Met or Unfulfilled
Recognition			
<p><i>Design utilizes forms of ornamentation as signifiers. E.g., asymmetric design, bold patterning, accentuated fixtures, non-functional detailing or other original elements.</i></p>	<p>The design employs examples of the four signifiers identified in section 5.6.1:</p> <div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; align-items: flex-start;">  <div style="margin-left: 10px;"> <p>Asymmetric Design A kinked, diagonal cut breaks the jackets symmetry.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="margin-left: 10px;"> <p>Bold Patterning A range of patterns can be selected. The pattern currently projected is a black ink-blot pattern.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="margin-left: 10px;"> <p>Accentuated Fixtures Oversized metal clasps provide a dominant feature on the jacket.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="margin-left: 10px;"> <p>Non-Functional Detailing While allowing articulation around the spine protector, the fabric plates across the jackets front are purely cosmetic.</p> </div> </div> </div>	●	
<p><i>Products primary function is not immediately recognisable as 'safety'.</i></p>	<p>The design is visually differentiated from existing PPE products for snowboarding.</p>	●	
<p><i>Product type is either recognisable as a unique product category, or part of an existing, accepted genre.</i></p>	<p>Despite its armour aesthetic, the products form suggests an apparel product.</p>	●	

8.1 Experiential Design Criteria			
Criteria Description	Design Validation	Criteria Met or Exceeded	Criteria Only Partially Met or Unfulfilled
<i>Products intended user is recognisable as a male, experienced snowboarder in late-teens or early 20's.</i>	The jacket utilizes a 'contemporary grunge' styling which, according to questionnaire findings in section 5.1 is strongly associated with male snowboarders between 16-25 who ride in the 'park and jump' area of the skifield.	●	
<i>Product draws associations with park-riding and jumping.</i>	Refer to previous.	●	
Comprehension			
<i>Product semantics make use and adjustment intuitive to new users.</i>	<p>The design of the buckle clearly suggests its operation, while the adjustment pull tabs include finger indentations and an arrow shape to suggest motion.</p> 	●	
Association			
<i>Visual dis-association from existing 'un-cool' PPE products.</i>	The design presents a completely new PPE product typology, breaking associations with existing 'uncool' products.	●	

8.2 Performance Design Criteria (Design Limitations)			
<i>Product does not encumber rider with excessive weight</i>	Product weight is no greater than an existing jacket and separate spine protector.	●	
<i>Product does not restrict riders ability to bend forward and touch toes, crouch, and sit.</i>	Fabric articulation at key locations, such as the spine, elbows and shoulders allows a wide range of motion. In addition, testing with harness prototypes ensured that basic motions can be performed.	●	
<i>Product does not restrict arm motion in such a way which limits the riders ability to balance with them.</i>	Refer to previous.	●	
<i>Design mitigates fall-related impacts on at least one of the following body areas:</i>			
<i>Head – impact protection, particularly on the rear of the skull.</i>	Protection for rear of head provided while hood is folded down. Limited protection on other areas may require helmet use.		●
<i>Shoulders – impact mitigation reducing risk of fractures to shoulder blade and clavicle.</i>	Impact fabric across the shoulders helps dissipated impact during falls.	●	
<i>Spine – Both rigid protection to prevent over-extension and impact protection to prevent blunt impacts.</i>	A spine protector based on existing, proven designs provides spine protection.	●	
<i>Knee and Ankle – Mitigation of impact force during landings, reducing dynamic loading on ACL Tendons</i>	Not covered by this product		●
<i>Torso/limb protection from non-serious falls.</i>	In addition to the shoulder and spine protection, impact fabric down the forearms helps minimise injury during falls or collisions.	●	
<i>Product is easily adjustable to suit varying body shapes and sizes.</i>	Minor size-adjustment is performed via easily accessible straps down the front of the jacket.	●	
<i>Product does not exclude the use of other snowboarding apparel products such as helmets, backpacks, hydration bladders, etc unless it replaces them.</i>	A helmet/wrist protector and backpack can be work over the jacket if desired.	●	

Conclusion

Experiential and performance design criteria derived from Warell's (2008) perceptual product experience framework provided a highly effective basis for the evaluation of this forecast product, allowing individual product attributes and features to be addressed in isolation. While this qualitative method is partially based on the designers understanding of users and user-perceptions, such research had been a focus throughout this study and was readily available.

Based on this analysis it is apparent that the *Spectre* jacket is highly successful in addressing many of the experiential weaknesses identified with existing PPE products, including:

- The application of an appropriate aesthetic style associated with the target demographic.
- The incorporation of specific snowboarding signifiers to aid product recognition.
- The fulfillment of additional instrumental emotional needs, providing greater motivation for users to purchase and wear the product.
- The disassociation with existing safety products and the negative connotations they carry.

