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Perception in Virtual Worlds: Personality Impressions Based on Avatars in *Second Life*

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Sommaire

Selon Gartner, vers la fin de l'année 2011, 80% des utilisateurs actifs sur internet et des compagnies présentent dans le Fortune 500 auront un avatar ou une présence dans une communauté virtuelle semblable à *Second Life*. En lien avec ces prédictions, l'objectif principal de ce mémoire de maîtrise est de mieux comprendre comment la perception de la personnalité d'un avatar (une représentation virtuelle personnifiée par l'intermédiaire de la technologie informatique) dans l'univers virtuel de *Second Life* reflète la personnalité de l'individu qui le contrôle. L'auteur utilise une adaptation du modèle de la lentille de Brunswik pour spécifier les liens existants entre les individus (les cibles) et leurs avatars, ainsi qu'entre leurs avatars et un observateur externe. Au total, 103 individus ont envoyé une photo de l'avatar qu'ils utilisent dans *Second Life* et ont répondu à un questionnaire portant sur leur propre personnalité, de même que sur leur personnalité idéale et utilisant le Modèle à Cinq Facteurs (*FFM : Five-Factor Model*) : *Extraversion*, *Agréabilité*, *Caractère consciencieux*, *Neuroticisme* et *Ouverture d'esprit*. La personnalité perçue de ces avatars a ensuite été jugée par sept observateurs externes. Ce mémoire répond à quatre questions: (1) Est-ce que les différents observateurs externes arrivent à un consensus en ce qui concerne la personnalité des avatars ? (2) Est-ce que les jugements des observateurs externes sont justes ? (3) Quels repères visuels les observateurs utilisent-ils pour juger les avatars et lesquels sont valides ? (4) Quelles dimensions sont affectées par l'utilisation du concept d' « *impression management* » par les individus ? Les résultats suggèrent que: (1) les avatars provoquent des impressions similaires entre des observateurs indépendants pour chacune des dimensions, (2) les jugements des observateurs montrent des niveaux d'accord entre les individus et les observateurs relativement plus faibles que ceux trouvés dans des études comparables, (3) les observateurs comptent sur certains repères visuels des avatars pour former des impressions valides des individus, et (4) les cotes des observateurs sont plus élevées que celles des individus pour les dimensions *Extraversion* et *Ouverture à l'expérience*. Des implications managériales sont également proposées.

Mots clés

Perceptions, traits de personnalité, avatars, *Second Life*, univers virtuels.

Abstract

According to Gartner, 80% of active internet users and Fortune 500 companies will have an avatar or presence in a virtual community like *Second Life* by the end of 2011. In light of this prediction, the objective of this paper is to gain a better understanding of how personality impressions of an avatar (a virtual "person" created by means of computer technology) in the virtual world *Second Life* reflect the personality of the individual controlling the avatar. The author of this paper used an adaptation of Brunswik's lens framework to identify links between individuals (targets) and their avatars, as well as between avatars and the personality impressions observers (perceivers) formed of the avatars. A total of 103 individuals submitted a picture of their *Second Life* avatar and answered questions about their selves and ideal personalities using the five-factor model (FFM) dimensions: *Extraversion*, *Agreeableness*, *Conscientiousness*, *Neurotism* and *Openness*. These avatars were then viewed by seven perceivers, who rated their perception of the targets' real personality. Four research questions were answered: (1) Do perceivers judge a target's personality based on their analysis of the avatar? (2) Are perceivers' impressions of a target's personality accurate? (3) Which valid cues do perceivers use to form their impressions? (4) Which dimensions are influenced by impression management? Findings suggest that: (1) avatars elicit high levels of similar impressions from independent perceivers for all FFM dimensions, (2) perceivers' impressions indicate that self-perceiver agreement is lower than that found in comparable studies, (3) perceivers rely on specific avatar cues to form valid impressions on individuals, and (4) perceivers' impressions of individuals were enhanced for *Extraversion* and *Openness*. Managerial implications are provided in the conclusion.

Key words

Perceptions, personality traits, avatars, *Second Life*, virtual worlds.

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Avant-propos

Le Chapitre 2 du présent mémoire est un article scientifique qui sera soumis à une revue scientifique dans les mois suivants le dépôt de ce mémoire.

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Chapitre 1 – Introduction

Au cours des 10 dernières années, le pourcentage d'individus qui utilisent internet a rapidement augmenté. Aux États-Unis, ce pourcentage est passé de 10,5% de la population en 1995, à 66,8% en 2005 (eMarketer, 2006), une augmentation de 536%. De plus, selon eMarketer (2006), 73% de la population adulte aux États-Unis a effectué une transaction en ligne en 2006, comparativement à 47% en 2000. Cette augmentation dans le nombre d'individus qui utilisent internet, ainsi que dans le nombre d'individus qui achètent des articles sur internet, a grandement modifié les stratégies de marketing employées par les entreprises qui désirent effectuer du marketing de type B2C (*Business-to-consumer*) efficace et ainsi rejoindre le plus grand nombre de consommateurs potentiels possible. Une des stratégies avant-gardistes pour rejoindre ces consommateurs potentiels par l'intermédiaire d'internet est d'augmenter le degré d'interaction avec ceux-ci en utilisant des avatars. Selon Holzwarth, Janiszewski et Neumann (2006, p. 20) « un avatar est une représentation virtuelle qui peut être personnifiée par l'intermédiaire de la technologie informatique » (traduction libre de l'auteur). En ce qui a trait aux stratégies marketing, les avatars peuvent être utilisés de deux manières: (1) pour faire du marketing auprès d'utilisateurs d'internet à l'aide d'avatars, ce que l'on nomme du « marketing par avatars » (Holzwarth et al., 2006), ou (2) pour faire du marketing auprès des utilisateurs qui possèdent des avatars, ce que l'on nomme du « marketing aux avatars » (*avatar-based marketing* : Hemp, 2006). Dans le cadre du présent mémoire, c'est le marketing aux avatars dont il sera question.

Outre cette introduction qui constitue le Chapitre 1, ce mémoire se divise en trois autres chapitres. Tout d'abord, le Chapitre 2 consiste en un article scientifique dans lequel les réponses à quatre questions concernant le marketing aux avatars sont présentées; la méthodologie, les résultats obtenus, de même que leurs implications théoriques et managériales sont également expliquées. Par la suite, le Chapitre 3, offre une conclusion récapitulative de cette étude. Enfin, le Chapitre 4 présente des détails supplémentaires en ce qui concerne la méthodologie employée lors de la collecte de données pour l'article présenté dans le Chapitre 2.

Chapitre 2 – Perception in Virtual Worlds: Personality Impressions Based on Avatars in *Second Life*

2.1 – Introduction

According to Gartner, 80% of active Internet users and Fortune 500 companies will have an avatar or presence in a virtual community like *Second Life* by the end of 2011 (eMarketing 2007). Virtual communities similar to *Second Life* stand out in that they have their own economy in which transactions are made. *Second Life* has its own money (Linden), which fluctuates[1] like real-world currency. The ability to conduct transactions in the *Second Life* economy increases the appeal of this virtual world. Many real-world companies are present in *Second Life*: *Adidas*, *American Apparel*, *Dell*, *Disney*, *IBM*, *Nike*, *MTV*, *Reuters*, *Telus* and *Toyota*[2]. *American Apparel* asks *Second Life* residents for feedback on their new collections (Joel, 2006). With their e-money, residents can buy property, buildings, multiple services, clothing for their avatars (LaVallee, 2006) and replica cell phones (Joel, 2006). The potential increase in the number of individuals with avatars emphasizes the need for a greater understanding of who these users are in order to improve avatar-based marketing (Hemp, 2006). Doing so would allow companies to establish an effective business-to-consumer (B2C) relationship, with an ultimate view to encouraging these individuals to buy real-world merchandise from the same companies their avatars purchase from online.

To target users, we need to study how their avatars interact in the virtual community. The following terms will be used to ensure constancy. The individual who observes another's avatar will be referred to as a "perceiver"[3], while the avatar being observed will be called a "target"[4]. Every user in a virtual community, just like in real life, can be both target and perceiver because the relationship is reciprocal. The only information a user has about another user is what the other's avatar looks like. Each perceiver finds himself in a minimal-information situation where socio-demographics (age, race, gender, social status,

[1] These fluctuations appear at http://secondlife.com/whatis/economy-market.php
[2] For a complete list of companies present in *Second Life*, see http://secondliferesearch.blogspot.com/2007/07/companies-in-second-life.html
[3] Other words such as "observer", "judge", "rater", "decoder" and "actor" are also used
[4] Other words such as "ratee" and "partner" are also used

ethnicity, lifestyle or location of other individuals), as well as the most important aspects of self-concept (Belk, 1988; James, 1890; and Prelinger, 1959), such as physical characteristics, are unknown. Past social psychology research has shown that individuals tend to judge others on their traits as well as on their behaviour (Fiske & Cox, 1979; Winter & Uleman, 1984). Evidence suggests users base their judgment of another's avatar on the avatar's traits. Evaluating this judgment process requires an analysis of traits that are stable over time. Allport and Odbert (1936, p. 26) define the term "personality traits" as "generalized and personalized determining tendencies, consistent and stable modes of an individual's adjustment to his environment". Personality psychologists such as John (1990) generally assume that personality traits, in addition to being relatively stable over time, differ among individuals and influence behaviours. Therefore, personality traits were used to measure how users would judge the avatars of others. Despite the growing popularity of avatars, a literature census revealed that no study has been conducted on our main research question, namely how personality impressions of an avatar reflect the real personality of the user controlling the avatar. Though many research questions related to our main research question would be of interest to marketers, psychologists and communicators, we will focus on the four deemed most important for the purposes of this study:

1. Do perceivers judge a target's personality based on their analysis of the avatar?
2. Are perceivers' impressions of a target's personality accurate?
3. Which valid cues do perceivers use to form their impressions?
4. Which FFM dimensions are influenced by impression management?

In this article, we: (1) explain the central concepts pertaining to avatars, (2) propose a theoretical framework, (3) present extant research, (4) present the field experiment *Second Life* and expose the methodology used and results obtained, and (5) conclude with a brief discussion about managerial implications and further research that could be conducted to increase understanding of how avatars are perceived.

2.2 – Avatar Characteristics and Environment

The term "avatar" comes from Sanskrit and refers to "the manifestation of a deity, notably Vishnu, in human, superhuman or animal form" (Collins English Dictionary, 1998, p. 104). This term was popularized in computer science and related disciplines in the 1992 novel *Neuromancer* by Neal Stephenson. From among the many definitions of "avatar", the one proposed by Holzwarth, Janiszewski and Neumann (2006), "general graphic representations that are personified by means of computer technology" (p. 20)[5], will be retained for this study.

Avatars have distinctive characteristics. First, they can be designed in two or three dimensions. Second, they can have human characteristics, such as physical attributes (musculature, hair colour, hairstyle, eye colour, skin colour and tattoos) socio-demographic traits (gender and age) and a defined fashion sense. Although in real life it is difficult or impossible to modify one's physical attributes, this can be instantly accomplished online by means of graphic technology. Third, avatars can be fantastic creatures, such as robots (Johnny 5, Robocop and Terminator), video game characters (Crash Bandicoot, Donkey Kong, Mario and Sonic the Hedgehog) or cartoon characters (Bugs Bunny, Garfield and SpongeBob SquarePants).

Avatars are the only means by which users in virtual worlds present themselves to others and make an identity claim. Identity claims are defined as "symbolic statements made by individuals about how they would like to be regarded; these statements may be directed at the self or to convey messages to others" (Vazire & Gosling, 2004, p. 124). Avatars are primarily considered as controlled sources of identity claims since users can choose colour, clothing and body types to reflect their personal taste, a process similar to that of the draw-a-person test developed by clinical psychologist Machover (1949). Given users' near total control over the creation process, the avatars may reflect signs of the creator's self, though these signs may have been unconsciously added. When making their avatars, users often ask themselves such questions as "Who am I?" or "What do I want to look like?" to create

[5] Many other definitions focalized on a more virtual communities-centered approach. For instance, Bahorsky, Graber and Mason (1998) described an avatar as "a pictorial representation of a human in a chat environment" (p. 8), while Loos (2003, p. 17) states "a representation of the user as an animated character in virtual world".

an ameliorated self (Harraway, 1991; Taylor, 2002; Turkle, 1995). Some individuals use their avatars to escape from their offline selves, hiding behind a mask to reveal the repressed part of their personalities, as is done when wearing a disguise on Halloween. According to Gosling, Ko, Mannarelli & Morris (2002), identity claims could be divided into self-directed identity claims and other-directed identity claims. Self-directed identity claims are defined as symbolic statements made by the target to reinforce his self-view (Vazire & Gosling, 2004). These symbols could be cultural symbols (e.g. dark skin) or personal symbols (e.g. tattoo or Mohawk hairdo). Other-directed identity claims are statements to others about how the target would like to be perceived (Baumeister, 1982; Goffman, 1959; Swann, 1987). By displaying such symbols (e.g. a t-shirt of a favourite band or Gothic clothing), a target may intentionally be communicating his attitude, values and group identification. Self-directed and other-directed identity claims may be manifested in similar ways. For example, having a tattoo could reinforce both the view of the self and the view a target wants others to have of him. Targets may try to present an enhanced version of who they really are. This phenomenon is called "impression management" (Schlenker, 1980, Tedeschi, 1981).

Generally, avatars can be used as company representatives or as an interaction tool in virtual communities. More and more companies are using avatars as company representatives (Ikea: Anna; Michelin: Michelin Man; Pillsbury: Pillsbury Dough Boy). These corporate avatars can serve as an e-spokesperson, personal shopping assistant and website guide, thus fulfilling consumers' needs for an interactive shopping experience (Holzwarth et al., 2006). Companies generally create avatars to increase consumer interaction, provide entertainment value and ensure more personalized service (Holzwarth et al., 2006; Koda, 1996; Nowak, 2004; Nowak & Biocca, 2003; Maes, 1999; Redmond, 2002). Avatars can be found in nearly every type of virtual community. The term "virtual community", also called "online" and "computer-mediated" community, was first defined by Rheingold (1993, p. 5) as "social aggregations that emerge from the [Internet] when enough people carry on those public discussions long enough, with sufficient human feeling, to form webs of personal relationships in cyberspace". According to Kozinets (1999), virtual communities can be divided into four different categories: rings, discussion boards, rooms and multi-user dungeons (MUD). Over the last few years, a new category of virtual community has appeared: virtual worlds (also called metaverses). A synthesis of the

major characteristics of these five types of virtual communities is presented in Table 1 (for a more complete description of virtual communities, see Kozinets, 1999 and Wellman & Gulia, 1999).

Table 1 – Types of Virtual Communities

Type	Definition	Best Known
Rings (Electronic mailing lists)	Virtual community where groups of individuals interact through electronic mailing lists to share information on specific interests. Rings are characterized by the fact that a single e-mail address, called a receptor, sends a copy of the message to all subscribers. This type of virtual community is harder to track because these specific communities are generally untraceable through search engines.	• Hard to track
Discussion boards	Electronic bulletin boards organized around specific interests where all active members can read and post messages sorted by date and subject. Over the last few years, traditional boards have been replaced by weblogs, often called blogs, which are online diaries.	• Facebook • LiveJournal • MySpace • YouTube
Rooms	Virtual environments where people interact by means of a chat box (and they can also exchange files). Like discussion boards, they are organized around specific interests, but they differ in that the discussions are carried out in real time instead of through posted messages.	• *Internet Relay Chat* (IRC) (Mirc, EFnet, etc…) • *Instant messaging* (Windows Live Messenger, ICQ and Yahoo Messenger) • *Peer-to-peer* (P2P) file exchange (Kazaa, Morpheus, Napster and Limewire).
Multi-user Dungeons (MUD)	Virtual communities that were originally computer-generated communities where players of fantasy games like *Dungeons and Dragons* meet. Today, MUD include virtual environments where people interact through their avatars in a role-playing environment.	• Dark Age of Camelot • World of Warcraft
Virtual worlds (Metaverses)	Virtual communities that are universes (virtual worlds) incorporated into another universe (the real world). They diverge from MUD because they lack the goal-oriented structure found in these games. Participants, who interact through their avatars, can buy property, buildings, multiple services, clothes for their avatars, etc.	• Entropia Universe • Kaneva • *Second Life* • The Sims Online (TSO) • There.com

2.3 – Modelling Avatars' Relationships in Virtual Worlds

According to social response theory (SRT) regarding human-computer interactions, people tend to react to computer-technology as if it were a social entity (Moon 2000, 2003; Reeves and Nass 1996). Also, recent research indicates that individuals respond to computers as they do to people when computer-related features, such as avatars, possess

anthropomorphic attributes (Moon 2003; Nass and Steur 1993). Anthropomorphism is defined as "the tendency of people to make attributions of humanlike characteristics to animals and nonhuman entities" (Kiesler, 2006, p. 149). An avatar composed of pixels is not a human, but it can easily be described with human characteristics. In view of this, avatars should be studied as individuals instead of objects because (1) the relationship they have with other avatars is reciprocal (an individual can interact with something perceived as an individual, though not with something that is perceived as an object), and because (2) an individual's behaviour is changeable while that of an object is stable (Kenny, 1994).

