Towards customized user interface skins: investigating user personality and skin colour

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Skinning technology allows applications to have multiple appearances, giving designers the ability to customize a user interface for specific user groups. For effective customisation, designers need to (i) segment their user population, and (ii) understand the relationship between the segmentation and the dimensions in which an application can be skinned. This paper presents two exploratory pilot studies that focus on user personality as a way to segment a user group, and colour as a skinning dimension. Instead of the traditional questionnaire style personality inventories, the study looks at user interaction behaviour as a way to determine the user personality. In the first study, 16 participants were asked to use an application for 5 days and to complete the IPIP-NEO personality inventories. Analysis of the recorded interaction behaviour and the participants' personality, revealed significant correlations between behavioural measures such as time between two consecutive user actions, or the number of user actions made, and personality traits such as extraversion, and conscientiousness. A second pilot study asked 20 participants also to complete the personality inventory and to indicate their preferences for 5 colour-skins of two applications. The results revealed significant correlations between personality traits and skin colour such as blue and extraversion, but also between black and imagination. These early findings suggest that designers could develop customized skins based on users' behaviour.

Skinning, personality, customisation, interaction behaviour, and colour.

1. INTRODUCTION

Whereas traditionally applications usually have a single user interface, applications such as Windows Media Player, ICQPlus, and Winamp allow users to change the look and feel of the user interface. This technology challenges the current design practice. The now dominant "similarity centred" design approach, which focuses on the characteristics of the average user, needs to be replaced by a more "diversity centred" approach, which focuses more on groups of users, or even on the characteristics of individual users. This means that designers need to understand how individual user characteristics, such as gender, disabilities or personalities, relate to user preferences for interface properties such as structure, layout, or shape. Designers could segment their user population according to these design-relevant user characteristics, and develop customized user interfaces. Successful customisation would probably improve the usability, and the usage experience itself. Users would no longer have to accept the traditional uniform design that only targets the average user. Instead they would have a product tailored to their needs and allow them to express their individuality.

1.1 Skinning
Skinning technology gives products a chameleon-like ability. It allows users to change the product appearance — the skin. Users can download a new skin, while keeping their old software and hardware. Skinning can be very basic, such as changing background images, or colour, but also more extensive, such as changing the interaction style. The benefit for users is that they can change the entire interface in one instance, instead of setting each property separately. For example, users of Microsoft Media Player can go online and choose from more than 100 different skins to transform the user interface of their player. They can choose from themes such as: Harry Potter, Israel, Science, Spider-Man, Terminator 3, and Zen Garden. Besides skins for popular themes, the technology could also be applied for users with special needs, e.g. large font size for visually impaired individuals, or specific letter colours for dyslectic users [1].

1.2 User Personality
A research area that traditionally focuses on individual differences is Personality Psychology. This area has developed psychometric tests for rating people on several personality dimensions, and these seem to correlate

with user preferences for some interface properties. For example, Nas, Moon, Fogg, Reeves and Dryer [2] demonstrated that a user interface with a dominant interaction style, emphasised in language used and in turn-taking, was preferred by dominant users, whereas submissive users preferred a more submissive interaction style. Luczak, Roetting, and Schmidt [3] found a relation between extraversion and the amount of verbal interactions users had with their technical devices. Extraversion also correlates with the preferred level of background noise [4] and has also been suggested to correlate with users preferences for the interface colour or shape [5]. Besides these findings, understanding in this area is still limited. Furthermore, the traditional questionnaire based personality inventories that often include over 100 questions, are impractical tools for designers to gather segmentation data, as users might be unwilling to fill them out. Obtaining similar information from recorded interaction behaviour therefore seems more practical. This has motivated us in conducting two exploratory pilot studies, one studying the feasibility of using log files to determine the users personality characteristics, and another relating these personality characteristics to the user preference for a skin property such as colour. Together, these studies look at the idea of customizing skins based on users' interaction behaviour.

2. INTERACTION BEHAVIOUR AND USER PERSONALITY

2.1 Method
The first study involved a CD-player with a logging mechanism that recorded all the user actions with a time stamp in a log file. To obtain natural interaction behaviour, we installed the application on the computer of 5 male and 11 female participants, aged between 19 and 24 years and asked them to use this application as they pleased over a period of 3 to 5 days, after which we collected the log files. They were also asked to complete the short version of the online IPIP-NEO personality inventory [6]. This inventory measures the differences between individuals on five dimensions, the so-called five-factor model [7], which are: extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. Each of these 5 factors has 6 associated subscales in this inventory.

2.2 Results and Discussion
For each participant two measures were derived from the collected log files: the average number of user actions made in a day and the average time between two consecutive user actions (action speed). Interval times smaller than 1 second or larger than 2 minutes were ignored to remove the effect of possible double clicks or periods of long inaction as participants were doing something else. Table 1 presents only the significant correlation between these two measures and the results of the personality tests. The results show that compared to the more introvert participants, extraverts tended to be faster with their actions and on average performed more actions in a day with the CD-player. This seems to correspond with the idea that extraverts are more lively, active and sociable [7], but also with reported correlations between the speed of human movement and extraversion [8]. The number of actions also had a positive correlation with conscientiousness, and especially self-efficacy and self-discipline. Again this corresponds to the description of conscientiousness as: hardworking, energetic, persevering, but also dutiful [7]. This last description might indicate a possible experimental bias as these participants might have considered it as their duty to interact regularly with the CD-player as part of their agreement to participate in the experiment. Still, dutifulness, a subscale of conscientiousness, only had a correlation of 0.25 with the number of actions, which was not significant.

TABLE 1: Significant Pearson correlations between personality (sub)scale and action speed and number of actions.