Spectre Jacket





9.0 Conclusion

This thesis presented the research conducted in the development of a forecasted PPE product for snowboarding. Responding to negative perceptions towards existing PPE products, this study proposed and put into effect a design philosophy focused on improving the user-product experience by addressing experiential needs unfulfilled by existing “uncool” products.

These requirements were investigated through a series of qualitative research methods such as ‘product personality profiling’, immersive ‘skifield’ research and mood boards. Warell’s (2008), perceptual product experience framework then provided a language and structure in defining experiential needs unique to snowboarders. Findings from this research suggested the following essential factors were missing in the design of existing PPE products, contributing to their negative perceptions.

- Recognition of contemporary fashion styles, meaning products failed to be appreciated by users.
- Unique characteristics setting individual products apart from others on the market.
- Visual signifiers or ‘carrying elements’ – product attributes unifying snowboarding apparel products while differentiating them from skiing and other snow-sport products.
- Instrumental emotional needs were limited to ‘protection’, providing limited motivation for many users to purchase PPE products.
- Existing PPE products are often associated with ‘uncool’ users, impeding them with this negative association.

With these experiential criteria as a basis, the study utilized creative research-through-design methods such as concept sketching, digital painting and fabric prototyping as a means to explore affective features and attributes, drawing inspiration from industrial design, fashion design and science fiction. Through this evolutionary process, a range of original PPE product typologies were also explored, breaking away from existing product categories and their associations.

The *Spectre* jacket design represents revolutionary leap from existing PPE products, incorporating a number original features and attributes which fulfill a number of users experiential needs and bring desirability to a PPE product.

These features and attributes include:

- An armour aesthetic reflecting an evolution from existing fashion styles while presenting an original form of ornamentation and signifier for a new generation of snowboarding products.
- A unique, asymmetric design helps the products stand out from other apparel products.
- The product typology represents a new genre of snowboarding products and separates the design from negative associations with existing PPE products.
- A market-first application of electro-chromatic fabrics allowing users to express themselves with a range of colour themes, patterns and animations.
- Flexible body armour inspiring confidence to attempt tricks while protecting users from serious injury during falls.

In addition, the concept enables a range of areas for future research, including user-generated content for suit customization, the application of a computer game type ‘level’ system where suit designs are unlocked through tricks, and integration of an ‘augmented reality’ system to aid in snowboarding instruction and safer riding/falling techniques.

Several limitations of this study have been acknowledged:

- The forecast concept is based on immature materials and technologies applied in a complex manner beyond current manufacturing capabilities.
- The design process neglected some performance requirements - such as breathability and thermal insulation - to focus on the experiential needs.
- Desirability is a qualitative attribute; while theoretical models such as Warell’s perceptual product experience framework are invaluable in developing an understanding of user experiential needs and defining criteria which affect ‘desirability’, it is only when these products are presented on the market alongside appropriate marketing that the designs real-world desirability can be fully evaluated.

While important in a real-world project, these limitations reflect the explorative, forecasting nature of this study and fall beyond the scope of the research.

However, this thesis was highly effective in exploring and presenting new research in the fields of emerging smart materials and protective equipment design. Furthermore, it was successful in developing a product that addressed many of the weaknesses with existing PPE designs, bringing desirability to these products, while enriching the experience and visual culture of snowboarding.

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11.0 Figure Index

Figure 1: *Research aim and objectives.*
Author (2009).

Figure 2: *Objectives and corresponding research methods.*
Author (2009).

Figure 3: *Tom Sims.*
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Figure 4: *Tom Sims and team.*
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Figure 5: *Tim Sims on slalom competition event.*
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Figure 6: *Sims rider Craig Kelly at the World Snowboarding Championships in 1987.*
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Figure 7: *Tahoe City half pipe in 1983.*
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Figure 8: *Tom Sander in 1998.*
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Figure 9: *Tom Burt in 1989.*
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Figure 10: *Peter Line.*
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Figure 11: *Example of baggy pants trend.*
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Figure 12: *Example of grunge influence in magazine advertising.*
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Figure 13: *Peter Line jibbing a park rail in 1996.*

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Figure 14: *Nokia air-style competition.*
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Figure 15: *Tina Basich at competition in 1995.*
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Figure 16: *Danny Kass on podium at Burton 2009 US Open Snowboarding Competition.*
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Figure 17: *Terje White Harkonnen half-pipe in competition.*
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Figure 18: *Shaun White training in half-pipe.*
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Figure 19: *Shaun White at Nokia Air-Style Competition.*
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Figure 20: *Cover of Rolling Stone magazine featuring Shaun White.*
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Figure 21: *Burton Audex helmet.*
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Figure 22: *Danny Kass, inspiration behind the Audex helmet.*
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Figure 23: *Crossover of computer games and snowboarding.*
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Figure 24: *Shaun White snowboarding game cover.*
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Figure 25: *Luke Skywalker from Star Wars.*