Before describing our theoretical framework, we will define the model we used to analyze it: the Five-Factor Model (FFM: McCrae & Costa, 1999; McCrae & John, 1992). The FFM is a hierarchical model that contains five factors (dimensions) at the highest level of abstraction. These five factors are: *Extraversion* (energetic approach), *Agreeableness* (prosocial and communal orientation), *Conscientiousness* (socially prescribed impulse control), *Neurotism* (negative emotionality) and *Openness*[6] *to Experience* (mental and experiential life). In addition, each factor is bipolar: *Extraversion* vs. *Introversion*, *Conscientiousness* vs. *Impulsivity*, *Neurotism* vs. *Emotional Stability*, *Agreeableness* vs. *Antagonism* and *Openness* vs. *Close-mindedness*. The factors summarize a myriad of more specific traits (e.g. - sociability for *Extraversion*) and subsume a large number of even more specific ones (e.g. - talkative and outgoing for *Extraversion*)[7]. The FFM was selected because it is the most commonly used model, it has the strongest theoretical components and it contains five orthogonal dimensions that incorporate every single personality trait (McCrae, Zonderman, Costa, Bond & Paunonen, 1996).

As illustrated in Figure 1, Brunswik's lens interpersonal perception model (1956) was used to analyze the relationship between the perceiver and avatars in virtual communities. Over the last decade, many adaptations of the Brunswik lens model have been proposed (see Gangestad, Simpson, DiGeronimo & Biek, 1992; Gifford, 1994; Gosling et al., 2002). According to Figure 1, visual avatar cues can serve as a kind of lens through which perceivers indirectly observe underlying constructs. For instance, an unconventionally-

[6] The term "*Openness*" will be used instead of "*Openness to Experience*" throughout the study to shorten the text.

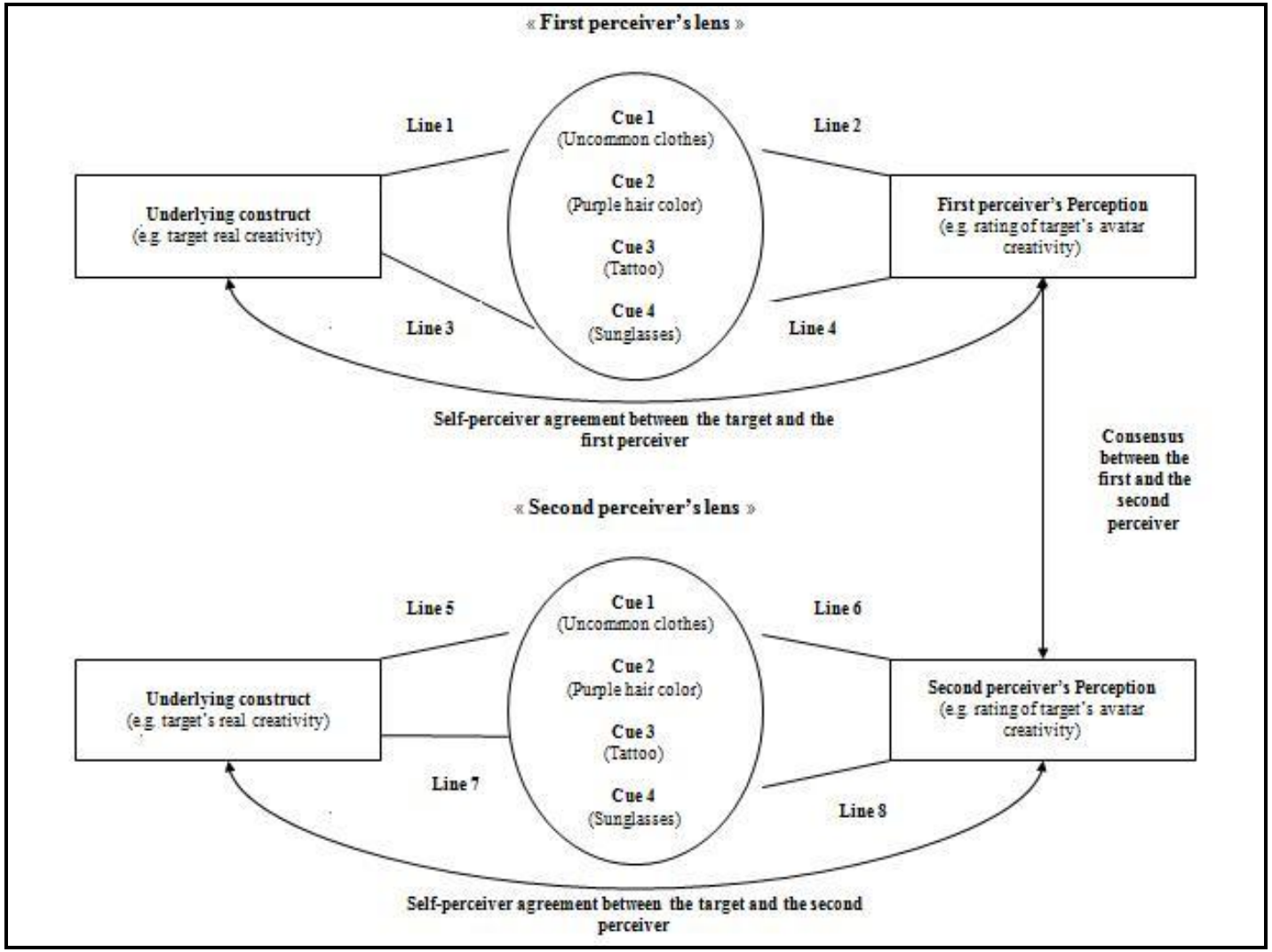
[7] For more information on the FFM hierarchical structure, see Paunonen, 1998; for more information on the FFM, see Endler & Speer, 1998; McCrae & John, 1992 and John & Srivastava, 1999).

dressed avatar could serve as a lens through which the perceiver would identify the target's high level of creativity.

In Figure 1, Line 2 connecting the Cue 1 (unconventional clothing) and the perceiver's perception (target's creativity) is referred to as cue utilization. Line 1 connecting Cue 1 and the target's underlying construct (target's real degree of creativity) is referred to as cue validity. If both of these lines point to the same cue, then the perceiver's perceptions converge with those of the target's underlying construct, resulting in agreement between the perceiver and target. This kind of agreement is referred to as self-perceiver agreement (or "self-peer agreement" or "self-other agreement" or "achievement"). Self-perceiver can be defined as "the relationships better than chance existing between [two individuals], and due to an organism and variables in its physical environment" (Brunswik, 1956, p. 34) or as "the similarity between personality descriptions by the self and by others" (Funder & West, 1993, p. 457). In Figure 1, Line 1 and Line 2 illustrate perfect self-perceiver agreement (r = 1.0) because the perceiver correctly infers the target's actual personality, while Line 3 and Line 4 illustrate the opposite.

Measuring "consensus" (or "peer-peer agreement", "other-other agreement", "interjudge agreement" or "interobservers agreement") is also important. Consensus is defined as "the agreement with which two people (or more) can describe the personality of another" (Funder & West, 1993, p. 457). Consensus is illustrated in Figure 1, where the relationship between perceiver 1 and perceiver 2 illustrate perfect consensus for Cue 1, since Line 2 and Line 6 both point to the same cue. Consensus is necessary for making a valid judgment, though self-agreement is also required (Brunswik, 1956; Kenny, 1994). As illustrated in Figure 1, both perceivers reach consensus on Line 8 and Line 4, but only perceiver 1 reaches self-perceiver agreement.

Figure 1 – Multi-perceivers Brunswik's (1956) Lens Model Adapted to Avatars



2.4 – Research questions

Past studies have examined personality impressions formed on the basis of personal environments, such as personal possessions (Burroughs, Drews, & Hallman, 1991), offices and bedrooms (Gosling et al., 2002), personal websites (Vazire & Gosling, 2004; Marcus, Machilek & Schütz, 2006), Internet chat rooms (Markey & Wells, 2003) and Facebook profiles[8] (Gosling, Gaddis & Vazire, 2007). Past studies have also analyzed target's perceptions from different channels of communication. According to Ambady and Rosenthal (1992), channels of communication can be divided into three categories: (1) nonverbal channels (visual: face, body, or face and body; vocal: tone of voice); (2) verbal channels (speech and transcripts) and (3) audiovisual channels (combination of visual and verbal channels). Furthermore, authors such as Kenny (1994) divided past research according to their level of acquaintance: (1) zero-acquaintance, (2) short-term acquaintance and (3) long-term acquaintance. Zero-acquaintance refers to impressions based on minimal exposure to the targets, generally when the perceiver has never met the target; short-term acquaintance refers to situations where the perceiver and target have interacted with each other for a few minutes or hours; and long-term acquaintance refers to situations where the perceiver and target have know each other for a long time, generally years. In this study, we examined personality impressions based on a personal environment: an avatar in the virtual world *Second Life*. We also used visual nonverbal channels (face and body). Perceivers in the study have zero-acquaintance with the targets, but most of them have long-term acquaintance with the virtual world *Second Life*. The framework presented in the previous section (Figure 1) underlies at least four research questions. Our main objective is to provide evidence on how personality impressions of an avatar reflect the real personality of its target. To examine perceivers' impressions based on the target's avatar, we focus on four areas. First, we determine the concordance of perceivers' impressions by testing consensus. Second, we determine if these impressions correspond to the targets' actual personality by testing for self-perceiver agreement. Third, we examine the link between perceivers' impressions and the avatar characteristics on which perceivers base their impressions (cue utilization) and the targets' actual personality and avatar characteristics

[8] Facebook is a virtual community where individuals can add information about themselves: http://www.facebook.com/

(cue validity). Fourth, we test for impression management by looking at different elements that could explain the distortion between a target's real personality and his avatar's personality. Our four research questions are:

1. Consensus: Do perceivers judge a target's personality based on their analysis of the avatar?
2. Self-perceiver agreement: Are perceivers' impressions of a target's personality accurate?
3. Cue Utilization and Cue Validity: Which valid cues do perceivers use to form their impressions?
4. Impression Management: Which FFM dimensions are influenced by impression management?

A literature census was conducted for each of the aforementioned questions and served to guide our research. The census was limited to studies using the FFM (McCrae & Costa, 1999; McCrae & John, 1992) that measured personality traits based on personal environment.

2.4.1 – Question 1 – Consensus

We identified four studies after completing a literature census on consensus for studies using the FFM when examining personality traits based on personal environment. When measuring consensus, many authors used intraclass correlations (ICC: Shrout & Fleiss, 1979)[9] instead of mean of Pearson correlations. Gosling et al. (2002) conducted two studies on the relationship between an individual's perceived personality traits and his personal space (Study 1: Bedrooms, Study 2: Offices) and self-reported personality traits. For Study 1, eight perceivers examined the offices of 94 people and evaluated the occupants based on the perception of their personalities. For all traits, the mean of 28 pairwise correlations[10] was positive and significant ($r_{pc} = .34$). There were also significant consensus correlations ($p < .05$) for four dimensions, ranging from .14 to .51; only *Neurotism* was not significant.

[9] Intraclass correlations are appropriate when there is no theoretical reason to differentiate between perceivers (see Rosenthal & Rosnow, 1984; Shrout & Fleiss, 1979).
[10] The number of pairwise correlations is accessed by computing (8x7)/2 = 28.

For Study 2, seven perceivers examined the bedrooms of 83 college students. For all traits, the mean of 21 pairwise correlations was positive and significant ($r_{pc} = .34$). Consensus correlations were significant ($p < .05$) for three out of five dimensions and ranged from .08 for *Neurotism* to .58 for *Openness*; *Agreeableness* and *Neurotism* were not statistically significant. The results of both studies were combined, and the average consensus correlations per dimension are, from highest to lowest: *Openness* ($r_{ave} = .49$), *Conscientousness* ($r_{ave} = .45$), *Extraversion* ($r_{ave} = .35$), *Agreeableness* ($r_{ave} = .22$) and *Neurotism* ($r_{ave} = .11$). Vazire and Gosling (2004) examined consensus correlations between an individual's perceived personality based on his personal website. Eleven website perceivers reviewed the personal website of 89 targets. Consensus correlations were significant for all dimensions, ranging from .18 for *Extraversion* and *Openness* to .32 for *Neurotism*. Gosling et al. (2007) examined personality impressions of targets based on their Facebook profiles. Nine perceivers examined the Facebook profiles of 133 targets. Authors found that all consensus correlations were significant and ranged from .05 for *Neurotism* to .30 for *Extraversion*. A synthesis of these results is presented in Table 2 and shows that globally, *Openness* ($r_{med} = .42$) has the highest median consensus correlation, followed by *Conscientousness* ($r_{med} = .35$) and *Extraversion* ($r_{med} = .32$), while *Agreeableness* ($r_{med} = .22$) and *Neurotism* ($r_{med} = .12$) have lower coefficients. These results imply that studies examining impressions based on personal environments have similar consensus correlations compared to those examining face-to-face interactions.

Table 2 – Census of Studies Examining FFM Dimension Consensus

Study	Type	Targets	Perceivers	Extra.	Agree.	Consc.	Neuro.	Open.
	Offices	94	8	.39**	.23*	.42**	.14	.51**
Gosling, Ko, Mannarelli and Morris, (2002)	Bedrooms	83	7	.31*	.20	.47**	.08	.58**
Vazire and Gosling (2004)	Personal Websites	89	11	.32**	.28**	.27**	.18*	.32**
Gosling, Gaddis and Vazire (2007)	Facebook profiles	133	9	.30*	.09*	.18*	.05*	.16*
Study Median	-	-	-	.32	.22	.35	.12	.42

*$p < .05$, ** $p < .01$.

Note: Extra. = *Extraversion*, Agree. = Agreeableness, Consc. = Conscientiousness, Neuro. = *Neurotism*, Open. = Openness, Note: Gosling, Gaddis and Vazire (2007) only mention $p < .05$.

2.4.2 – Question 2 – Self-perceiver Agreement

We did a census of seven studies measuring self-perceiver agreement by using the FFM. Self-perceiver agreement is generally measured using Pearson correlations instead of the intraclass correlations used for consensus; and self-perceiver correlations are generally lower than consensus correlations (Funder & West, 1993). The difference between accuracy and self-perceiver agreement resides in the fact that accuracy refers to the correlation between perceivers and aggregated ratings that include self ratings and acquaintance or sibling ratings[11]. Since the term "self-perceiver agreement" is included in the definition for "accuracy", we will employ the term accuracy in this paper from here on. Gosling et al. (2002) found that accuracy correlations range from -.04 to .46 for offices and from .20 to .65 for bedrooms. It was also noted that eight out of ten coefficients were significant. For both studies, dimensions with the highest average self-perceiver correlations were as follows: *Openness* ($r_{ave} = .64$), *Conscientousness* ($r_{ave} = .29$), *Neurotism* ($r_{ave} = .28$), *Extraversion* ($r_{ave} = .23$) and *Agreeableness* ($r_{ave} = .12$). Based on 15-minute one-on-one interactions in Internet chat rooms, Markey and Wells (2002) used a sample of 84 undergraduate students and found positive and significant ($p < .05$) self-perceiver correlations for only *Extraversion* (.32) and *Openness* (.46). Similarly to Markey and Wells (2003), Rouse and Haas (2003) used a sample of 64 undergraduate students who participated in two 15-minute one-on-one interactions in Internet chat rooms, and found that only *Conscientiousness* (.40) was positive and significant ($p < .05$). Vazire and Gosling (2004) found that all accuracy correlations were significant and ranged from .28 to .63. *Openness* (.63), *Conscientiousness* (.43) and *Extraversion* (.38) all had high correlation coefficients, while *Neurotism* (.31) and *Agreeableness* (.28) had weaker, though still significant ($p < .05$), coefficients. Marcus et al. (2006) expanded on Vazire and Gosling's (2004) personality trait and website study. They asked five perceivers unacquainted with the target of each website, and to surf the target's website for five minutes. The authors found that four out of five self-perceiver correlations were significant, ranging from .01 to .36. From highest to lowest, the correlations were: *Openness* (.36), *Extraversion* (.23), *Neurotism* (.20), *Conscientiousness* (.18), *Agreeableness* (.01). In their study about Facebook, Gosling et al. (2007) found that all accuracy correlations, except *Neurotism*,

[11] For more information on accuracy, see Funder & West (1993) and Kruglanski (1989).

were significant, ranging from -.13 for *Neurotism* to .46 for *Extraversion*. A synthesis of these results is presented in Table 3. From highest to lowest, the highest self-perceiver correlations were: *Openness* ($r_{med} = .46$), *Conscientousness* ($r_{med} = .34$), *Extraversion* ($r_{med} = .24$), *Neurotism* ($r_{med} = .20$) and *Agreeableness* ($r_{med} = .04$). These results imply that studies examining impressions based on personal environments have lower accuracy correlations than those examining face-to-face interactions.