(Sub)Scale	Action Speed	No Actions	(Sub)Scale	Action Speed	No Actions
Extraversion	-.64**	.83**	*Conscientiousness*		.56*
friendliness	-.54*		self-efficacy		.54*
gregariousness	-.53*		self-discipline		.61*
assertiveness		.61*	*Neuroticism*		
Agreeableness			anxiety	.67**	
trust		.54*	self-consciousness	.61*	
			Openness to experience		
			liberalism	-.60*	

* sign. at a 0.05 level, ** sign. at a 0.01 level.

Table 1 also shows a positive correlation between the speed of the actions and two subscales of neuroticism: anxiety and self-consciousness. Participants who scored high on these two subscales were slower in their actions than participants that scored lower. Neuroticism is defined in terms such as worrying, insecure, self-consciousness and temperamental [7]. These more neurotic participants might have been less confident in their actions, and therefore reluctant to act quickly. Still, the significant correlation with self-consciousness and their awareness that actions were recorded, could also be explained as a Hawthorne effect [9], an unwanted experimental effect.

3. USER PERSONALITY AND SKIN COLOUR

The idea of a possible relationship between personality and skin colour, as an explanatory element of skin preference, can be linked with a classic colour and personality theme in the domain of Personality Psychology. Research in this domain has looked at whether an individual's personality could be determined by his or her colour preference [10], or by how often the person used colours when describing an abstract image, the so-called Rorschach inkblots [11]. Systematic empirical studies [12], however, have failed to find statistical significant data that support such a relationship. A possible limiting factor of these empirical studies was their abstract approach towards colour, as they looked at colour preference in general, and did not take into account that people prefer different colours for different objects [13]. Therefore, we conducted a study to investigate whether the colour preference in the context of a specific computer application might still be a valid explanation for the relationship between personality and skin preference.

3.1 Method

A calculator and CD-player were developed, both with five skins that only varied by their colour (Table 2): a blue, a red, a green, a yellow, and a black skin. Instead of using a single luminosity level for the entire skin, the luminosity level was varied from very high (white) at the lower left and the upper right corners of the skin to a more average luminosity level (±50%) at the skins' diagonal. The 10 male and 10 female participants were all students of Brunel University. They had to complete five tasks with the calculator and five tasks with the CD-player. They had to perform each task with another skin; however it was left to the participants to choose which skin they would use for which task. After completing the tasks, the participants were asked to sort the skins according to their preference. The most preferred skin received a score of 5, downwards to the least preferred skin, which received a score of 1. All participants also completed the online IPIP-NEO personality inventory before they entered the experiment.

TABLE 2: Colours used in skins.

Skin	Diagonal			Lower left and upper right corner		
	Hue	Saturation	Luminosity	Hue	Saturation	Luminosity
Blue	225°	99%	60%	224°	45%	94%
Red	0°	96%	50%	7°	44%	94%
Green	120°	85%	27%	120°	14%	90%
Yellow	60°	100%	53%	60°	100%	95%
Black	240°	0%	20%	240°	0%	95%

3.2 Results and Discussion

Of the 20 participants only two participants varied in their ordering of the skin colours for the two applications. Therefore, the analysis was conducted on the summation of the scores for both applications. Table 3 presents the significant correlations between personality scales and preference for skin colour. The table shows significant negative correlations between the blue skins and extraversion, assertiveness, and cheerfulness. The blue skins were more preferred by the more introvert participants than by the more extrovert participants. This seems to agree with ergonomic guidelines that describe blue as a more cold and restful colour [14]. The blue skins were also less preferred by the more achievement driven participants than by less achievement driven participants. The results also revealed significant correlations between personality traits and the yellow and black skins.

TABLE 3: Significant Spearman correlations between personality (sub)scale and skin colour.

(Sub)Scale	Skin colour				
	Blue	Red	Green	Yellow	Black
Extraversion	-.53*				
assertiveness	-.48*				
cheerfulness	-.53*				
Agreeableness					
altruism					-.46*
Conscientiousness					
achievement-striving	-.51*			.48*	
Openness to experience					
imagination					.73**

* sign. at a 0.05 level, ** sign. at a 0.01 level.

4. CONCLUDING REMARKS AND FURTHER RESEARCH

Like any study these two studies also have their limitations, which will be addressed in a follow-up study. First of all, the relatively small sample size. Post-hoc analyses with small sample sizes are often unstable, and also less representative for large populations. Also, the explorative nature in combination with the large number of correlations that were examined creates a considerable opportunity for capitalization on chance. On the other hand, the studies seem to justify further research as dividing the user population according to user personality might be sensible and feasible. A major objection of personality segmentation, which is the impracticality of a questionnaire, might be overcome by using less intrusive means such as analysing interaction behaviour. Especially as more computer applications have network access, designers could potentially have access to personality data of large user populations, without users having to make any additional effort in providing this information. The study also suggests that personality data could help designers to select appropriate skin colours. For example, the results of two studies brought together could suggest that if designers notice extensive variance in the number of user actions and the average time between two consecutive actions, they might consider designing a blue coloured skin to target the more introvert users of these two applications.

As part of the PROSKIN project [15] more research is currently being conducted to study customized skinning based on interaction behaviour. A skinnable web radio has been built that will be freely available on the Internet (www.proskin.org). Users' consent will be asked to record all their interaction behaviour over an extensive period of time. They will also be asked to complete various psychometric inventories. This will allow us to validate the current findings, but also to study interaction measures for other design relevant user characteristics such as cognitive style, which relates to the user interface style [16]. More understanding of the relationship between individual differences, interaction behaviour and skin preference, in combination with the growing use of Internet, might change the traditional one-off design practice. Designers will distribute their initial designs, gather data about its use and develop new skins aiming to fit the needs of targeted user groups better than the original designed user interface.

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