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Figure 26: *Adidas Skywalker sneaker.*

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Figure 27: *Big-Jump tricks applied to natural mountain runs.*

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Figure 28: *Comparison of injury patterns.*

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Figure 29: *Common serious injury patterns among snowboarders.*

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Figure 30: *Examples of new apparel for 2009.*

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Figure 31: *Existing personal protective equipment (PPE) products.*

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Figure 31a: *PPE Products*

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Figure 31b: *Serius wrist protector.*

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Figure 31c: *Flexmeter wrist guard.*

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Figure 31d: *POC back protector.*

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Figure 32: *The multi-modal product experience.*

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Figure 33: *Sensory sub-components.*

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Figure 34: *Cognitive sub-components.*

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Figure 35: *Affective sub-components.*

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Figure 36: *Apple iPod Touch.*

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Figure 38: *Categories of concept products.*

Figure 38a: *Audi Le Mans concept car.*

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Figure 38b: *Audi Le Mans concept car interior.*

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Figure 38c: *Citron C Cactus car.*

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Figure 38d: *Citron C Cactus car interior.*

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Figure 38e: *BMW Gina.*

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Figure 38f: *BMW Gina interior.*

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Figure 39: *D3O impact material.*

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Figure 40: *DowCorning's Active Protection system fabric and molecular diagram.*

Figure 40a: *Active Protection system fabric*

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Figure 40b: *Molecular diagram.*

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Figure 41: *Philips Bubelle dress illuminated.*

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Figure 42: *Philips Bubelle dress illuminated.*

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Figure 43: *Philips Frission dress.*

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Figure 44: *Philips Lumalive.*

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Figure 45: *Hussein Chalayan dress basic configuration, from Airborne collection.*

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Figure 46: *Hussein Chalayan dress activated.*

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Figure 47: *Hussein Chalayan video dress screen capture.*

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Figure 48 and 49: *Video dress from Hussein Chalayan's 2007 Airborne collection.*

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Figure 50: *Example of active camouflage in Fallout 3 computer game*

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Figure 51: *Screen shot showing the predators active camouflage in movie Predator*

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Figure 52: *Screenshot from Ultraviolet movie showing colour-change fabric*

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Figure 53: *Burton (RED) and Skullcandy Earpads jacket.*

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Figure 54: *Willy Bogner's ski-suit.*

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Figure 55: *Head ski-suit.*

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Figure 56: *Spyder Race Suit for the US ski-team.*

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Figure 57: *Schoffel Protector S2 jacket.*

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Figure 58: *Burton/Motorola Audex jacket.*

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Figure 59: *Pop-culture influences*
(clockwise from top left)

Figure 59a: *Clone trooper helmet, Star Wars Episode II.*

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Figure 59c: *G.I. Joe movie poster.*

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Figure 59d: *Transformers 2 movie poster.*

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Figure 60: *Martial influences.*

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Figure 60a: *WWII German machine gunner.*

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Figure 60d: *German SS insignia.*

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Figure 60e: *US army shirt.*

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Figure 61: *Historical armour design*

(clockwise from top left)

Figure 61a: *Patterned armour.*

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Figure 61b: *Medieval shoulder detail.*

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Figure 61c: *Black Armour.*

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Figure 61d: *Articulated Gauntlet.*

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Figure 62: *Science-fiction armour design.*

(clockwise from top left)

Figure 62a: *Halo concept art.*

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Figure 62b: *Warhammer 40,000 Terminator Armour.*

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Figure 62c: *Halo concept art.*

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Figure 62d: *Half-Life 2 concept art.*

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Figure 63: *High-tech suits.*

(clockwise from top left)

Figure 63a: *Wingsuit concept.*

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Figure 63b: *Tron 2 concept art.*

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Figure 63c: *Luigi Colani ski-jumper suit.*

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Figure 63d: *Splinter Cell Conviction Game review.*

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Figure 64: *Performance sports products.*

(clockwise from top left)

Figure 64a: *X-Undergear.*

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Figure 64b: *Deuter Freerider pack.*

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Figure 64c: *Vaude Alpin Air pack detail.*

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Figure 64d: *W1 wetsuit by Waterproof.*

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Figure 64e: *Jeb Corliss wearing his wingsuit.*

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Figure 65: *Sports PPE products (clockwise from top left)*