Table 3 – Census of studies dealing with accuracy for dimensions of the FFM

Study	Type	# Targets	# Perceivers	Extra.	Agree.	Consc.	Neuro.	Open.
Gosling, Ko, Mannarelli and Morris, (2002)	Offices	94	8	.24*	.04	.24*	.19	.46**
	Bedrooms	83	7	.22*	.20*	.33**	.36**	.65**
Markey and Wells (2002)	Internet Chat Rooms	84	84	.32*	-.13	-†	-	.46*
Rouse and Haas (2003)	Internet Chat Rooms	64	64	.04	.00	.40**	.08	.06
Vazire and Gosling (2004)	Personal Websites	89	11	.38**	.28**	.43**	.31**	.63**
Marcus, Machilek and Schütz (2006)	Personal Websites	222	5 (out of 119)	.23**	.01	.18**	.20**	.36**
Gosling, Gaddis and Vazire (2007)	Facebook profiles	133	9	.46*	.20*	.27*	.13	.39*
Median of studies	-	-	-	.24	.04	.34	.20	.46

*p<.05, ** p< .01, † Authors reported insufficient variance to compute correlation.
Note: *Extraversion*, Agree. = Agreeableness, Consc. = Conscientousness, Neuro. = *Neurotism*, Open. = Openness, Markey and Wells (2002) and Gosling, Gaddis and Vazire (2007) only mention p<.05.

2.4.3 – Question 3 – Cue Utilization and Cue Validity

The analysis of visual cues dates back to physiognomists Porta ([1586] 1801) and Lavater (1789). In the beginning of the 20th century, personality psychologists argued that personality may be expressed through observable cues (Allport, 1937). Allport noted that perceivers seem to naturally attribute certain characteristics to targets. Brunswik (1956) suggested that "at least tacitly, any physiognomic experiment envisages some kind of appraisal of distal achievement as one of its ultimate ends and thus is bound to the principles of representative design" (p. 100). Goffman (1979) proposed that the Earth was a "glimpsed" world, which he defines as being a world populated by valid details that allows perceivers to observe targets and form judgments about the characteristics they see.

All of these studies on physiognomy led to the creation of the Weighted-Average Model (WAM: Kenny, 1994). The WAM parameter of "similar meaning system" reveals the

"agreement between judges within an act" (Kenny, 1994, p. 247). In other words, this refers to the degree to which perceivers agree on the meaning of analyzed information. Similar meaning systems could be apparent when a perceiver judges an avatar. For instance, the perceiver could, upon noting an avatar's purple hair, interpret this as being a special cue that the target is extraverted. If every perceiver makes the same assumption, then consensus should be strong (Hayes & Dunning, 1997). Another model, the Realistic Accuracy Model (RAM) developed by Funder (1995, 1999), suggests that self-perceiver agreement will be increased when perceivers use what he calls "good information". Impression formation should be accurate when perceivers base their judgments on information related to self ratings. If the underlying constructs are actually related to visual avatar cues, then this should provide accurate information about the target. The WAM and RAM concepts thus form the two halves of Brunswik's (1956) lens model (Figure 1). Cue utilization refers to the relation between judgments and observable avatar cues; cue validity refers to the relation between the target's ratings and observable information on avatars. Thus, cue utilization is similar to the WAM parameter of meaning systems, and cue validity is similar to the RAM parameter of good information. The lens model can represent all combinations of cue utilization and cue validity, revealing sources of good and bad judgments (Funder & Sneed, 1993; Gifford, 1994). As mentioned earlier, good judgment results from perceivers using valid cues (represented by Cue 1 in Figure 1) and ignoring invalid ones (Cue 4), just as was done in the studies by Gosling et al. (2002) and Marcus et al. (2006).

2.4.4 – Question 4 – Impression Management

According to James (1890, p. 294), "[w]e do not show ourselves to our children as to our club-companions, to our customers as to the labourers we employ, to our masters and employers as to our intimate friends." This statement accurately describes the concept of impression management. According to Goffman (1959), Schlenker (1980) and Tedeschi (1981), particular behaviours (and characteristics) can be controlled in public to meet self-presentation objectives in order to convey desired impressions to gain approval and status from perceivers (Hogan, Jones, & Cheek, 1985). The goal of such manipulation by the target is to influence the perceiver's view and ensure it aligns with one's own ideal-self view (Higgins, 1987; Leary, Nezlek, Downs, Radford-Davenport, Martin & McMullen,

1994; Leary & Kowalski, 1990; Stires & Jones, 1969; Tice, Butler, Muraven, & Stillwell, 1995). According to Baumeister (1982), targets are "guided by the desire to make one's public image equivalent to one's ideal self" (p. 3). Furthermore, two previous studies test the presence of impression management on given personality traits. In their study on personal websites that used a two-step regression procedure, Vazire and Gosling (2004) found that impression management was significant for two of the five dimensions: *Extraversion* and *Agreeableness*. Moreover, in their study on Facebook profiles, Gosling, Gaddis and Vazire (2007) also concluded that impression management was significant for two of the five dimensions: *Neurotism* and *Openness*. Since both of these studies provided divergent results, it is still too early to conclude which dimensions can be influenced by impression management. Avatars, like personal websites and Facebook profiles, are highly controllable information transmitters, well-suited to strategic self-presentation. We can suppose that impression management would be significant for at least one dimension, though we can't predict which one.

2.5 – Methodology

This study comprises two data collection phases. For each phase, participants (targets and perceivers) were asked to fill out a questionnaire. The participants were *Second Life* residents and older than 18 years of age[12]. Six research assistants filled out the two questionnaires as a pre-test to identify problems, which were later resolved.

2.5.1 – A description of Field experiment

Second Life is the virtual world with the fastest growing membership, having gone from approximately 700 000 members in September 2006 (LaVallee, 2006) to over 9 000 000 members a year later. In *Second Life*, each user (also called a "resident") must choose a permanent nickname. Residents can select any first name they want, though they must select a last name from among one of the 200 choices available. Residents must then configure their avatar's appearance. Even if most residents choose to create human avatars, it is also possible to create anthropomorphic animals and robots. Residents may include personal information in their profiles that comprises one picture, the resident's status

[12] The minimal legal age to participate in *Second Life* is 18 years. Younger users can register to *Teen Second Life*.

(online/offline), biographical information (up to 500 words), group affiliations, interests, skills and information about the resident's "first" life in the real world (up to 250 words).

All residents can chat with other avatars near them or communicate with other residents anywhere on the *Second Life* map through instant messaging. Each resident has an instant messaging list (IM list) and can add other residents to it by exchanging "trade cards". Thereafter, the resident is notified when the residents on their IM list are online. Any resident can create a group (virtual community) or join an existing one.

As previously mentioned, *Second Life* has its own economy. Multiple objects can also be created in *Second Life*. Each such object "has permissions set for three actions: copying the object, modifying the object, and transferring the object" (McKeon & Wyche, 2006, p. 6). All residents can buy property; most popular locations are awarded by Linden Lab monitors. *Second Life* also encourages residents to increase their social status by, among other things, consulting the leader board or finding a mentor. McKeon and Wyche (2006) identified at least three areas in which residents can increase their social status: group affiliation, wealth and amount of property owned. Residents can also join different groups, and being a member of some groups can be considered as having attained a higher social rank.

2.5.2 – Phase 1

In Phase 1, targets filled out an online questionnaire that was divided into six sections, though only four sections were used for the study. In the first section, targets were asked to send a picture of the avatar they use in *Second Life*. Instructions for doing so were included in the questionnaire. In the second section, targets were asked to answer questions about their level of participation in virtual worlds, especially *Second Life*. In the third section, targets were asked questions about their self-perceived personality traits (self), their avatar-perceived personality traits (avatar) and their ideal-self perceived personality traits (ideal self). In the last section, they were asked questions about their socio-demographic profile (this questionnaire is presented in Appendix 1)

Even though *Second Life* has a total population of more than 9 000 000 residents (http://secondlife.com), there is minimal probability of a user encountering another *Second Life* user in the real world, such as while taking a walk in the park. A five-prong recruitment strategy was adopted for Phase 1. First, the author contacted an important blogger[13] interested in e-marketing by e-mail, who agreed to advertise this study on his blog. Second, the author selected a total of 10 traditional discussion boards written in French or English[14] and posted a letter soliciting volunteers on each discussion board[15]. To ensure transparency, the author presented himself as a researcher of the RBC Financial Group Chair in E-Commerce at HEC Montréal. Third, the author met residents one-on-one in *Second Life* and asked them to fill out the questionnaire on the study's website. Fourth, the author subscribed to a specific discussion board named SLprofiles[16] and met residents one-on-one to ask them to fill out the questionnaire on the website. Fifth, those who filled out the questionnaire were asked to refer up to five friends, with each referral giving an additional chance to win a grand prize.

Of the 129 targets who agreed to participate in the study, 103 filled out the questionnaire completely, and 65 completed the picture extraction procedure properly. Even though respondents were clearly instructed to send a 640-by-480 full body picture of their avatar facing the screen, many did not follow them. The author resized all pictures to a 240-by-320 format using Paint software to ensure all avatars appeared in the same position to reduce bias regarding picture position. After resizing the pictures, only 75 were usable. Three avatars were anthropomorphic animals or robots, while the rest were human. To the best of our knowledge, our sample characteristics were similar to typical users of *Second Life*. The average target age was 33.9 (SD: 10.0, median: 33.0) and most of them were female (56.3%). Targets were mostly Caucasian (77.7%) and lived in the United States (40.8%), France (19.4%) or Canada (13.6%). Approximately half of them had an annual income of under US$40,000 before taxes (51.5%) and were working full-time (47.6%). A large number of them attended a post-secondary educational institution (78.7%), with 24.3% at the graduate level. Targets spent an average of 42.4 hours on the Internet (SD: 25.9, median: 35.0), 26.3 hours in virtual worlds (SD: 22.9, median: 20.0) and 25.9 hours in

[13] Michel Leblanc's blog: http://www.michelleblanc.com.
[14] The complete list of traditional discussion boards is presented in Appendix 2.
[15] A sample of one of these letters is presented in Appendix 3.
[16] http://www.slprofiles.com

Second Life (SD: 22.6, median: 20.0) per week. Fifty-eight (45.0%) targets have a premium account[17], 118 (93.7%) own objects other than clothes, 65 (50.8%) own no property, while 35 (27.3%) own one property, 12 (9.4%) own two properties and 16 (12.5%) own three properties or more. On average, targets spent US$33.92 per month in *Second Life* (SD: 63.1, median: 10.0). In exchange for their participation, targets were offered the chance to win the final grand prize of US$500, which is the equivalent of 135 000 Lindens.

2.5.3 – Phase 2

For Phase 2, seven perceivers who were hired as research assistants filled out the online questionnaire that was divided into three sections[18]. Their average age was 32.1 years (ranging from 18 and 59). For the main section, they were asked to independently give their initial impressions of the perceived personality traits based on the appearance of the 75 *Second Life* avatars of those who had filled out the Phase 1 questionnaire. Each perceiver received a different questionnaire generated via a simple random sample without replacement procedure to ensure the perceivers saw each avatar only once[19]. This procedure was used to reduce bias related to order effects. Perceivers did not discuss their ratings with one another. To ensure zero-acquaintance, they were asked to notify us if they recognized a target's avatar. None did so.

2.5.4 – Cue Rating Assessment Procedure

To assess cue ratings, the author and a colleague acted as coders and independently rated avatars on 145 visual cues (avatar characteristics). These cues were derived from detailed advertising studies (Belk, 1981; Kolbe & Albanese, 1996, 1997) and personality psychology studies using static visual cues (Borkenau & Liebler, 1992, 1995). Cues such as colour (Gorn, Chattopadhyay, Yi & Dahl; 1997) and shoes (Belk, 2003) were used in the study. Other cues were selected based on observation of the *Second Life* environment. Cues

[17] A premium account is available to residents of *Second Life* at a cost of $US9.95/month or $US72.00/year (http://secondlife.com/whatis/plans.php).
[18] A sample of this questionnaire is included in Appendix 4.
[19] Each perceiver's random number list was generated using the website: http://stattrek.com/Tables/Random.aspx, fixing the number of random numbers to 75, the minimum value to 1, the maximum value to 75 and not allowing duplicate entries. The presentation order of avatars is presented in Appendix 5.

were divided by category and section: (1) general cues, (2) male avatar cues and (3) female avatar cues. The Perreault and Leigh index (1989) was computed for each category; categories with coefficients lower than .75 were deleted (Crano & Brewer, 2002). Both coders compared their answers to reach consensus. Afterwards, a third independent coder was asked to rate the remaining problematic cues, and his answers were the ones used for the study. In the end, a total of 127 avatar cues were retained for analysis.

2.5.5 – Instruments

For the Phase 1 questionnaire, targets answered the Big Five Inventory (BFI), a 44-item scale developed by John and Srivastava (1999). This scale contains all FFM dimensions (McCrae & Costa, 1999) and is one of the most commonly used in personality research. A wide range of personality traits can be captured with the FFM to ensure compatibility of this study with other personality trait analysis research. Cronbach's alpha reliability coefficients[20] (α) for *Extraversion*, *Agreeableness*, *Conscientiousness*, *Neurotism*, and *Openness to Experience* were as follows for self ratings (.87, .83, .86, .89, and .87), for avatar-ratings (.83, .84, .86, .85, and .92) and ideal self ratings (.75, .83, .80, .88, and .90). These values are typical of those reported for the BFI (John & Srivastava, 1999) and are higher than the .70 barrier suggested by Nunnally (1978). All items were rated on a seven-point Likert-type scale.

For the Phase 2 questionnaire, perceivers answered the Ten Item Personality Inventory (TIPI). The TIPI, which was developed by Gosling, Rentfrow and Swann (2003), is a short version of the BFI and includes 10 items (two per dimension) of the 44 items of the BFI. Using the shorter TIPI scale eliminated the redundancy, fatigue, boredom and frustration the perceivers would have experienced had they been obliged to answer all 44 items of the BFI scale for each of the 75 avatars observed. All items were rated on a seven-point Likert-type scale. Correlations[21] between items for *Extraversion*, *Agreeableness*,

[20] After computing all Cronbach alpha's reliability coefficients, 4 items (Item 3 of *Agreeableness*, item 8 of *Neurotism* and items 9 and 10 of *Openness*) were deleted in each of the three scales because of inter-item correlation lower than .50.

[21] Correlations were deemed more accurate than Cronbach's alpha coefficient because there was only two items per dimension.

Conscientiousness, *Neurotism*, and *Openness to Experience* were, in order, .53, .38, .67, -.54, and .61.

