

# Avatar-Based Innovation: Consequences of the Virtual Co-Creation Experience

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## Abstract

*Virtual worlds, such as the prominent Second Life (SL), offer unprecedented opportunities for companies to tap the innovative potential of consumers and consumer communities. Despite the potential, the studied corporate open innovation initiatives fail to attract sustained engagement among co-creating participants. The underdeveloped state of these islands in terms of innovation tasks and the lack of knowledge about how to attract innovative avatars raise key concerns about the nature of the experience avatars have on corporate sites. In a quantitative study we examine the importance of the experience in encouraging active participation in the innovation tasks. When participants experience an inspiring, intrinsically motivating, involving and fun co-creation experience, they participate more intensely. Prior research on virtual new product development is extended to the virtual world context and insights of the virtual co-creation experience serve as guidelines for the conception of avatar-based innovation initiatives.*

## 1. Introduction: Avatar-based innovation

Faced with slow growth, global competition and heterogeneous customer needs, innovation is viewed as critical for corporate success, but new product development is characterized by high risk and high market failure [e.g. 65]. The main reason identified is the lack of market orientation [51] and traditional market research seems to fail in retaining customers' needs and wants [72]. Therefore, both theory and practice recommend to collaborate with customers for the creation of new products [30, 73]. We define open innovation in the context of this paper as a customer-centric innovation process, where value is co-created together with selected customers [6]. Open Innovation characterizes an innovation process where the customer is involved as source for ideas, technical solutions, design or even first prototypes. Instead of

the firm creating innovations and exchanging it with their customers, during open innovation consumers take an active role and co-create value together with the company [59]. Ever since the emergence of the Internet, unique and inventive opportunities to capitalize on users' innovative potential and knowledge have emerged, resulting in various approaches to integrate consumers into new product development [17, 47]. Recent Internet-based virtual reality technologies like virtual worlds - and its most prominent example Second Life - point out the latest technological developments. Virtual worlds like Second Life are computer-generated physical spaces, represented graphically in 3D that can be experienced by many users, or so-called avatars, at once [10].

Virtual Worlds have created new ways to experience products [40] and herald the next leap of evolution for open innovation. The potential is nurtured by two main rationals: First, incorporating the latest technological advances of virtual worlds into co-creation practice enriches existing Web-based customer integration methods by allowing real-time, media-rich and highly interactive collaboration between manufacturers and consumers. Influenced by interactivity and media richness [e.g. 69], virtual worlds increase telepresence [70], which is the sensation of "being there" in a mediated environment in time and place [39]. Finally, this leads to a closer and richer interaction between consumers and between consumers and actors inside the company. Second, virtual worlds build on a new mode of production where the host firm (e.g. Linden Lab for Second Life) facilitates unrestrained consumer freedom and empowerment [9]. The built-in tools encourage users to iteratively and interactively create almost anything imaginable, while sharing the act of creation with other users. The playful environment, allowing anyone to create nearly anything they can imagine and look like nearly anyone they want to be, has proven to be fertile ground for many innovative thinkers. Therefore, user-generated worlds resemble engines of creation that provide the freedom to

experiment and lead to unprecedented rates of innovation [52]. Virtual worlds' creative activities have become more visible and extensive and as the boundaries of the virtual and the real world dissolve, avatars might very well use their creativity to design products with real-world potential [32].

We use the term avatar-based innovation (ABI) to refer to an interactive new product development process, in which manufacturers collaborate with virtual worlds' avatars along the entire innovation process beginning with the identification of new trends and unsatisfied needs and ending with the launch of new products and the improvement of existing ones. The aim of the virtual collaboration for a specific task or during an entire product development cycle is to generate superior and more customer-centered new products and services, but also to provide value for its participants. Based on virtual world technology and using open innovation mechanisms, consumers and manufacturers jointly develop innovations in a media-rich and interactive environment. Several companies have already tried to leverage the innovative potential especially within Second Life and asked residents to engage in different innovation activities along various stages of the innovation process. For example, Osram, a light manufacturer, started an idea contest and invited Second Life residents to contribute ideas on the topic of lightning. Toyota Scion launched a virtual car model and encouraged participants to modify and customize their cars. Another example demonstrating the numerous opportunities of Virtual Worlds for innovation is the case of Aloft, a new hotel concept from Starwood Hotels. Before the real hotel was built, a virtual mockup was discussed, evaluated, modified, and further developed in Second Life. Based on the feedback, several changes to the overall design of Aloft resulted. These changes have been applied both to the virtual and to the physical hotels [41].