Figure 65a: *Nike Pro Combat suit.*

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Figure 65b: *Scott Gerona motorcycle jacket.*

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Figure 65c: *Dainese Shield 7 back protector*

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Figure 65d: *Beetle Cycle by Pulsium Design.*

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Figure 65e: *Alpinestars Tech10 boots*

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Figure 66: *Red (Burton) 'Hi-Fi' helmet.*

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Figure 67: *Giro Audio helmet.*

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Figure 68: *Burton 'Mutiny' helmet.*

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Figure 69: *POC helmet.*

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Figure 70: *Burton Audex padded hat.*

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Figure 71: *POC helmet and iF design-award winning back protector.*

Figure 71a: *POC helmet.*

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Figure 71b: *POC back protector.*

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Figure 72: *RED (Burton) Hi-Fi and Burton 'Mutiny' helmet.*

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Figure 73: *Analysis of snowboarding apparel.*

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Figure 73a: *Oakley 'Ranger' jacket.*

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Figure 74: *Comparison of snowboarding jackets.*

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Figure 74a: *Oakley 'Ranger' jacket.*

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Figure 74b: *Millet 'Origin' Alpine jacket.*

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Figure 75: *A scale of ornamentation.*
Author. (2009).



Figure 75a: *Marmot 'Oracle' jacket.*

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Figure 75b: *Millet 'Origin' Alpine jacket.*

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Figure 75c: *Helly Hansen 'Velocity' jacket.*

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Figure 75d: *Spyder ski jacket.*

Retrieved June 14, 2009 from <http://www.spyder.com/>

Figure 75e: *AK (Burton) 'Cyclic' jacket.*

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Figure 75f: *Ronin (Burton) 'Utility' jacket.*

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Figure 75g: *Burton 'Love' jacket.*

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Figure 75h: *Mountain Hardware 'Kongur' jacket.*

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Figure 75i: *Bask 'Force V2' jacket.*

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Figure 75j: *Kjus 'Viper' jacket.*

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Figure 75k: *Burton 'Outcast' jacket.*

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Figure 75l: *686 'Syndicate' jacket.*

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Figure 75m: *Oakley 'Ranger' jacket.*

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Figure 75n: *Burton 'Shelter' jacket.*

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Figure 76: *Scale of ornamentation, with associated sports over-laid.*
Author. (2009).

Figure 77: *Scale of ornamentation, with ornamentation analysis.*
Author. (2009).

Figure 78: *Examples of bold or flamboyant patterning.*
Author. (2009).

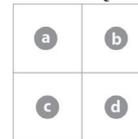


Figure 78a: *Oakley 'Bradford' jacket.* Retrieved November 11, 2009 from <http://www.oakley.com/catalog/products/bradford-jacket>

Figure 78b: *Burton 'Shelter' jacket.* Retrieved June 14, 2009 from <http://www.burton.com/mens-snowboard-jackets/mens-jackets,default,sc.html>

Figure 78c: *Burton 'Ronin' jacket.* Retrieved April 10, 2009 from <http://www.burton.com/mens-snowboard-jackets/mens-jackets,default,sc.html> on 10/04/2009

Figure 78d: *Burton 'Love' jacket.* Retrieved June 14, 2009 from <http://www.burton.com/mens-snowboard-jackets/mens-jackets,default,sc.html>

Figure 79: *Examples of asymmetrical design.*
Author. (2009).

Figure 79a: *Oakley 'Arrestino' jacket.* Retrieved November 30, 2009 from <http://www.oakley.com/catalog/products/arrestino-jacket>

Figure 79b: *Oakley 'Ranger' jacket.* Retrieved June 14, 2009 from <http://www.oakley.com/catalog/products/ranger-jacket>

Figure 79c: Burton 'Shaun White Asym' jacket. Retrieved November 30, 2009 from http://www.buckmans.com/store/Burton-Shaun-White-Asym-Jacket---Boys-OSCARItem_718=4728.aspx

Figure 79d: AK (Burton) 'Cyclic' jacket. Retrieved from <http://www.burton.com/mens-snowboard-jackets/mens-jackets,default,sc.html> on 14/06/2009

Figure 80: Examples of Non-Functional Detailing
Author. (2009).

Figure 80a: Burton "Shaun White Signature" jacket.
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Figure 80b: Ronin (Burton) 'Audio Stroll' jacket.
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Figure 80c: 686 'Article' jacket.
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Figure 80d: Grenade 'Frankenkass' jacket.
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Figure 81: Examples of accentuated closures
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Figure 81a: Ronin (Burton) 'Utility' jacket.
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Figure 81b: Burton 'Dream' jacket.
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Figure 81c: Ronin (Burton) 'Transition' jacket.
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Figure 81d: Oakley 'Ranger' jacket.
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Figure 82: Oakley jacket advertising, circa 1997.
Advertisement. (1997). *NZ Snowboarder*, May/June, p. 21.