2.6 – Results

2.6.1 – Question 1 – Consensus

In the previous section, we proposed that perceivers would agree on the targets' perceived personalities solely by observing the targets' avatars. To test this proposition, we computed the mean of the two TIPI items for each dimension and for each of the seven perceivers. We computed consensus using intraclass correlations (ICC: Shrout & Fleiss, 1979) instead of the mean of Pearson correlations, as the former is used to assess rating reliability by comparing the variability of different ratings of the same subject to the total variation across all ratings and all subjects. We predicted that consensus would vary across traits. To test this prediction, we computed consensus for each of the five FFM dimensions. Consensus results for each dimension are presented in the first column of Table 4. For all FFM dimensions, ICC were positive and significant (all p's < .01), ranging from .16 to .38. *Extraversion* had the strongest consensus, followed by *Neurotism*, *Conscientiousness*, *Openness* and *Agreeableness*. Consensus was globally achieved, since the mean ICC was positive (mean ICC(2, 1) = .25[22]) and significant ($p < .01$). These results suggest similar, and even greater, consensus compared to that of other studies examining impressions based on personal environments (Gosling et al., 2007; Gosling et al., 2002; Vazire & Gosling, 2004).

2.6.2 – Question 2 – Self-perceiver Agreement

We proposed there would be a correlation between targets' and perceivers' personality impressions. To measure self-perceiver agreement, we compared the mean ratings of perceivers for each dimension with the targets' self ratings mean using Pearson correlations. Self-perceiver mean correlation was positive, but not significant ($r = .09$, $p <$

[22] In the expression ICC(2,1), the "2" refers to Case 2, which implies that "a random sample of *k* judges is selected from a larger population, and each judge rates each target, that is, each judge rates *m* targets altogether" (Shrout & Fleiss, 1979; 421). Even though we argue that our judges were not randomly selected, of the three cases proposed by Shrout and Fleiss, Case 2 remains the most representative of our research. The "1" refers to the fact that we measure the reliability of a single rating, whereas "k" would refer to the expected reliability of the mean of the *k* judges' ratings (for more information, see Shrout & Fleiss, 1979).

.21). We also proposed that self-perceiver agreement would vary across traits. To test this, we computed self-perceiver agreement for the five FFM dimensions. The self-perceiver correlation for each trait is shown in the second column of Table 5. As proposed, self-perceiver agreement varied substantially across traits, but was positive and significant only for *Extraversion*. However, self-perceiver agreement was positive, though weaker and not significant, for *Agreeableness* and *Openness*, and negative for *Conscientiousness* and *Neurotism*. These results were slightly weaker than those reported in previous studies examining impressions based on personal environments (Gosling et al., 2007; Gosling et al., 2002; Marcus et al., 2006; Vazire & Gosling, 2004).

Table 4 – Avatars' ratings: Consensus, Self-perceiver agreement and Vector Correlations

	Question 1	Question 2	Question 3
Five-factor model dimension	Consensus (N=75)	Self-perceiver agreement (N=75)	Vector correlations (N=127)
Extraversion	.38***	.37***	.46***
Agreeableness	.16***	.09	.23***
Conscientousness	.21***	-.10	.06
Neurotism	.28***	-.03	-.18
Openness	.21***	.13	.01
M	.25***	.09	.11*

Note: Consensus is the intraclass correlation, ICC(2,1), for all 7 perceivers. Accuracy is the correlation between the aggregated perceivers' ratings. The sample size is 75 across analyses.
* $p < .10$, one-tailed. ** $p < .05$, one-tailed. *** $p < .01$, one-tailed.

2.6.3 – Question 3 – Cue Utilization and Cue Validity

Using the Brunswik (1956) lens model adapted to the avatars, we conducted an analysis of visual avatar cues to test for cue utilization and cue validity. As noted in the methodology section, cues were divided into three sections: (1) general cues (Table 5), (2) male avatar cues (Table 6) and (3) female avatar cues (Table 7).

As defined for Brunswik's model, cue utilization refers to the extent to which targets use visual avatar cues to judge avatars' personalities. Cue-utilization correlations are presented in the right side of Table 5, Table 6 and Table 7, and indicate the relationships between perceivers' ratings and visual avatar cues. These cue-utilization correlations permitted us to identify the avatar cues perceivers used to form their judgments. These cue-utilization correlations reveal which avatar cues may have been used as Brunswikian lenses through

which perceivers form impressions about targets. Logically, the FFM dimension that attained the highest consensus (*Extraversion*) would also have the most correlations with specific avatar cues. Thus, *Extraversion* had the largest number of significant cue-utilization correlations (57 out of 127, 44.9%) in all three tables.

Extraversion is generally associated with such traits as sociability, a high energy level, talkativeness and assertiveness. As noted in Table 6, global cue-utilization correlation results suggest that avatars with one or more of the following cues were perceived as more extraverted: flashy clothing (.24), stylish hairdos (.18) or located in a dynamic atmosphere (.20). Male avatars perceived as more extraverted had at least one of the following cues: Mohawk hairdo (.12), red hair (.14) or sunglasses (.10). Male avatars perceived as more introverted had at least one of the following cues: jeans (-.16), grey shirt (-.11), long-sleeve shirt (-.16), dry hair (-.23) or black hair (-.13). Female avatars perceived as more extraverted had at least one of the following cues: big breasts (.20), fully covered torso (.27), bathing suit (.23), pink shirt (.15), skirt (.15), necklace (.22) or high heels (.18). Female avatars wearing either a brown top (-.14) or blouse (-.19) were perceived as more introverted.

Agreeableness is associated with cooperativeness and being approachable. Perceived *Agreeableness* was generally associated with avatars that had at least one of the following cues: attractive (.15), friendly (.14) or well-groomed (.14). Male avatars with at least one of the following cues had received a low *Agreeableness* rating: army pants (-.20), black shirt (-.11), unconventional clothing (-.14), Mohawk hairdo (-.17), red hair (-.12), sunglasses (-.15), moustache (-.11) or combat boots (-.12). Female avatars with a high *Agreeableness* rating had at least one of the following cues: blouse (.17), dressy top (.12), blonde hair (.11) or brown hair (.16).

It is easier to analyze someone's Conscientiousness level by examining their personal environment, such as a room or office (Gosling et al., 2002), though harder to do by observing an avatar. Consequently, few of the avatar cues were related to perceivers' ratings of Conscientiousness.

Neurotism is associated with traits like anger, depression and vulnerability. Globally, avatars judged to be neurotic were those wearing flashy clothing (.16) or who had a grumpy expression (.14). Male avatars with at least one of the more deviant cues were perceived as neurotic: Mohawk hairdo (.13), red hair (.11) or tattoos (.12). Female avatars with big breasts (.13) and/or who wore Gothic clothing (.10) were perceived as neurotic. Female avatars judged to be more emotionally stable were those wearing a blouse (-.15) and/or casual clothing (-.11).

Openness is associated with individuals who tend to be curious, imaginative and unconventional. Globally, more attractive (.13) male avatars who were flashy dressers (.20) were perceived as being more open. Female avatars perceived as being more open had at least one of the following cues: big breasts (.18), tank top (.14), Gothic clothing (.12), boots (.15) or high heels (.13). Female avatars perceived as less open had at least one of the following cues: fully clothed (-.17), casual pants (-.13) or blouse (-.14).

According to Funder and Sneed (1993), these correlational analyses should be interpreted cautiously until future experimental research can address two limitations. Although cue-utlization correlations revealed that perceivers' impressions were associated with particular cues, correlations did not indicate if perceivers used these specific avatar cues to form their impressions. This analysis could not assess the extent to which visual avatar cues were used independently by perceivers, though perhaps a laboratory protocol analysis could prove useful for doing so.

As conceptualized in the Brunswik model, cue validity refers to the level at which avatar cues are related to the targets' actual personality. Cue-validity correlations shown in the left section of Tables 5, 6 and 7 mirrored the relationship between targets' self ratings and avatar cues. These cue-validity correlations suggest that there exist some valid cues with which perceivers formed their impressions. Globally, avatars with stylish hair (.19) were controlled by an extraverted target, while those who where attractive (.22), less muscular (.35) and/or female (.31) were controlled by an agreeable target. Avatars perceived as

Table 5 – A Brunswik (1956) Lens Model Analysis of Judgments Based on Avatars: Cue Validity and Cue Utilization Correlations

Cue validity						Cue utilization				
Extra.	**Agree.**	**Cons.**	**Neuro.**	**Open.**	**Avatar's cues (« lens »)**	**Extra.**	**Agree.**	**Cons.**	**Neuro.**	**Open.**
.10	-.09	-.14	.08	-.16	Black (vs. white) skin colour	.08*	-.02	-.03	-.05	.08*
.05	.09	.08	-.02	.03	Dynamic (vs. calm) environment	.20***	-.13***	.01	.06	.20***
.04	-.04	-.06	-.01	-.05	Young (vs. old)	-.11**	.07	.06	-.06	-.07
.06	.07	.22*	-.04	.09	Approachable (vs. reserved)	.01	.09*	.03	-.08*	-.07
.18	**.22***	.23**	-.08	.02	Attractive (vs. unattractive)	.12***	.15***	-.01	.06	.13***
-.15	**-.31****	-.22*	-.14	-.21*	Masculine (vs. feminine)	-.10**	-.11**	-.02	.02	-.08
.10	.03	-.10	.03	.06	Well-groomed (vs. unkempt) appearance	-.10**	.14***	.07	-.03	-.03
-.08	-.18	.01	.02	.03	Dark-coloured (vs. light-coloured) clothes	-.05	-.08*	.01	.07	.00
.01	.12	.05	.07	-.02	Flashy clothing (vs. plainly dressed)	.24***	-.11**	-.07	.16***	.20***
.11	-.05	-.02	.03	.10	Formal (vs. informal) clothing	-.08*	.12***	.04	.01	-.02
.06	.06	.22*	.00	-.03	Fashionably (vs. unfashionably) dressed	.03	.10**	.05	-.01	.07
-.05	-.21*	-.23**	-.07	-.16	Short (vs. long) hair	-.15***	-.06	.03	-.01	-.11**
.19*	.19*	.28***	-.08	.31***	Stylish (vs. unstylish) hairdo	.18***	-.05	.00	.11**	.05
.12	.22*	.19	-.17	.07	Light-coloured (vs. dark-coloured) hair	.11**	-.02	-.03	.11**	-.01
.15	.04	.01	.16	-.12	Slim build (vs. solid build)	.01	.08*	.02	-.07	.11**
-.17	.14	.05	.11	.06	Short (vs. tall)	-.04	.05	-.04	-.04	-.10**
.06	**.35*****	.24**	.03	.03	Less (vs. more) muscular	.01	.11**	.01	-.06	.07
.04	-.07	.08	.07	.06	Thin (vs. round) face	.12***	-.07	-.06	.10	.12***
.04	-.01	-.04	-.01	.03	Young (vs. adult) face	-.10**	.01	.03	-.06	-.08
-.01	-.01	**.22***	.06	-.02	Friendly (vs. grumpy) expression	-.02	.14***	.08*	-.14***	-.03
-.11	-.04	-.13	.01	-.14	Serious (vs. laid back) expression	-.01	-.02	-.03	.09**	.03
-.12	-.08	-.16	.11	.01	Shy (vs. confident) expression	-.29***	.12***	.03	-.08*	-.20***
1	**6**	**8**	**0**	**2**	**Total of Significant Avatar Cues**	**14**	**13**	**1**	**7**	**9**

Note: A correlation preceded with a minus sign refers to the cue indicated in brackets.
Extra. = Extraversion, Agree. = Agreeableness, Consc. = Conscientiousness, Neuro. = Neurotism, Open. = Openness
* Correlation is significant at the 0.10 level (2-tailed)., ** Correlation is significant at the 0.05 level (2-tailed), *** Correlation is significant at the 0.01 level (2-tailed). Numbers in bold indicate cue validity.

Table 6 – A Brunswik (1956) Lens Model Analysis of Judgments Based on Male Avatars: Cue-Validity and Cue-Utilization Correlations

Cue validity						Cue utilization				
Extra.	**Agree.**	**Cons.**	**Neuro.**	**Open.**	**Avatar's cues (« lens »)**	**Extra.**	**Agree.**	**Cons.**	**Neuro.**	**Open.**
-.08	-.09	.05	-.07	-.08	Black pants	-.08*	-.04	.04	.02	-.08*
-.01	-.14	-.11	-.02	-.16	Blue pants	-.12***	.01	.00	-.09***	-.07
.02	-.14	-.24**	-.07	.16	Grey pants	.01	-.06	-.01	.04	.00
-.10	-.26**	-.12	-.03	-.27**	Red pants	-.09*	.03	-.02	.01	.02
-.21*	-.02	-.03	-.03	-.18	White pants	.08*	-.11**	-.04	.06	.05
-.07	**-.20***	-.02	-.02	.09	Army pants	.11**	-.20***	.02	.08	.02
-.18	-.07	-.02	-.15	-.17	Casual pants	.00	-.07	-.02	.06	.00
-.11	-.26**	-.28***	.09	-.10	Jeans	-.16***	.02	-.02	-.08*	-.11**
.18	.04	.04	-.21*	-.06	Dress pants	-.06	.02	.06	.02	.05
-.04	**-.26****	-.01	-.02	-.20**	Black shirt	-.01	-.11**	-.03	.06	-.01
-.06	.04	-.07	-.21*	.16	Grey shirt	-.11**	.04	.01	-.05	-.02
-.24**	-.32***	-.20**	.18	-.33***	White shirt	-.06	.00	.03	-.10**	-.03
-.13	-.22**	-.14	-.06	-.31***	Long-sleeve shirt	-.16***	-.01	.01	-.04	-.01
-.05	-.16	-.15	-.10	.15	T-shirt	.05	-.12***	-.01	.07	-.08*
-.09	-.22*	-.17	.02	-.06	Downscale clothing	-.09*	-.02	-.07	-.03	-.10**
.04	-.14	-.10	-.23**	-.06	Upscale clothing	-.06	.01	.04	.03	.06
-.17	-.07	-.05	-.05	-.17	Unconventional clothing	-.01	-.14***	.07	.04	-.02
-.17	-.29***	-.25**	-.09	-.24**	Full head of hair	-.16***	-.03	.04	-.05	-.05
.03	-.05	.02	-.04	.16	Sides of head shaved	.12***	-.17***	-.10**	.13***	-.03
.00	.00	.03	-.07	-.05	Completely bald	-.03	.03	.03	-.01	-.01
-.03	.09	-.19*	-.07	.11	Dreadlocks	.02	.00	-.04	.00	.04
-.19	-.19	-.13	.10	**-.33*****	Standard hairdo	-.23***	.04	-.02	-.08*	-.10**
.03	-.05	.02	-.04	.16	Mohawk hairdo	.12***	-.17***	-.10**	.13***	-.03
-.16	-.22**	-.24	-.04	.06	Fluffed hair	.00	-.02	.03	.00	.00
-.03	-.29***	-.04	.06	-.14	Spiky hair	-.05	.06	-.03	.02	-.02
.04	-.05	-.01	-.22*	-.05	Wet hair	-.01	-.10**	.11**	.00	.01
-.02	-.20*	-.14	-.13	-.13	Black hair	-.13***	-.01	-.04	-.04	-.01
-.07	-.21*	-.23	.16	-.07	Brown hair	-.07	.08*	.01	-.03	-.06
-.01	.06	.00	-.12	.00	Fair hair	-.08*	-.03	.07	.02	-.12***

-.06	-.10	.08	-.07	.10	Red hair	.14***	-.12***	-.08*	.11**	-.02
-.18	-.10	-.09	-.02	-.19	No facial hair	.03	-.14***	.07	.01	.06
-.04	-.11	.04	-.19*	.05	Beard	.02	-.10**	.00	.03	.02
-.02	-.15	-.01	-.07	-.03	Moustache	.00	-.11**	-.01	.01	.02
-.12	-.14	-.06	.00	-.01	Sideburns	-.07	.03	-.04	-.09*	-.02
.14	.06	-.07	.03	.13	Earring	.02	-.11**	-.05	.06	-.03
-.02	-.02	-.08	-.05	.07	Necklace	.03	-.01	-.04	-.01	.06
.12	-.01	.09	-.17	.20*	Bracelet	.09*	-.11**	.02	.12***	-.07
.07	-.12	-.08	-.04	-.06	Belt	.03	-.19***	.01	.11**	-.04
.18	.04	.04	-.21**	-.06	Tie	-.06	.02	.06	.02	.05
.17	.07	-.04	-.24**	.04	Stylish glasses	-.06	.01	.06	.00	.05
.15	-.04	.00	-.03	.20**	Sunglasses	.10**	-.15***	-.07	.10**	-.03
-.03	.06	.06	-.16	.09	Tattoos	.06	-.09*	.00	.12***	-.07
.13	.03	-.01	-.18	-.07	Dress shoes	-.04	.01	.01	-.01	.03
-.18	**-.28****	-.34***	.04	-.16	Casual shoes	-.04	-.09**	-.05	.00	-.03
.12	-.10	.09	-.18	.02	Running shoes	-.04	.06	.04	.00	.00
-.19	.03	.07	.06	-.04	Sandals	-.12***	.03	-.04	-.05	-.07
-.11	-.08	-.01	-.05	-.07	Combat boots	-.03	-.12***	.07	.05	-.06
2	**13**	**6**	**7**	**8**	**Total of Significant Avatar Cues**	**19**	**20**	**4**	**12**	**6**