Figure 83: Outerwear, circa 1997.
Advertisement. (1997). *NZ Snowboarder*, May/June, p. 79.

Figure 84: Higher Level of Ornimentation?
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For image references see Figure 75.

Figure 85: Style-board description.
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Figure 86: Contemporary Grunge.
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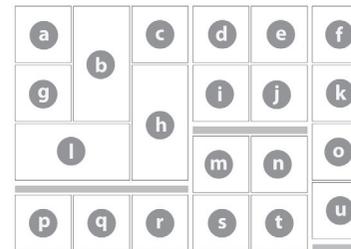


Figure 86a: Giro 'Shiv' helmet.
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Figure 86b: Ronin (Burton) 'Utility' jacket.
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Figure 86c: Northwave 'Decade TF3' snowboard boot.
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Figure 86d: Burton 'P11' binding.
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Figure 86e: Ride 'Tomcat' binding.
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Figure 86f and 86g: AK (Burton) 'Tech' gloves.
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Figure 86h: Burton 'Ranger' pant.

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Figure 86i: *Ronin (Burton) 'Utility' jacket.*

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Figure 86j: *Nixon 'Scout' watch.*

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Figure 86k: *Burton Cargo pant.*

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Figure 86l: *SP 'Brotherhood' binding.*

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Figure 86m: *German SS Helmet.* Retrieved June 14, 2009 from <http://www.thirdreich.ca/SShelmets.php>

Figure 86n: *Red Hot Chilli Peppers 'Blood, sugar, sex, magic' Album art.* Retrieved November 30, 2009 from http://s208.photobucket.com/albums/bb199/gracielynn_album/Albums/?action=view¤t=rhcp_bssm.jpg

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Figure 86r: (2008). *Burton catalogue*, p. 103

Figure 86s: *Shaun White Snowboarder Video game cover.*

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Figure 86t: *Helmet Concept.*

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Figure 86u: *Burton 'Ronin' Jacket.*

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Figure 87: *Visual Noise*

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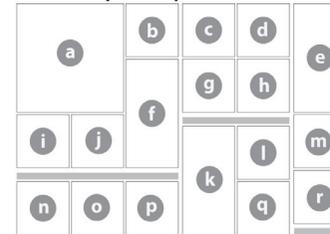


Figure 87a: *Ride "EX series" binding.*

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Figure 87b:

Figure 87c: *Burton 'Triad' binding.*

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Figure 87d: *Dragon 'DX' Goggles with integrated headphones.*

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Figure 87e: *Burton 'Shelter' jacket.*

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Figure 87f: *Burton 'One piece' suit.*

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Figure 87g: *Grenade 'GAS' glove.*

Retrieved November 30, 2009 from <http://www.dogfunk.com/snowboard/Grenade-GAS-Gloves/GRN0101M.html>

Figure 87h: *Burton 'Escapade' binding.*

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Figure 87i: *Anon 'Realm' goggles.*

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Figure 87j: *AK (Burton) 'Cyclic' jacket.*

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Figure 87k: *Snowboarder Damien Sanders in 1985.*

Reed, R. (2005). *The way of the snowboarder*. p.46. New York: H.N. Abrams.

Figure 87l: *Snowboarder Mike Baische in 1991.*

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Figure 87m: Rome SDS 'Targa' binding.

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Figure 87n: Smith Optics 'Phenom' goggles.

Retrieved November 30, 2009, from http://www.smithoptics.com/Snow-Goggles_Category_2.html?fl=flase

Figure 87o: Ride Snowboards website.

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Figure 87p: Rome SDS Board design.

Retrieved November 30, 2009, from www.romesnowboards.com

Figure 87q: F2 Snowboard advertisement, circa 1995.

(1995, May/June). *NZ Snowboarder*, p. 73.

Figure 87r: Burton 'Launch' jacket.

Retrieved November 30, 2009, from www.burton.com

Figure 88: Future Tech

Author. (2009).

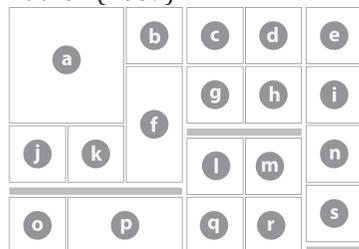


Figure 88a: Flow 'Flite 1' binding.

Retrieved November 30, 2009, from <http://www.flow.com/>

Figure 88b: Union 'Force MC' binding.

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Figure 88c: Flow 'Flite 1' binding.

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Figure 88d: Smith snowboard goggles.

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Figure 88e: Union 'C4 Mag 12' binding. Retrieved November 29, 2009 from www.unionbindingcompany.com/

Figure 88f: Oakley 'Ranger' Jacket.

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Figure 88g: Swany 'G-Cell' glove.

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Figure 88h: K2 'Auto Ever' binding.

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Figure 88i: SP 'Brotherhood' binding. Retrieved November 30, 2009 from <http://www.sp-united.com/>

Figure 88j: Electric 'EG5' goggles.

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Figure 88k: Flow 'The One' boot.

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Figure 88l: Halo game. Retrieved November 30, 2009 from http://s29.photobucket.com/albums/c275/xxch3rryxx/?action=view¤t=img_5391_halo3beta.jpg&newest=1

Figure 88m: F35 Helmet. Retrieved November 30, 2009 from <http://gizmodo.com/260482/f+35-helmet-display-system-to-scare-the-bejeezus-out-of-enemies>

Figure 88n: Flow 'Flite 1' binding. Retrieved November 30, 2009 from <http://www.flow.com/>

Figure 88o: LTD Snowboard graphics. Retrieved April 03, 2009 from <http://www.ltdsnow.com/>

Figure 88p: Ride snowboards magazine advertising. (2002, May/June). *NZ Snowboarder*, p. 12.

Figure 88q: Wingsuit concept. Retrieved November 30, 2009, from www.sparth.com

Figure 88r: Tron 2 concept art. Retrieved November 30, 2009, from <http://tronfaq.blogspot.com/2008/07/tron-2-sequel-footage-shown-at-2008-san.html>

Figure 88s: Thirtytwo magazine advertising. (2005) May/June). *NZ Snowboarder*, p. 70-71.

Figure 89: *Luxury*

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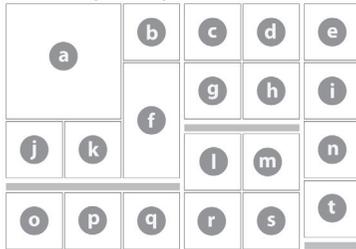


Figure 89a: *Burton 'EST' binding.*

(2008). *Burton Product Catalogue*, p. 18)

Figure 89b: *Anon 'Figment' goggle.*

Retrieved November 29, 2009 from <http://www.anonoptics.com/goggles/details/1-figment/>

Figure 89c: *686 'Ace' jacket.*

Retrieved December 01, 2009 from <http://www.686.com/2009/?#/Mens/>

Figure 89d: *Drake Snowboards magazine advertisement.*

(2007, May/June). *NZ Snowboarder*. p.21)

Figure 89e: *Burton 'EST' binding.*

(2008). *Burton Product Catalogue*, p. 8-9

Figure 89f: *Ronin (Burton) audio stroll jacket.*

Retrieved November 29, 2009 from <http://www.chipchick.com/2008/11/burton.html>

Figure 89g: *Ride Snowboards website imagery.*

Retrieved December 01, 2009 from www.ridesnowboards.com

Figure 89h: *Burton 'P1' binding.* Retrieved April 04, 2009, from www.burton.com

Figure 89i: *Fox 'Pinstripe' goggle.* Retrieved December 01, 2009 from <http://www.cyclekin.com/shop/categories/4/Dirt-Bike.html>

Figure 89j: *Burton 'Shaun White signature series'.* (2006, May-June). *NZ Snowboarder*, p. 1-2.

Figure 89k: *Burton 'White' boot.*

Retrieved April 04, 2009 from www.burton.com

Figure 89l: *Coat-of-arms.*

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Figure 89m: *Bugatti Veyron.*

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Figure 89n & 89p: *Northwave magazine advertisement.* (2007, May/June). *NZ Snowboarder*, rear-cover.

Figure 89o: *Never Summer Industries 'Titan'.*

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Figure 89p: *Northwave magazine advertisement.*

(2008, May/June). *NZ Snowboarder*, rear-cover.

Figure 89q: *Smith 'Phenom' goggles magazine advertisement.*

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Figure 89r: *Cartier bag.* Retrieved December 01, 2009, from www.cartier.com

Figure 89s: *Balenciaga heels by Nicolas Ghesquiere.*

Retrieved November 29, 2009, from www.balenciaga.com

Figure 89t: *Burton boot.*

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Figure 90: *Riding the Chairlift, Turoa Skifield 2009*

Author. (2009).