Note: Extra. = Extraversion, Agree. = Agreeableness, Consc. = Conscientousness, Neuro. = Neurotism, Open. = Openness

* Correlation is significant at the 0.10 level (2-tailed), ** Correlation is significant at the 0.05 level (2-tailed), *** Correlation is significant at the 0.01 level (2-tailed). Numbers boldfaced signifies cue validity elements

Table 7 – A Brunswik (1956) Lens Model Analysis of Judgments Based on Female Avatars: Cue-Validity and Cue-Utilization Correlations

Cue validity						Cue utilization				
Extra.	**Agree.**	**Cons.**	**Neuro.**	**Open.**	**Avatar's cues (« lens »)**	**Extra.**	**Agree.**	**Cons.**	**Neuro.**	**Open.**
.08	.28***	.02	.08	-.06	Breasts – Large (vs. normal) sized	.20***	-.02	-.08**	.13***	.18***
.05	.11	.01	-.06	.15	Fully clothed	-.16***	.07	.05	-.10**	-.17***
-.12	.06	.07	.07	-.01	Part of torso exposed	.03	.11**	.04	-.06	.09**
.24**	.18	.18	.14	.08	Torso fully covered	.27***	-.06	-.07	.14***	.18***
.02	.05	.22*	.10	.19	Black pants	.05	.04	.05	.01	.06
.09	.03	.08	.15	.10	Pink/purple pants	-.04	.07	.02	-.03	-.01
.11	.17	.04	-.11	.04	Blue pants	.07	-.02	-.07	.08*	.01
.21*	.23**	.06	-.09	-.03	Red pants	.07	.08	.03	-.04	.04
-.28**	-.08	-.15	.14	-.06	White pants	-.02	-.00	.00	-.07	.00
.06	.12	.16	-.13	.03	Other colour pants	.00	.06	.02	-.10**	.03
-.04	.11	-.13	.29***	.18	Casual pants	-.11**	.12**	.04	-.02	-.13***
.05	.03	.06	.11	.01	Dressy pants	-.07	.09*	.05	-.07	-.06
.06	.03	-.03	.00	-.07	Jeans	.16***	-.04	-.07	.12***	.14***
.02	.18	.32***	-.08	.09	Skirt	.15***	-.04	.01	.00	.14***
.14	.00	.12	-.15	.17	Shorts	.11**	-.12**	-.01	.00	.03
-.05	.04	-.01	.09	.07	Other types of pants	-.06	.08**	.05	-.11**	-.07
.14	.25**	.32***	-.17	-.07	Legs fully covered	.25***	-.07	-.06	.11**	.21***
.04	-.01	-.03	.11	.10	Legs mostly visible	-.10**	.11**	.04	-.11**	-.06
.07	.08	-.04	.20*	.21*	Legs partly visible	.02	.05	.02	.07	.00
-.13	-.01	.14	.15	.13	Black top	.02	.02	.03	.01	.07
-.06	-.09	-.08	.12	.03	Brown top	-.14***	.10**	.03	-.09**	-.02
.08	.21*	.11	.06	.13	Pink top	.15***	-.01	-.04	.04	.08*
.22**	.11	.05	-.17	.03	Red top	.00	-.01	-.04	.04	-.01
.18	.22**	.14	-.04	-.02	White top	.14***	.02	.01	.01	.07
-.09	-.04	-.15	.07	-.06	Other colour top	-.08*	.10**	.07	-.12***	-.13***
.01	.06	.18	-.12	.03	Blouse	-.19***	.17***	.10**	-.15***	-.14***
-.05	.10	-.20*	.33***	.16	Dressy top	-.06	.12***	.02	.00	-.11**
.06	.16	.15	-.02	-.04	Tank top	.09**	-.05	-.02	.04	.14***
.22*	.18	.05	-.04	.03	Bathing suit	.23***	-.07	-.06	.09**	.12***
-.04	-.11	.13	.04	.12	Other type of top	.17***	-.07	-.02	.02	.15***

-.07	-.12	.23**	-.01	.09	Long sleeves	-.12***	.14***	.05	-.10**	-.06
.23**	.36***	.03	.14	.14	Sleeveless	.24***	-.01	-.04	.08*	.13***
-.11	.07	-.04	-.04	-.05	T-shirt	-.07	.01	.05	-.05	-.02
.08	.03	**.19***	-.04	.06	Casual clothing	-.10**	.12***	.11**	-.11***	-.05
-.12	.01	-.08	.17	.24**	Historical clothing	-.06	-.01	-.02	-.03	-.11**
.06	**.21***	.20*	-.05	-.07	Downscale clothing	.08**	.08**	-.01	-.03	.07
.06	.10	-.09	.11	.08	Gothic clothing	.08*	-.04	.00	.10**	.12***
.00	-.12	-.01	.14	.09	Upscale clothing	-.05	.10**	.03	-.01	-.04
.04	.02	.04	-.02	.10	Dry hair	-.04	.01	.02	-.05	-.06
.07	.20*	.10	.16	-.01	Layered hairdo	.10**	.04	.04	-.05	.12***
.04	.05	.15	.01	.13	Fluffed hairdo	.04	.11**	.00	.01	-.02
.00	.12	-.06	-.05	.04	Ruffled hairdo	.03	-.05	-.05	.11**	.06
-.11	.02	.06	.31***	.02	Black hair	.02	.00	.00	-.01	.08*
.29***	**.28*****	.18	-.21*	.02	Blonde hair	.11**	.11**	-.01	.05	.03
.00	.12	.07	-.03	.11	Brown hair	-.10**	.16***	.09**	-.13***	-.09**
-.03	-.06	-.01	-.02	.10	Pink/purple hair	.09**	-.09**	-.02	.02	.04
.08	.03	-.05	.04	.05	Blue hair	.08*	-.08*	-.07	.08*	.08*
.26**	.35***	.14	.08	.18	Necklace	.22***	-.07	-.02	.14***	.21***
.10	.14	.10	.15	.11	Belt	.10**	-.05	.03	.02	.08*
-.14	.04	-.02	.18	.02	Bandana	.03	.03	-.05	-.03	-.06
.03	-.06	.09	.04	-.11	Hat	.11**	-.07	-.01	.03	.09**
-.01	.10	-.05	.05	.02	Glasses	.05	-.01	-.02	.00	-.05
.12	.11	.13	.11	.15	Boots	.13***	-.12***	.01	.05	.15***
.01	.11	-.06	.14	.09	Dress shoes/Boots	-.02	.02	-.05	.01	-.05
-.14	-.09	-.06	.07	-.15	Casual shoes	-.07	.11**	.00	-.01	-.02
.19*	.18	.18	-.11	-.01	High heels	.18***	.02	-.06	.07	.13***
.20*	.08	.12	-.14	.15	Running shoes	.15***	.00	-.01	.04	.07
.06	.01	.01	-.06	.00	Sandals	-.20***	.14***	.12***	-.20***	-.15***
-.19*	.08	-.01	.14	.16	Barefoot	-.02	.05	.04	-.05	-.07
11	**10**	**7**	**5**	**2**	**Total of Significant Avatar Cues**	**34**	**22**	**5**	**20**	**28**

Note: Extra. = Extraversion, Agree. = Agreeableness, Consc. = Conscientousness, Neuro. = Neurotism, Open. = Openness
* Correlation is significant at the 0.10 level (2-tailed), ** Correlation is significant at the 0.05 level (2-tailed), *** Correlation is significant at the 0.01 level (2-tailed). Numbers boldfaced signifies cue validity elements

friendly (.22) were controlled by a conscientious target. Male avatars wearing army pants (-.20), a black shirt (-.26) and/or casual shoes (-.28) were controlled by less agreeable targets, while avatars with dry hair (-.33) were controlled by reserved targets. Female avatars with at least one of the following cues were controlled by extraverted targets: blonde hair (.29), sleeveless top (.23), bathing suit (.22), fully covered torso (.24), necklace (.26), high heels (.19) or running shoes (.20). Avatars with blonde hair (.26) and/or wearing downscale clothing (.21) were controlled by agreeable targets, while those wearing casual clothing (.19) were controlled by conscientious ones. Our analysis revealed that no avatar cues indicative of *Neurotism* were used efficiently by perceivers to form their impressions. This can be explained by the fact that *Neurotism* is not socially desirable, and it seems that neurotic targets do not want to be perceived as neurotic in *Second Life*. Conversely, emotionally stable targets may choose to experiment by adopting neurotic traits for their *Second Life* avatar.

To scientifically test the extent to which perceivers' cue-utilization and cue-validity correlations correspond to one another, we used the vector correlation method proposed by Funder and Sneed (1993). This method can be described as a two-step procedure. We first applied a Fisher's r-to-z transformation[23] to both cue-utilization (Vector 1) and cue-validity correlations (Vector 2) to all FFM dimension and cues presented in Tables 5, 6 and 7. Next, we computed vector correlations between both transformed correlations (Vector 1 and Vector 2). Results from this computation are presented in the last column of Table 4. We projected that the increasing order of FFM dimension correlations would be similar to the one for self-perceiver agreement (Column 2 of Table 4), but more importantly, we also suggested that the dimensions with the highest number of significant cues (Table 9) would be the ones with the highest vector correlations. Thus, the two FFM dimensions with the highest number of cues, *Extraversion* (81) and *Agreeableness* (84), were the ones with the highest vector correlations, .46 and .23. Note the significant FFM vector correlation average ($p < .10$).

[23] Pearson correlations are not normally distributed. The Fisher's r-to-z transformation (Cohen & Cohen, 1983) is used to convert Pearson correlations into normally distributed variable z. This transformation can be computed using the following formula: $z = .5[\text{Ln}(1 + r) - \text{Ln}(1 - r)]$

2.6.4 – Question 4 – Impression management

We tested if targets' avatars were a source of impression management and could provide accurate information about the targets' real and ideal selves. To achieve our objective, we needed to remove the ideal-self component from the targets' avatars to determine the degree to which they were elements of impression management. A two-step regression as proposed by Vazire & Gosling (2004) was conducted for each FFM dimension to first assess the influence of self ratings on aggregate perceivers' ratings, and then assess the influence of self ratings and ideal self ratings on aggregate perceivers' ratings.

Moderate evidence of impression management for FFM dimensions is apparent in the results in Table 8. The first data column of Table 8 shows standardized beta weights for self ratings (Step 1); these coefficients are the same as self-perceiver correlation coefficients shown in the second data column of Table 4. The second and third data columns of Table 8 show the combined standardized beta weights for self ratings and ideal-self ratings (Step 2). After removing ideal self ratings effects from self ratings, *Extraversion* ($p < .10$) and *Openness* ($p < .05$) showed evidence of impression management. That being said, perceivers interpreted the targets' levels of *Extraversion* and *Agreeableness* as the way the targets would like to be perceived (represented) and not how they really are. It is also noteworthy that for three of the five dimensions, beta weights for self ratings were higher than beta weights for the ideal self ratings. These results are similar to those reported in studies examining impressions based on personal environments (Gosling et al. 2007; Vazire & Gosling, 2004).

Table 8 – Standardized beta weights of two-step regressions of perceivers' ratings on self-ratings, and on self-ratings and ideal self-ratings for each FFM dimension

	Step 1	Step 2	
Five Factor model dimension	Self-ratings	Self-ratings	Ideal self-ratings
Extraversion	.37***	.23**	.24**
Agreeableness	.09	.01	.13
Conscientousness	-.10	-.18	.20
Neurotism	-.03	0.02	-.01
Openness	.13	-.03	.22*

* $p < .10$, one-tailed. ** $p < .05$, one-tailed. *** $p < .01$, one-tailed.

2.7 – Conclusion and Discussion

This study provides empirical evidence about the existence of a relationship between an individual and his avatar, and between an avatar and a perceiver's perceptions of the avatar. This proves it is not possible to accurately judge a target by simply examining specific avatar cues. For example, the fact an avatar has a Mohawk hairdo does not mean the target controlling the avatar is neurotic. Our primary findings and the research and managerial implications can be divided among four research questions.

2.7.1 – Conclusions concerning our four research questions

Avatars elicit similar impressions from independent perceivers for all FFM dimensions. Since these consensus correlations are significant, it means that if a company designed an avatar with a personality similar to that of the company's targeted consumer, it could stimulate greater consumer interest in the company's products and increase the likelihood of the individual recommending the company to friends. Lazarsfeld & Merton, (1954) defined this concept, which they called homophily, as an interaction between two individuals of similar personality.

Perceivers' impressions show self-perceiver agreement is lower than that in comparable studies (Gosling et al. 2007; Vazire & Gosling, 2004); in this study, only *Extraversion* achieved significant correlation. Nevertheless, it would be interesting to explore *Extraversion* in greater depth and conduct an analysis with lower-order FFM dimensions (for a more complete description of lower-order models, see Paunonen, 1998). Another possible next step would be to find moderators to explain the distortion between who a target is and what his avatar looks like.

Perceivers rely on particular avatar cues (attractiveness, female gender, stylish hair, friendly expression, etc.) to form valid impressions about individuals. This could be interesting for managers who would want to investigate *Second Life* and would rely on these valid cues to make a decision if it would be to their advantage to interact with the target's avatar. As a theoretical implication, further research could be done to analyze and modelize how perceivers form their impressions based on visual avatar cues. Techniques such as "Bubbles" (Gosselin & Schyns, 2001; Taylor, Worsley & Gosselin, 2007), which refers to a

"general technique that can assign the credit of human categorization performance to specific visual information" (Gosselin & Schyns, 2001, p. 2261), and the use of eye-tracker technology could be interesting options (for more information on the use of visual techniques and tools for marketing and decision-making, see Lurie & Mason, 2007).

Perceivers' impressions of individuals were enhanced for *Extraversion* and *Openness*. In this way, it would be interesting for managers to see that if an avatar looks extremely extraverted, this only means that the user behind this avatar is extraverted, though perhaps not as extraverted as his avatar appears to be.

2.7.2 – Limitations

This study also has limitations. We recognize that answering questions about one's self, avatar and ideal self all at once could result in desirability bias. Many potential subjects did not fill out the questionnaire because of a lack of fluency in English. *Second Life* is an international virtual world, and many groups are formed in this world on the basis of language. When navigating in *Second Life*, it is not unusual to encounter avatars whose targets are native speakers of French, German or Spanish. Having a questionnaire only in English created a barrier for a large number of *Second Life* residents.

2.7.3 – General conclusion

Owing to the fact some targets adapt their behaviours and avatars to the *Second Life* virtual world environment (Yee & Bailenson, 2007), it is not always possible to form accurate impressions about a target based on his avatar's appearance. We admit there is still lot to learn about virtual communities, particularly the relationship between an individual and his avatar, as well as between an avatar and independent perceivers. The proportion of frequent users of virtual worlds is minimal, regardless of what is stated in the media. At any given time, there are about 45,000 residents logged on to *Second Life*. However, those with a slow internet connection cannot enjoy the full range of features offered in this virtual world.