Figure 91: *Snowboarder jumping in terrain-park.*

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Figure 92: *Riders on chairlift.*

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Figure 93 & 94: *Riders wearing backpack and camelpack.*

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Figure 95: *Snowboarders falling.*

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Figure 96: *Typical snowboarding activities*

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Figure 97: *Analysis of professional rider while jumping.*

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Figure 98: *Snowboarding PPE Products*

Figure 31a: *PPE Products*

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Figure 31b: *Serius wrist protector.*

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Figure 31c: *Flexmeter wrist guard.*

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Figure 31d: *POC back protector.*

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Figure 99: *Snowboarding Products*

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Figure 99a: *Burton PPE Products.*

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Figure 99b: *Anon 'Realm' goggles.*

Retrieved June 14, 2009, from <http://www.tactics.com/anon>

Figure 99c: *Burton 'P1' binding.*

Retrieved June 14, 2009, from www.burton.com

Figure 99d: *Burton 'One-Piece'.*

Retrieved July 14, 2009, from <http://www.burton.com>

Figure 100: *Overview of 'Research through design' process.*

Author. (2009).

Figure 101: *Timeline of 'Research through design' process.*

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Figure 102: *Suit animation concepts.*

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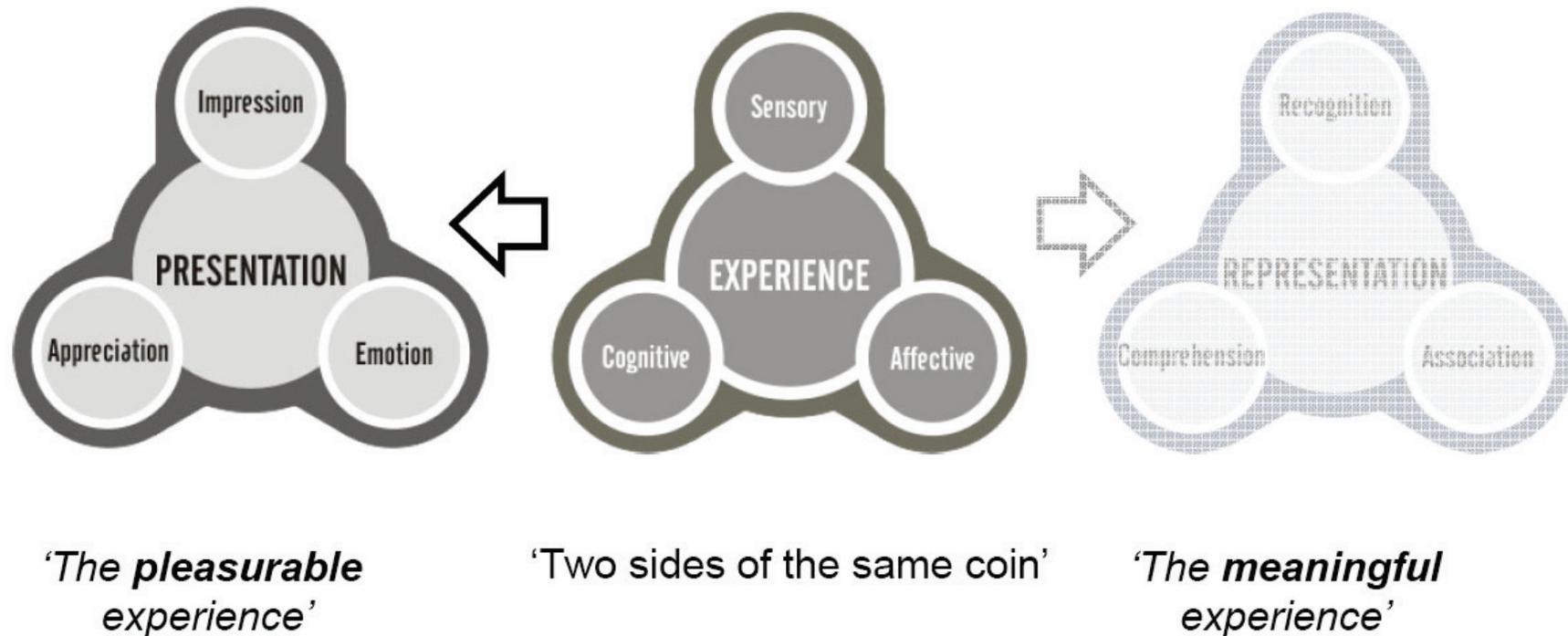
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13.0 Appendix

PPE Framework Perceptual Product Experience



DESIRABLE IMPACT

Adding value to protective equipment



This questionnaire is part of the postgraduate research study: **“Desirable Impact”** conducted by Lans Hansen.