Chapitre 3 – Conclusion

Suite à la lecture du Chapitre 2, nous pouvons admettre que nous en avons encore beaucoup à apprendre sur les univers virtuels et plus précisément sur les relations qui existent entre un avatar et son utilisateur, ainsi qu'entre un avatar et un observateur externe. La proportion d'individus qui consacre plusieurs heures dans les univers virtuels est encore très marginale contrairement à ce que certains médias peuvent laisser croire. Au total, le nombre de personnes en ligne en même temps sur *Second Life* est d'environ 45 000 personnes (http://www.secondlife.com/) et certains utilisateurs ont encore une connexion internet beaucoup trop lente pour pleinement profiter des avantages interactifs que peut procurer cet univers virtuel. Par ailleurs, les médias font de plus en plus allusion aux compagnies qui s'implantent dans *Second Life*, mais plusieurs d'entre elles (i.e. Coca-Cola et la National Basketball Association) n'ont pas rencontré le succès escompté dans cet univers (Rose, 2007)

Néanmoins, plusieurs projets de recherche scientifiques concernant l'univers de *Second Life* ont vu le jour au cours des derniers mois dans le but de pouvoir mieux comprendre les liens entre cet univers et ses utilisateurs. Ainsi, que ce soit le *Group Experiment Environment Project* (GEEP) dirigé par Robert Goldstone du département de psychologie de l'Université d'Indiana ou le *eLab City Project* lancé par Thomas P. Novak de l'Université de la Californie à Riverside, il semble que la recherche scientifique concernant l'univers de *Second Life* continuera de progresser au cours des prochains mois et au cours des prochaines années…

Chapitre 4 – Annexes

Cette section se divise en six parties. Premièrement l'annexe 1 traite de la méthode employée pour effectuer la revue de littérature. Deuxièmement, l'Annexe 2 présente le questionnaire utilisé lors de la présentation de la Phase 1. Troisièmement, l'Annexe 3 présente la liste des forums de discussions utilisées pour effectuer le recrutement lors de la phase de collecte de données. Quatrièmement, l'Annexe 4 présente un exemple de lettre poster sur les forums de discussion. Cinquièmement, l'Annexe 5 présente un exemple de questionnaires utilisés lors de la Phase 2 de la collecte de données. Finalement, l'Annexe 6 présente un tableau généré par un échantillonnage aaléatoire simple sans remplacement qui représente l'ordre de présentation des avatars auprès des observateurs.

4.1 – Annexe 1 – Méthode employée pour effectuer la revue de littérature

Les articles cités dans cette étude proviennent principalement de recherches par mots clés dans les banques de données *ProQuest*, *Business Source Complete*, *JSTOR et scholargoogle.com*. Les revues identifiées sont présentées dans le Tableau 9. À partir des bibliographies des premiers articles trouvés et en recherchant par référence croisée, d'autres articles utiles au déroulement cette étude ont été recensée. Les résultats de ces recherches ont permis au total de recenser environ une centaine articles cités dans cette étude.

Tableau 9 – Principales revues utilisées pour effectuer la recherche d'articles

Nom de la revue	Domaine
Journal of Computer Mediated Communication	Communication
Journal of Consumer Psychology	Psychologie de la consommation
Journal of Marketing	Marketing
Journal of Personality	Psychologie (personnalité)
Journal of Personality and Social Psychology	Psychologie (personnalité)
Psychological Bulletin	Psychologie

4.2 – Annexe 2 (Appendix 2 – Presentation of the Phase 1 online questionnaire)

Page 1 – Introduction

In the following pages, you will find a questionnaire that you are invited to answer. This questionnaire is about avatars on virtual worlds, more precisely on *Second Life*. The participation to this research engages you to send a picture of your avatar on *Second Life*. This questionnaire has been developed by researchers of the RBC Financial Group Chair in E-Commerce at HEC Montréal. To thank you for your participation, you earn the chance to win the grand prize of 500 US$. **TO FILL IN THE QUESTIONNAIRE AND TO BE ELIGIBLE FOR THE GRAND PRIZE, YOU MUST BE 18 YEARS OLD OR MORE. THE AGE OF THE WINNER WILL BE VERIFIED.**

AFTER COMPLETION OF THIS QUESTIONNAIRE, THE PICTURE OF YOUR AVATAR WILL BE USED INTO THE SECOND PHASE OF THIS RESEARCH WHERE FIVE INDIVIDUALS WILL BE EXPOSED TO YOUR AVATAR AND ASKED TO JUDGE IT.

The main objective of this research is to understand relationships between individuals and avatars in virtual worlds. An avatar has been defined by Holzwarth, Janiszewski and Neumann (2006, p. 20) as a "general graphic representation that *is* personified by means of computer technology". This questionnaire is divided in six sections. In the first section you will be asked to send a picture of the avatar you use in the virtual world *Second Life*. In the second section, you will be asked to answer questions concerning your level of participation in virtual worlds. In the third section and fourth section, you will be asked to answer questions about yourself. In the fifth section, you will be asked questions about your level of involvement towards different product classes. Finally, in the sixth section you will be asked questions about your socio-demographic profile.

Through this questionnaire, work at a fairly high speed. Do not worry or puzzle over individual items. It is your first impressions, the immediate feelings about the items that we want to study. On the other hand, please do not be careless, because we also want your true impressions. Please be sure to follow the instructions while filling it in. There is no time limit to answer this questionnaire even though we have estimated the length to about 30 minutes.

Considering confidentiality measures taken, your participation to this research should not cause you prejudice nor benefit you directly. Your answers will eventually provide insights for the development of knowledge concerning virtual worlds and avatars. All data collected for the current research will serve for the realization of a Master thesis and could be used for future researches. All information collected in the questionnaire will stay strictly confidential, except the avatar, and will be used only for the diffusion of global results into scholarly and professional forums.

You are absolutely free to refuse to participate to this project, and you can decide at anytime to stop answering the questions. To fill in this questionnaire will be considered as your commitment to participate to this research. A confidentiality commitment has been signed by the researchers involved in this study. If you have any questions concerning this research, you can contact the main researcher, Mr. Jean-François Bélisle, via the e-mail address indicated below.

The HEC Montreal Research Ethics Committee (CER) has stated that the data collection linked to the present study respects ethical norms in research towards human beings. For any interrogations concerning ethical questions, you can contact the secretary of this committee at (+1) 514-340-6257 or at cer@hec.ca.

Thank you for your precious participation. Your opinion is highly valued.

☐ ***I hereby acknowledge I have read and understood the terms of service concerning the present research***

☐ ***I understand that answering this questionnaire is my commitment to participate to this research***

☐ ***I acknowledge being 18 years old or more***

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Under the supervision of :
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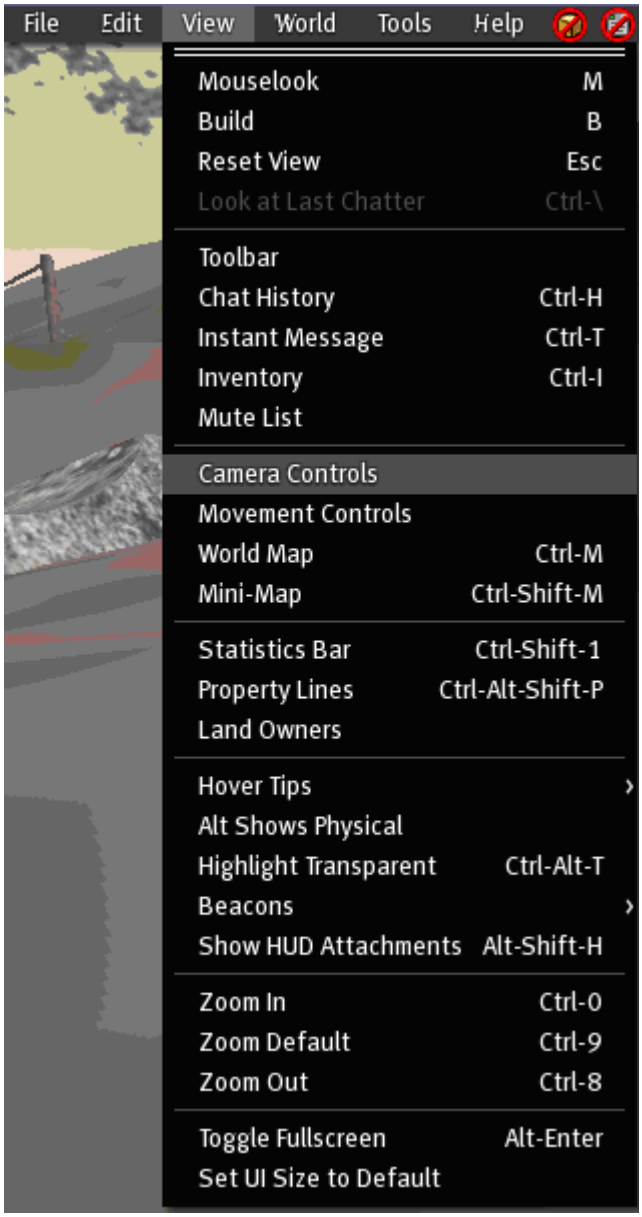
Start questionnaire -->>

Page 2 – First section

Please send the picture of the avatar you are presently using in the virtual world *Second Life*. **All body parts of your avatar should be included in the picture.** Here is the procedure to send your picture.

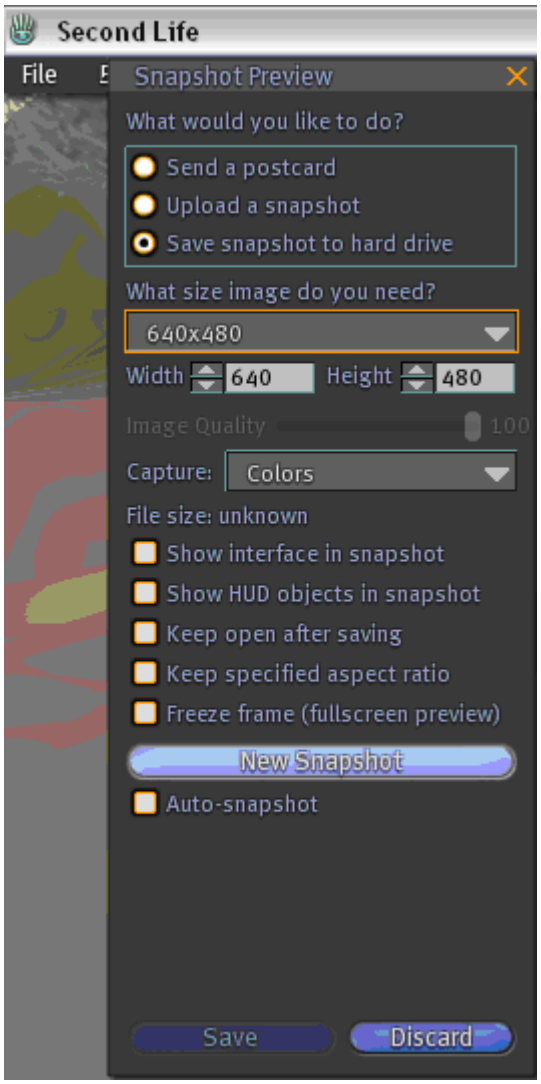
1. Connect to *Second Life*,
2. Click on the "view" button situated on the main menu and then scroll to "camera controls"



3. Click on “Rotate Camera Around Focus”, on “Zoom Camera Towards Focus” and on “Move Camera Up and Down, Left and Right” to center your avatar face-to-face with the screen so that it takes the entire screen. **Be sure that your avatar is face-to-face with the screen, that all body parts (including clothing) are visible and that your avatar covers the entire screen**

4. Click on the “file” button situated on the main menu and then scroll to “Take snapshot”.

5. Thereafter, you will see the following screen:



6. Under the "what would you like to do" question, select the "save snapshot to hardrive" option.
7. Under the "what size image do you need?" question, select the "640 x 480" option.
8. Click on "New Snapshot" when your avatar is face-to-face with the screen
9. Select the "save" button situated at the bottom of the "snapshot preview" window,
and name your file to represent your e-mail address (e.g. jf.belisle@hec.ca would be jf.belisle.bmp).
10. To upload the picture of your avatar, click on this hyperlink: "Upload the picture of your avatar here"
11. Start filling the questionnaire to earn the chance **to win 500 US$ the equivalent of 135,000 Linden dollars.**

Note that if you send something else than your avatar, your questionnaire will be destroyed and you won't be admissible for the grand prize of 500 US$.

Thank you so much for your time, your opinion is highly valued

Page 3 – Second section

Please answer these questions concerning your level of participation in virtual worlds and especially in *Second Life*.

1. On average, how many hours per week do you spend on the Internet?

☐ **hours per week**

2. Please select any virtual worlds to which you subscribed.

☐ Active Worlds	☐ Moove
☐ Cybertown	☐ Playdo
☐ Disney's Toontown	☐ Playstation Home
☐ Dreamville	☐ *Second Life*
☐ Dubit	☐ The Sims Online
☐ Entropia Universe	☐ There.com
☐ Habbo Hotel	☐ Virtual Magic Kingdom
☐ Hipihi	☐ Whyville
☐ Kaneva	☐ Worlds.com
☐ Mokitown	☐ Yohoho! Puzzle Pirates

3. On average, how many hours per week do you spend in all these virtual worlds combined?

_____ hours per week

4. When did you APPROXIMATIVELY subscribe to *Second Life*?

Month: _____ Year: _____

5. On average, how many hours per week do you spend on *Second Life*?

_____ hours per week

6. Do you have a premium account? If you don't know what a premium account is then answer "no"

☐ Yes
☐ No

7. Do you own lands?

☐ No
☐ Yes, one land
☐ Yes, two lands
☐ Yes, three lands or more

8. Do you own objects other then clothes?

☐ Yes
☐ No

9. On average, excluding premium account fees, how much money do you spend per month in *Second Life*?

☐ **Linden dollars (1 US$ = 270 Lindens)**

or

☐ **US Dollars**

Page 4 – Third section

Here is a list of statements that **may or may not apply to you.** Please indicate the extent to which **you agree or disagree** with each statement.

Strongly Disagree	Disagree	Slightly disagree	Neither agree nor Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

I see **Myself** as Someone Who...							
1. Is talkative	1	2	3	4	5	6	7
2. Is full of energy	1	2	3	4	5	6	7
3. Generates a lot of enthusiasm	1	2	3	4	5	6	7
4. Has an assertive personality	1	2	3	4	5	6	7
5. Is outgoing, sociable	1	2	3	4	5	6	7
6. Is reserved	1	2	3	4	5	6	7
7. Tends to be quiet	1	2	3	4	5	6	7
8. Is sometimes shy, inhibited	1	2	3	4	5	6	7
9. Is helpful and unselfish with others	1	2	3	4	5	6	7
10. Has a forgiving nature	1	2	3	4	5	6	7
11. Is generally trusting	1	2	3	4	5	6	7
12. Is considerate and kind to almost everyone	1	2	3	4	5	6	7
13. Likes to cooperate with others	1	2	3	4	5	6	7
14. Tends to find fault with others	1	2	3	4	5	6	7
15. Starts quarrels with others	1	2	3	4	5	6	7
16. Can be cold and aloof	1	2	3	4	5	6	7
17. Is sometimes rude to others	1	2	3	4	5	6	7
18. Does a thorough job	1	2	3	4	5	6	7
19. Is a reliable worker	1	2	3	4	5	6	7
20. Perseveres until the task is finished	1	2	3	4	5	6	7
21. Does things efficiently	1	2	3	4	5	6	7
22. Makes plans and follows them	1	2	3	4	5	6	7
23. Can be somewhat careless	1	2	3	4	5	6	7
24. Tends to be disorganized	1	2	3	4	5	6	7
25. Tends to be lazy	1	2	3	4	5	6	7
26. Is easily distracted	1	2	3	4	5	6	7
27. Is depressed, blue	1	2	3	4	5	6	7
28. Can be tense	1	2	3	4	5	6	7
29. Worries a lot	1	2	3	4	5	6	7
30. Can be moody	1	2	3	4	5	6	7
31. Remains calm in tense situations	1	2	3	4	5	6	7
32. Is relaxed, handles stress well	1	2	3	4	5	6	7
33. Is emotionally stable, not easily upset	1	2	3	4	5	6	7
34. Gets nervous easily	1	2	3	4	5	6	7

35. Is original, comes up with new ideas	1	2	3	4	5	6	7
36. Is curious about many different things	1	2	3	4	5	6	7
37. Is ingenious, a deep thinker	1	2	3	4	5	6	7
38. Has an active imagination	1	2	3	4	5	6	7
39. Is inventive	1	2	3	4	5	6	7
40. Values artistic, aesthetic experiences	1	2	3	4	5	6	7
41. Likes to reflect, play with ideas	1	2	3	4	5	6	7
42. Is sophisticated in art, music, or literature	1	2	3	4	5	6	7
43. Prefers work that is routine	1	2	3	4	5	6	7
44. Has few artistic interests	1	2	3	4	5	6	7

Page 5

Here is the same list of statements as the one you have previously filled. Judge which of these statements may or may not apply to your definition of your ideal-self (the person you would like to be). Please indicate the extent to which you agree or disagree with each statement.