The purpose of this questionnaire is to **learn more about your experiences with, and perception of personal protective equipment, eg helmets, spine protectors, etc.**

This questionnaire is completely **anonymous**: no names or contact details will be recorded.

There are 10 questions which will take approximately 10 minutes to complete.

Your answers will be important in helping shape the design of a concept snowboarding product. Your input is much appreciated.

If you require more space to answer the questions please feel free to write on the back of the page.

Please return the questionnaire to me when completed. Thanks

Background

- 1 Would you consider yourself a:
- | | |
|-------------|--------------------------|
| Snowboarder | <input type="checkbox"/> |
| Skiier | <input type="checkbox"/> |
| Neither | <input type="checkbox"/> |

- 2 How often do you participate in these sports?
- | | |
|-------------------------------|--------------------------|
| Once or twice a year | <input type="checkbox"/> |
| Two to five times per year | <input type="checkbox"/> |
| More than five times per year | <input type="checkbox"/> |

- 3 What would you consider your level of experience? Please indicate on the following scale:



- 4 What areas do you ski/snowboard? Please indicate a rough percentage of time spent at each location.

Terrain Park	<input type="text"/>	%
Slopes	<input type="text"/>	%
Big Jumps	<input type="text"/>	%
Half- Pipe	<input type="text"/>	%
Backcountry	<input type="text"/>	%
Other_____	<input type="text"/>	%

- 5 Do you participate in any other sports? Please list...

Injuries and Protective Equipment

- 6 Have you ever sustained an injury (or multiple injuries) while skiing or snowboarding?

Yes No

If yes, please give a brief description of the injury (or injuries) and how it happened?

- 7 Was your injury severe enough to stop you skiing/boarding for the day?

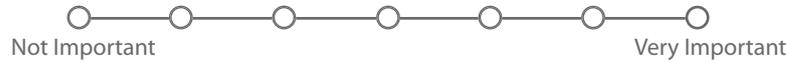
Yes No

- 8 Do you use any of the following protective equipment products?

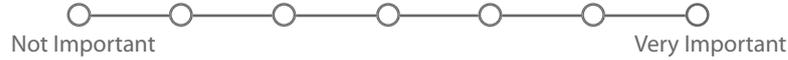
	Never	Occasionally	Always
Helmet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wrist protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Back protector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9 What are (or would be if you don't use any now) the most important factors influencing your choice of protective equipment? Please indicate on the scale how important they are to you:

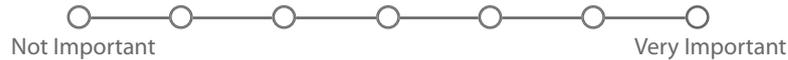
The **Brand** (eg burton, etc)



Styling (Shape, colour, graphics, etc)



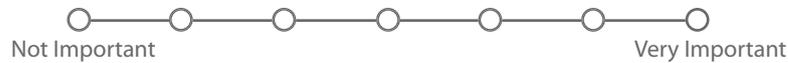
Comfort



Additional **features** (headphones, ipod controls, etc)



The **price** \$\$



Are there any other factors that might influence your choice?

10 The purpose of this section is to gain an understanding of your perceptions towards particular styles of protective equipment.

For each of the following snowboarding products there are two exercises:

A **Word associations**
Write down the first 5 words that come into your mind when you look at the product.

B **Personality Profiling**
What kind of person do you think would use this product? Eg, a living-the-dream professional or a total beginner? What stereotypes would they fit within? What do they do when not on the snow?

	<p>Word associations</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>Personality Profiling</p> <p>Guy or Girl? _____ Age: _____</p> <p>Ski or Board? _____</p> <p>Skill Level: _____</p> <p>Where would you see this person on the skifield?</p> <p>_____</p> <p>When not skiing/boarding this person does... _____</p> <p>_____</p> <p>Stereotypes: _____</p>
---	--	---



Word associations

Personality Profiling

Guy or Girl? _____ Age: _____
Ski or Board? _____
Skill Level: _____
Where would you see this person on the skifield?

When not skiing/boarding this person does... _____

Stereotypes: _____



Word associations

Personality Profiling

Guy or Girl? _____ Age: _____
Ski or Board? _____
Skill Level: _____
Where would you see this person on the skifield?

When not skiing/boarding this person does... _____

Stereotypes: _____



Word associations

Personality Profiling

Guy or Girl? _____ Age: _____
Ski or Board? _____
Skill Level: _____
Where would you see this person on the skifield?

When not skiing/boarding this person does... _____

Stereotypes: _____



Word associations

Personality Profiling

Guy or Girl? _____ Age: _____
Ski or Board? _____
Skill Level: _____
Where would you see this person on the skifield?

When not skiing/boarding this person does... _____

Stereotypes: _____