Strongly Disagree	Disagree	Slightly disagree	Neither agree nor Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

I see **my ideal-self** as Someone Who...							
45. Is talkative	1	2	3	4	5	6	7
46. Is full of energy	1	2	3	4	5	6	7
47. Generates a lot of enthusiasm	1	2	3	4	5	6	7
48. Has an assertive personality	1	2	3	4	5	6	7
49. Is outgoing, sociable	1	2	3	4	5	6	7
50. Is reserved	1	2	3	4	5	6	7
51. Tends to be quiet	1	2	3	4	5	6	7
52. Is sometimes shy, inhibited	1	2	3	4	5	6	7
53. Is helpful and unselfish with others	1	2	3	4	5	6	7
54. Has a forgiving nature	1	2	3	4	5	6	7
55. Is generally trusting	1	2	3	4	5	6	7
56. Is considerate and kind to almost everyone	1	2	3	4	5	6	7
57. Likes to cooperate with others	1	2	3	4	5	6	7
58. Tends to find fault with others	1	2	3	4	5	6	7
59. Starts quarrels with others	1	2	3	4	5	6	7
60. Can be cold and aloof	1	2	3	4	5	6	7
61. Is sometimes rude to others	1	2	3	4	5	6	7
62. Does a thorough job	1	2	3	4	5	6	7
63. Is a reliable worker	1	2	3	4	5	6	7
64. Perseveres until the task is finished	1	2	3	4	5	6	7
65. Does things efficiently	1	2	3	4	5	6	7
66. Makes plans and follows them	1	2	3	4	5	6	7
67. Can be somewhat careless	1	2	3	4	5	6	7
68. Tends to be disorganized	1	2	3	4	5	6	7
69. Tends to be lazy	1	2	3	4	5	6	7
70. Is easily distracted	1	2	3	4	5	6	7
71. Is depressed, blue	1	2	3	4	5	6	7
72. Can be tense	1	2	3	4	5	6	7
73. Worries a lot	1	2	3	4	5	6	7

74. Can be moody	1	2	3	4	5	6	7
75. Remains calm in tense situations	1	2	3	4	5	6	7
76. Is relaxed, handles stress well	1	2	3	4	5	6	7
77. Is emotionally stable, not easily upset	1	2	3	4	5	6	7
78. Gets nervous easily	1	2	3	4	5	6	7
79. Is original, comes up with new ideas	1	2	3	4	5	6	7
80. Is curious about many different things	1	2	3	4	5	6	7
81. Is ingenious, a deep thinker	1	2	3	4	5	6	7
82. Has an active imagination	1	2	3	4	5	6	7
83. Is inventive	1	2	3	4	5	6	7
84. Values artistic, aesthetic experiences	1	2	3	4	5	6	7
85. Likes to reflect, play with ideas	1	2	3	4	5	6	7
86. Is sophisticated in art, music, or literature	1	2	3	4	5	6	7
87. Prefers work that is routine	1	2	3	4	5	6	7
88. Has few artistic interests	1	2	3	4	5	6	7

Page 6

Here is the same list of statements filled previously twice. Judge which of these statements may or may not apply to your avatar. Please indicate the extent to which you agree or disagree with each statement.

Strongly Disagree	Disagree	Slightly disagree	Neither agree nor Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

I see **my avatar** as Someone Who...							
89. Is talkative	1	2	3	4	5	6	7
90. Is full of energy	1	2	3	4	5	6	7
91. Generates a lot of enthusiasm	1	2	3	4	5	6	7
92. Has an assertive personality	1	2	3	4	5	6	7
93. Is outgoing, sociable	1	2	3	4	5	6	7
94. Is reserved	1	2	3	4	5	6	7
95. Tends to be quiet	1	2	3	4	5	6	7
96. Is sometimes shy, inhibited	1	2	3	4	5	6	7
97. Is helpful and unselfish with others	1	2	3	4	5	6	7
98. Has a forgiving nature	1	2	3	4	5	6	7
99. Is generally trusting	1	2	3	4	5	6	7
100. Is considerate and kind to almost everyone	1	2	3	4	5	6	7
101. Likes to cooperate with others	1	2	3	4	5	6	7
102. Tends to find fault with others	1	2	3	4	5	6	7
103. Starts quarrels with others	1	2	3	4	5	6	7
104. Can be cold and aloof	1	2	3	4	5	6	7
105. Is sometimes rude to others	1	2	3	4	5	6	7
106. Does a thorough job	1	2	3	4	5	6	7
107. Is a reliable worker	1	2	3	4	5	6	7
108. Perseveres until the task is finished	1	2	3	4	5	6	7
109. Does things efficiently	1	2	3	4	5	6	7
110. Makes plans and follows them	1	2	3	4	5	6	7
111. Can be somewhat careless	1	2	3	4	5	6	7
112. Tends to be disorganized	1	2	3	4	5	6	7
113. Tends to be lazy	1	2	3	4	5	6	7
114. Is easily distracted	1	2	3	4	5	6	7

115. Is depressed, blue	1	2	3	4	5	6	7
116. Can be tense	1	2	3	4	5	6	7
117. Worries a lot	1	2	3	4	5	6	7
118. Can be moody	1	2	3	4	5	6	7
119. Remains calm in tense situations	1	2	3	4	5	6	7
120. Is relaxed, handles stress well	1	2	3	4	5	6	7
121. Is emotionally stable, not easily upset	1	2	3	4	5	6	7
122. Gets nervous easily	1	2	3	4	5	6	7

123. Is original, comes up with new ideas	1	2	3	4	5	6	7
124. Is curious about many different things	1	2	3	4	5	6	7
125. Is ingenious, a deep thinker	1	2	3	4	5	6	7
126. Has an active imagination	1	2	3	4	5	6	7
127. Is inventive	1	2	3	4	5	6	7
128. Values artistic, aesthetic experiences	1	2	3	4	5	6	7
129. Likes to reflect, play with ideas	1	2	3	4	5	6	7
130. Is sophisticated in art, music, or literature	1	2	3	4	5	6	7
131. Prefers work that is routine	1	2	3	4	5	6	7
132. Has few artistic interests	1	2	3	4	5	6	7

Page 7 – Fourth section

This section contains a list of statements concerning **your perceptions of yourself in a variety of situations**. Please indicate the extent to which **you agree or disagree** with each statement.

1. I am concerned about my style doing things	1	2	3	4	5	6	7
2. I am concerned about the way I present myself	1	2	3	4	5	6	7
3. I am self-conscious about the way I look	1	2	3	4	5	6	7
4. I usually worry about making a good impression	1	2	3	4	5	6	7
5. One of the last things I do before I leave my house is look in the mirror	1	2	3	4	5	6	7
6. I am concerned about what other people think of me	1	2	3	4	5	6	7
7. I am usually aware of my appearance	1	2	3	4	5	6	7

8. The way I look is extremely important to me	1	2	3	4	5	6	7
9. I am very concerned about my appearance	1	2	3	4	5	6	7
10. I would feel embarrassed if I was around and did not look my best	1	2	3	4	5	6	7
11. Looking my best is worth the effort	1	2	3	4	5	6	7
12. It is important that I always look good	1	2	3	4	5	6	7

13. People notice how attractive I am	1	2	3	4	5	6	7
14. My looks are very appealing to others	1	2	3	4	5	6	7
15. People are envious of my good looks	1	2	3	4	5	6	7
16. I am a very good-looking individual	1	2	3	4	5	6	7
17. My body is sexually appealing	1	2	3	4	5	6	7
18. I have the type of body that people want to look at	1	2	3	4	5	6	7

19. Professional achievements are an obsession for me	1	2	3	4	5	6	7
20. I want others to look up to me because of my accomplishments	1	2	3	4	5	6	7
21. I am more concerned with professional success than most people I know	1	2	3	4	5	6	7
22. Achieving greater success than my peers is important to me	1	2	3	4	5	6	7
23. I want my achievements to be recognized by others	1	2	3	4	5	6	7

24. In a professional sense, I am a very successful person	1	2	3	4	5	6	7
25. My achievements are highly regarded by others	1	2	3	4	5	6	7
26. I am an accomplished person	1	2	3	4	5	6	7
27. I am a good example of professional success	1	2	3	4	5	6	7
28. Others wish they were as successful as me	1	2	3	4	5	6	7

29.	In social situations, I have the ability to alter my behavior if I feel that something else is called for.	1	2	3	4	5	6	7
30.	I have the ability to control the way I come across people, depending on the impression I wish to give them	1	2	3	4	5	6	7
31.	When I feel that the image I am portraying isn't working, I can readily change it something that does	1	2	3	4	5	6	7
32.	I have found that I can adjust my behavior to meet the requirements of any situation I find myself in	1	2	3	4	5	6	7
33.	Once I know what the situation calls for, it's easy for me to regulate my actions accordingly	1	2	3	4	5	6	7
34.	I have trouble changing my behavior to suit different people and different situations	1	2	3	4	5	6	7
35.	Even when it might be to my advantage, I have difficulty putting up a good front	1	2	3	4	5	6	7
36.	I am often able to read people's true emotions correctly through their eyes	1	2	3	4	5	6	7
37.	In conversations, I am sensitive to even the slightest change in the facial expression of the person I am conversing with.	1	2	3	4	5	6	7
38.	My powers of intuition are quite good when it comes to understanding others' emotions and motives	1	2	3	4	5	6	7
39.	I can usually tell when other consider a joke to be in bad taste, even though they may laugh convincingly	1	2	3	4	5	6	7
40.	I can usually tell when I've said something inappropriate by reading in the listener's eyes	1	2	3	4	5	6	7
41.	If someone if lying to me, I usually know it at once from that person's manner of expression/	1	2	3	4	5	6	7
42.	In general, I have a clear sense of who I am and what I am	1	2	3	4	5	6	7
43.	My beliefs about myself often conflict with one another	1	2	3	4	5	6	7
44.	On one day I might have one opinion of myself and on another day I might have a different opinion	1	2	3	4	5	6	7
45.	I spend a lot of time wondering about what kind of person I really am	1	2	3	4	5	6	7
46.	Sometimes I feel that I am not really the person that I appear to be	1	2	3	4	5	6	7
47.	When I think about the kind of person I have been in the past. I'm not sure what I was really like	1	2	3	4	5	6	7
48.	I seldom experience conflict between the different aspects of my personality	1	2	3	4	5	6	7
49.	Sometimes I think I know other people better than I know myself	1	2	3	4	5	6	7
50.	My beliefs about myself seem to change very frequently	1	2	3	4	5	6	7
51.	If I were asked to describe my personality, my description might end up being different from one day to another day	1	2	3	4	5	6	7
52.	Even if I wanted to, I don't think I could tell someone what I'm really like	1	2	3	4	5	6	7
53.	It is often hard for me to make up my mind about things because I don't really know what I want	1	2	3	4	5	6	7

Page 8 – Fifth section

The purpose of this section is to measure your involvement or interest in a specific product category. This section contains a short list of statements that you need to answer for 10 product categories. Here is how you are to use these scales.

1	2	3	4	5	6	7
Very closely related to the item at the left end of the scale	**Quite closely related** to the item at the left end of the scale	**Only slightly related** to the item at the left end of the scale	Neutral	**Only slightly related** to the item at the right end of the scale	**Quite closely related** to the item at the right end of the scale	Very closely related to the item at the right end of the scale

Product category: Cars (sport cars, modified cars, luxury cars, etc...)

Unimportant	1	2	3	4	5	6	7	Important
Of no concern	1	2	3	4	5	6	7	Of concern to me
Irrelevant	1	2	3	4	5	6	7	Relevant
Means nothing to me	1	2	3	4	5	6	7	Means a lot to me
Doesn't matter	1	2	3	4	5	6	7	Matters to me

Product category: Music (CD's, DVD's, MP3, etc...)

Unimportant	1	2	3	4	5	6	7	Important
Of no concern	1	2	3	4	5	6	7	Of concern to me
Irrelevant	1	2	3	4	5	6	7	Relevant
Means nothing to me	1	2	3	4	5	6	7	Means a lot to me
Doesn't matter	1	2	3	4	5	6	7	Matters to me

Product category: Movies (Cinema, DVD's, VHS, etc...)

Unimportant	1	2	3	4	5	6	7	Important
Of no concern	1	2	3	4	5	6	7	Of concern to me
Irrelevant	1	2	3	4	5	6	7	Relevant
Means nothing to me	1	2	3	4	5	6	7	Means a lot to me
Doesn't matter	1	2	3	4	5	6	7	Matters to me
Not needed	1	2	3	4	5	6	7	Needed

Product category: Sports (equipment, wearing, etc...)

Unimportant	1	2	3	4	5	6	7	Important
Of no concern	1	2	3	4	5	6	7	Of concern to me
Irrelevant	1	2	3	4	5	6	7	Relevant
Means nothing to me	1	2	3	4	5	6	7	Means a lot to me
Doesn't matter	1	2	3	4	5	6	7	Matters to me

Product category: Clothing (including shoes, boots, etc...)

Unimportant	1	2	3	4	5	6	7	Important
Of no concern	1	2	3	4	5	6	7	Of concern to me
Irrelevant	1	2	3	4	5	6	7	Relevant
Means nothing to me	1	2	3	4	5	6	7	Means a lot to me
Doesn't matter	1	2	3	4	5	6	7	Matters to me

Product category: Video games (Wii, PC, Playstation, Xbox, etc...)

Unimportant	1	2	3	4	5	6	7	Important
Of no concern	1	2	3	4	5	6	7	Of concern to me
Irrelevant	1	2	3	4	5	6	7	Relevant
Means nothing to me	1	2	3	4	5	6	7	Means a lot to me
Doesn't matter	1	2	3	4	5	6	7	Matters to me

Product category: Restaurants

Unimportant	1	2	3	4	5	6	7	Important
Of no concern	1	2	3	4	5	6	7	Of concern to me
Irrelevant	1	2	3	4	5	6	7	Relevant
Means nothing to me	1	2	3	4	5	6	7	Means a lot to me
Doesn't matter	1	2	3	4	5	6	7	Matters to me

Product category: Computer (acessories, etc...)

Unimportant	1	2	3	4	5	6	7	Important
Of no concern	1	2	3	4	5	6	7	Of concern to me

Irrelevant	1	2	3	4	5	6	7	Relevant
Means nothing to me	1	2	3	4	5	6	7	Means a lot to me
Doesn't matter	1	2	3	4	5	6	7	Matters to me

Product category: Beauty (make-up, etc...)								
Unimportant	1	2	3	4	5	6	7	Important
Of no concern	1	2	3	4	5	6	7	Of concern to me
Irrelevant	1	2	3	4	5	6	7	Relevant
Means nothing to me	1	2	3	4	5	6	7	Means a lot to me
Doesn't matter	1	2	3	4	5	6	7	Matters to me

Product category: Books								
Unimportant	1	2	3	4	5	6	7	Important
Of no concern	1	2	3	4	5	6	7	Of concern to me
Irrelevant	1	2	3	4	5	6	7	Relevant
Means nothing to me	1	2	3	4	5	6	7	Means a lot to me
Doesn't matter	1	2	3	4	5	6	7	Matters to me

Page 9 – Sixth section

The purpose of this section is to collect socio-demographic information about you that is necessary to statistical use only. Be sure that this information will remain strictly confidential.

1. How old are you?

_____ years old (write down your age on the line)

2. What gender are you?

- ☐ Woman
- ☐ Man

3. In which country do you live?

_____

4. What is your race?

- ☐ Arab
- ☐ Asian
- ☐ Black or African
- ☐ Caucasian
- ☐ Hispanic
- ☐ Don’t want to answer

5. What is the last education level that you have completed?

- ☐ Primary school
- ☐ High school
- ☐ Collegial or CEGEP
- ☐ University - Certificate
- ☐ University - Undergraduate (Bachelor)
- ☐ University – Graduate (Master, doctoral and postdoctoral studies)
- ☐ Don’t want to answer

6. What is your annual income?

- ☐ Less than 20 000$

- ☐ Between 20 000$ and 39 999$
- ☐ Between 40 000$ and 59 999$
- ☐ Between 60 000$ and 79 999$
- ☐ Between 80 000$ and 99 999$
- ☐ 100 000$ or more
- ☐ Don't want to answer

7. Which ones of the following statements best describes your situation?

- ☐ I am unemployed.
- ☐ I am working full-time.
- ☐ I am working part-time (including contract-worker seasonal work, etc.).
- ☐ I am a student.
- ☐ I am retired.
- ☐ Don't want to answer

Page 10

To be admissible to the grand prize of 500 US$, please indicate your e-mail address on the space provided below. This information will be kept in a separate database from your questionnaire and no links will be possible between your questionnaire and your personal information.

Also, for each additional person you refer to fill in this questionnaire, we give you another chance to win the grand prize.

E-mail address 1

E-mail address 2

E-mail address 3

E-mail address 4

E-mail address 5

4.3 – Annexe 3 (Appendix 3 – List of traditional discussion boards)

1. *Gamesforum.ca* – Section dedicated to *Second Life*

http://www.gamesforum.ca/forumdisplay.php?f=134

2. *Gamespot PC Games* forum – Section dedicated to *Second Life*

http://www.gamespot.com/pc/rpg/secondlife/forum.html

3. *JeuxOnLine* forum – Section dedicated to *Second Life*

http://forums.jeuxonline.info/forumdisplay.php?f=422

4. *Jeux Vidéo PC* forum – Section dedicated to *Second Life*

http://www.jeuxvideopc.com/forums/jeux/jeu/second-life/liste_sujet-1.htm

5. *Second Life France* forum – Section dedicated to *Second Life*

http://www.secondlifefrance.com/

6. *Second Life* official forums – Resident answers section

http://forums.secondlife.com/forumdisplay.php?f=327&daysprune=30&order=asc&sort=postusername

7. *SLForum.com* – Section dedicated to *Second Life*

http://www.slforum.com/index.php

8. *SLUniverse* – Section dedicated to *Second Life*

http://www.sluniverse.com/forums/

9. *Vaolia* forum – Section dedicated to *Second Life*

http://second-life.vaolia.com/list.php?

10. *Talk Second Life* Forum – Section dedicated to *Second Life*

http://www.talksecondlife.com/

4.4 – Annexe 4 (Appendix 4 – A sample of a letter sent to traditional discussion boards)

Dear *Second Life* residents,

I am a Master degree student and I am currently doing a study concerning "*Second Life*". I am looking for respondents who use this virtual world. Each participant to my study earns the chance to win a grand prize of 135000 Linden dollars (the equivalent of 500US$). If this study interests you, don't waist a second. You can start to fill in the questionnaire available at: http://www.chairerbc.com/msc407/

Thank you,

Jeff Swamphen

4.5 – Annexe 5 (Appendix 5 – Presentation of the Phase 2 electronically-based questionnaire)

Page 1

In the following pages, you will find a questionnaire that you are invited to answer. This questionnaire is about avatars in virtual worlds, more precisely in *Second Life*. This questionnaire has been developed by researchers of the RBC Financial Group Chair in E-Commerce at HEC Montréal. To thank you for your participation, you earn the chance to win the grand prize of 500 US$. To fill in the questionnaire and to be eligible for the grand prize, you must be 18 years old or more. The age of the winner will be verified. Note that if you already fill in the first questionnaire entitled: Avatars And Virtual Worlds Part 1, you are not admissible to this questionnaire and it doesn't give you an additional chance to win the grand prize.

The main objective of this research is to understand relationships between individuals and avatars in virtual worlds. An avatar has been defined by Holzwarth, Janiszewski and Neumann (2006: 20) as a "general graphic representation that is personified by means of computer technology". This questionnaire is divided in three sections. In the first section, you will be asked to answer questions concerning your level of participation in virtual worlds. In the second section, you will be asked to give your opinion about 75 different types of avatars from the virtual world *Second Life*. Finally, in the third section you will be asked questions about your socio-demographic profile.

Through this questionnaire, work at a fairly high speed. Do not worry or puzzle over individual items. It is your first impressions, the immediate feelings about the items that we want to study. On the other hand, please do not be careless, because we also want your true impressions. Please be sure to follow the instructions while filling it in. There is no time limit to answer this questionnaire even though we have estimated the length to about 30 minutes.

Considering confidentiality measures taken, your participation to this research should not cause you prejudice nor benefit you directly. Your answers will eventually provide insights for the development of knowledge

concerning virtual worlds and avatars. All data collected for the current research will serve for the realization of a Master thesis and could be used for future researches. All collected information will stay strictly confidential and will be used only for the diffusion of global results into scholarly and professional forums.

You are absolutely free to refuse to participate to this project, and you can decide at anytime to stop answering the questions. To fill in this questionnaire will be considered as your commitment to participate to this research. A confidentiality commitment has been signed by the researchers involved in this study. If you have any questions concerning this research, you can contact the main researcher, Mr. Jean-François Bélisle, at the e-mail address indicated below.

The HEC Montreal Research Ethics Committee (CER) has status that this data collection linked to the present study respects ethical norms in research toward human beings. For any interrogations concerning ethical questions, you can contact the secretary of this committee at (+1) 514-340-6257 or at cer@hec.ca.

Thank you for your precious participation. Your opinion is highly valued.

Jean-Francois Belisle
M.Sc. Student
HEC Montréal
jf.belisle@hec.ca

Jacques Nantel,
Professor
HEC Montréal
jacques.nantel@hec.ca

HEC MONTRÉAL

Page 2 – First section

Please answer these questions concerning your level of participation in virtual worlds and especially in *Second Life*.

1. On average, how many hours per week do you spend on the Internet?

_____ hours per week

2. Please select any virtual worlds or multi-user dungeons (MUD) to which you subscribed.

- ☐ Active Worlds
- ☐ Cybertown
- ☐ Disney's Toontown
- ☐ Moove
- ☐ Playdo
- ☐ Playstation Home

- ☐ Dreamville
- ☐ Dubit
- ☐ Entropia Universe
- ☐ Habbo Hotel
- ☐ Hipihi
- ☐ Kaneva
- ☐ Mokitown
- ☐ *Second Life*
- ☐ The Sims Online
- ☐ There.com
- ☐ Virtual Magic Kingdom
- ☐ Whyville
- ☐ Worlds.com
- ☐ Yohoho! Puzzle Pirates

3. On average, how many hours per week do you spend in all these virtual worlds combined?

   _____ hours per week

4. When did you subscribe to *Second Life*?

   Month: _____ Year: _____

5. On average, how many hours per week do you spend on *Second Life*?

   _____ hours per week

6. Do you have a premium account?

   ☐ Yes
   ☐ No

7. Do you own lands?

   ☐ No
   ☐ Yes, one land
   ☐ Yes, two lands
   ☐ Yes, three lands or more

8. Do you own objects other then clothes?

   ☐ Yes
   ☐ No

9. On average, excluding premium account fees, how much money do you spend per month in *Second Life*?

   _____ US dollars or _____ Linden dollars

Page 3 – Second section

In this section, you will see 75 different avatars. On the best of your knowledge, please answer each of the following 10 statements that **may or may not apply to the avatar you see.** Please indicate the extent to which **you agree or disagree** with each statement. Here is the scale that you must follow:

Disagree strongly	Moderately Disagree	disagree a little	Neither agree nor Disagree	Agree a little	Moderately Agree	Agree strongly
1	2	3	4	5	6	7

You can now go to next page.

Page 4 – Avatar 1

I see this **avatar** as someone who is ...	1	2	3	4	5	6	7
1. Extraverted, enthusiastic.							
2. Reserved, quiet.							
3. Critical, quarrelsome.							
4. Sympathetic, warm.							
5. Dependable, self-disciplined.							
6. Disorganized, careless.							
7. Anxious, easily upset.							
8. Calm, emotionally stable.							
9. Open to new experiences, complex.							
10. Conventional, uncreative.							

Page 5 – Avatar 2

I see this **avatar** as someone who is ...	1	2	3	4	5	6	7
1. Extraverted, enthusiastic.							
2. Reserved, quiet.							
3. Critical, quarrelsome.							
4. Sympathetic, warm.							
5. Dependable, self-disciplined.							
6. Disorganized, careless.							
7. Anxious, easily upset.							
8. Calm, emotionally stable.							
9. Open to new experiences, complex.							
10. Conventional, uncreative.							

Page 6 – Avatar 3

I see this **avatar** as someone who is ...	1	2	3	4	5	6	7
1. Extraverted, enthusiastic.							
2. Reserved, quiet.							
3. Critical, quarrelsome.							
4. Sympathetic, warm.							
5. Dependable, self-disciplined.							
6. Disorganized, careless.							
7. Anxious, easily upset.							
8. Calm, emotionally stable.							
9. Open to new experiences, complex.							
10. Conventional, uncreative.							

Page 7 – Avatar 4

I see this **avatar** as someone who is ...	1	2	3	4	5	6	7
1. Extraverted, enthusiastic.							
2. Reserved, quiet.							
3. Critical, quarrelsome.							
4. Sympathetic, warm.							
5. Dependable, self-disciplined.							
6. Disorganized, careless.							
7. Anxious, easily upset.							
8. Calm, emotionally stable.							
9. Open to new experiences, complex.							
10. Conventional, uncreative.							

Page 8 – Avatar 5

I see this **avatar** as someone who is ...	1	2	3	4	5	6	7
1. Extraverted, enthusiastic.							
2. Reserved, quiet.							
3. Critical, quarrelsome.							
4. Sympathetic, warm.							
5. Dependable, self-disciplined.							
6. Disorganized, careless.							
7. Anxious, easily upset.							
8. Calm, emotionally stable.							
9. Open to new experiences, complex.							
10. Conventional, uncreative.							

Page 9 – Avatar 6

I see this **avatar** as someone who is ...	1	2	3	4	5	6	7
1. Extraverted, enthusiastic.							
2. Reserved, quiet.							
3. Critical, quarrelsome.							
4. Sympathetic, warm.							
5. Dependable, self-disciplined.							
6. Disorganized, careless.							
7. Anxious, easily upset.							
8. Calm, emotionally stable.							
9. Open to new experiences, complex.							
10. Conventional, uncreative.							

Page 10 – Avatar 7

I see this **avatar** as someone who is ...	1	2	3	4	5	6	7
1. Extraverted, enthusiastic.							
2. Reserved, quiet.							
3. Critical, quarrelsome.							
4. Sympathetic, warm.							
5. Dependable, self-disciplined.							
6. Disorganized, careless.							
7. Anxious, easily upset.							
8. Calm, emotionally stable.							
9. Open to new experiences, complex.							
10. Conventional, uncreative.							

Page 11 – Avatar 8

I see this **avatar** as someone who is ...	1	2	3	4	5	6	7
1. Extraverted, enthusiastic.							
2. Reserved, quiet.							
3. Critical, quarrelsome.							
4. Sympathetic, warm.							
5. Dependable, self-disciplined.							
6. Disorganized, careless.							
7. Anxious, easily upset.							
8. Calm, emotionally stable.							
9. Open to new experiences, complex.							
10. Conventional, uncreative.							

Page 12 – Avatar 9

I see this **avatar** as someone who is ...	1	2	3	4	5	6	7
1. Extraverted, enthusiastic.							
2. Reserved, quiet.							
3. Critical, quarrelsome.							
4. Sympathetic, warm.							
5. Dependable, self-disciplined.							
6. Disorganized, careless.							
7. Anxious, easily upset.							
8. Calm, emotionally stable.							
9. Open to new experiences, complex.							
10. Conventional, uncreative.							

Page 13 – Avatar 10

I see this **avatar** as someone who is ...	1	2	3	4	5	6	7
1. Extraverted, enthusiastic.							
2. Reserved, quiet.							
3. Critical, quarrelsome.							
4. Sympathetic, warm.							
5. Dependable, self-disciplined.							
6. Disorganized, careless.							
7. Anxious, easily upset.							
8. Calm, emotionally stable.							
9. Open to new experiences, complex.							
10. Conventional, uncreative.							

And it goes on until Page 79….

Page 79 – Third section

The purpose of this section is to collect socio-demographic information about you that is necessary to statistical use only. Be sure that this information will remain strictly confidential.

1. How old are you?

_____ years old (write down your age on the line)

2. What gender are you?

- ☐ Woman
- ☐ Man

3. In which country do you live?

_____

4. What is your race?

- ☐ Arab
- ☐ Asian
- ☐ Black or African
- ☐ Caucasian
- ☐ Hispanic
- ☐ Don't want to answer

5. What is the last education level that you have completed?

- ☐ Primary school
- ☐ High school
- ☐ Collegial or CEGEP
- ☐ University - Certificate
- ☐ University - Undergraduate (Bachelor)
- ☐ University – Graduate (Master, doctoral and postdoctoral studies)
- ☐ Don't want to answer

6. What is your annual income?

- ☐ Less than 20 000$
- ☐ Between 20 000$ and 39 999$
- ☐ Between 40 000$ and 59 999$
- ☐ Between 60 000$ and 79 999$
- ☐ Between 80 000$ and 99 999$
- ☐ 100 000$ or more
- ☐ Don't want to answer

7. Which ones of the following statements best describes your situation?

- ☐ I am unemployed.
- ☐ I am working full-time.
- ☐ I am working part-time (including contract-worker seasonal work, etc.).
- ☐ I am a student.
- ☐ I am retired.
- ☐ Don't want to answer

This questionnaire is now over. Thank you very much for your time and willingness

4.6 – Annexe 6 (Appendix 6 – The presentation order of avatars)

	Perceiver 1	Perceiver 2	Perceiver 3	-Perceiver 4	Perceiver 5	Perceiver 6	Perceiver 7
1	57	21	51	1	54	12	68
2	8	31	34	3	20	63	3
3	4	75	30	16	27	7	27
4	37	38	21	50	47	44	65
5	68	17	48	43	42	8	64
6	29	41	44	10	17	20	13
7	32	46	1	13	37	39	73
8	48	50	53	60	73	4	2
9	53	74	68	69	38	32	26
10	74	10	2	22	50	3	37
11	30	62	71	34	68	37	34
12	46	56	13	18	34	25	8
13	60	40	38	64	62	5	67
14	20	69	39	57	32	71	21
15	43	55	70	58	67	22	7
16	70	42	72	56	18	73	69
17	24	2	11	63	55	31	14
18	52	52	45	41	25	23	29
19	28	33	17	51	52	26	4
20	12	13	60	61	28	43	60
21	13	53	8	49	60	67	25
22	10	28	55	48	61	13	55
23	18	49	64	71	72	24	49
24	71	22	16	9	22	27	19
25	61	47	28	21	43	40	54
26	40	27	59	67	56	74	5
27	59	70	52	5	70	34	22
28	58	67	50	66	29	9	1
29	6	63	57	52	21	18	15
30	11	20	36	72	64	46	47
31	15	12	26	12	48	57	24
32	3	15	5	62	75	42	39
33	39	32	43	44	12	6	48
34	50	37	22	8	36	65	42
35	27	58	46	20	41	75	59
36	1	14	4	38	40	10	9
37	5	16	15	4	26	72	10
38	34	30	67	32	49	33	41
39	7	44	61	2	35	41	43
40	42	36	74	37	39	15	57
41	72	4	47	73	63	28	16
42	17	26	7	31	30	1	63
43	73	8	56	7	74	21	31
44	54	35	18	23	71	36	53
45	14	71	58	26	45	11	35
46	62	1	33	42	58	68	62

47	67	54	54	68	44	62	74
48	35	24	27	24	31	56	23
49	41	64	32	40	51	61	28
50	2	23	75	74	66	29	6
51	23	45	25	47	57	55	71
52	36	34	20	14	11	47	51
53	9	11	37	46	16	49	50
54	44	60	42	6	59	66	17
55	47	18	63	65	9	16	61
56	19	59	19	55	1	17	38
57	55	66	35	75	10	48	32
58	75	57	49	33	4	50	45
59	64	72	41	15	3	64	18
60	63	19	9	28	5	38	46
61	51	73	31	36	53	70	72
62	25	25	12	11	15	30	66
63	31	7	40	29	24	35	12
64	21	68	62	54	65	14	20
65	38	39	6	17	33	58	58
66	66	51	69	30	23	45	11
67	22	6	65	35	69	52	33
68	56	65	23	45	7	60	52
69	65	9	24	19	14	53	30
70	26	29	3	25	46	19	40
71	33	5	73	53	8	54	36
72	16	61	29	70	6	59	75
73	45	48	66	59	2	69	70
74	49	43	10	27	13	2	44
75	69	3	14	39	19	51	56

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5.2 – Sites Internet

Michel Leblanc's blog
http://www.michelleblanc.com

Online questionnaire at RBC chair
http://www.chairerbc.com/msc407

Second Life research
http://secondliferesearch.blogspot.com/2007/07/companies-in-second-life.html

SLprofiles
http://slprofiles.com/

Stat Trek – Random number generator
http://stattrek.com/Tables/Random.aspx

Valleywag
http://valleywag.com/tech/second-life/linden-lab-begins-a-denial-campaign-285366.php