## **2. Compelling co-creation experience**

Regardless of the promising opportunities provided by avatar-based innovation, one major challenge impeding its development is the lack of interest in corporate projects among avatars. The overwhelming majority of avatar-based innovation pioneers is challenged by too few interested participants and, therefore, too few activities that make the place a vibrant source of great connections and innovations. The underdeveloped state of these islands in terms of innovation tasks and the lack of knowledge of how to attract innovative avatars

inhibit the companies from achieving their product development goals, which, in turn, puts a damper on avatar-based innovation. On a general level, many reports point toward nascent corporate presences being ghost towns [63], and the Second Life community is more interested in their own homegrown activities [2]. An analysis of multiple companies' experiments with avatars as a source of innovation confirmed the companies' inability to attract sustained engagement among avatars. After all, for virtual co-creation the participation of engaged customers is crucial. Evaluating these innovation initiatives on the basis of participation rates, they are far from successful [41].

One possible explanation for this shortcoming is that the pathfinding companies fail to create a compelling experience for users of virtual worlds. In this paper, we use the term compelling experience to refer to an experience that is characterized by intrinsic enjoyment, engagement, and interest. Academics have both highlighted the need for a compelling experience [27, 49, 60] and acknowledged the positive relationship with a number of characteristics. Fuller [25] stresses the interaction experience as a key motivator to join co-creation projects, and von Hippel and Katz [73] regard it as critical for inspiring consumers to make creative contributions. Others such as Hoch [33, 34] or Jiang [40] highlight the importance of such an experience for consumers' ability to become familiar with the innovation, discover its qualities, and learn from self-generated, non-ambiguous experiences. Despite these implicit endorsements of the topic's importance, little empirical research has examined the co-creation experience [49]. Recently, academics have called for a focus on the interaction experience [48]. This article tackles this research task and explores how consumers experience co-creation activities within a virtual world. We are especially interested in the consequences of a compelling virtual world innovation experience. Toward this aim, the article is structured as follows: First, we briefly review relevant literature on co-creation to discuss the nature of the interaction experience in virtual worlds. Then we introduce our research setting before presenting the results of our study, which focused on assessing the consequences of a compelling co-creation experience. Finally, we discuss the study's theoretical as well as practical implications.

## **3. Designing the co-creation experience**

In the most general and broadest use of the term, experience is the mental state that occurs in any given individual, at any conscious moment [57]. For the purpose of this research, experience is understood as the content of direct observation or participation in an event, specifically in a co-creation process [71]. Experience is a complex interplay of situations, the individual and the system over time [31] and designers of the virtual co-creation interaction do not control all aspects of the experience. While the setting, the atmospheric cues, can be provided and largely controlled, the process or activities that occur within this setting are mostly determined by the users and also the conception of the experience is created by the participants themselves [44, 62]. Understood this way, users always have an experience – whether good, bad or indifferent. To add a quality dimension to the co-creation experience, we use the term compelling experience to refer to an experience that is characterized by fun, intrinsic enjoyment and engagement. It is the quality of experience consumers feel when involved in the creative activity which drives them to continue and keeps them motivated to perform at their best [16]. Enjoyable and engaging experiences provide intrinsic value [19], they offer a state of ‘jouissance’ which people try to maintain and seek to repeat [6].

For the Web context, a number of studies address the user experience subject, but only a few recent studies focus on the co-creation context. Hoffman and Novak [37] proposed that creating a compelling website depends on facilitating a state of flow - a term introduced by Csikszentmihalyi [14] to describe a highly enjoyable and rewarding “optimal” experience, in which challenge and skills match. Flow has been applied to various online activities, such as browsing [50], playing games [11, 38], or engaging in computer-mediated communications [28]. For the Internet context, additionally telepresence and interactivity are considered antecedents of flow [37].

Nambisan and his colleagues [48, 49] studied customers’ actual interaction experiences in the limited context of online product forums. The authors provide empirical support for Prahalad and Ramaswamy’s [58] assertion that the customer’s interactions in value co-creation can themselves be an important source of value. The extent to which interactions in the virtual customer environment offer benefits (cognitive, social integrative, personal integrative and hedonic) shape the actual participation. The results reveal that customers’ actual experiences and their beliefs about the expected benefits significantly influence their actual continued participation in such forums.

Due to the embryonic nature of virtual worlds and the fact that academic research has only recently picked up, there is both a dearth of studies that address issues concerning experiences in virtual worlds in general and for avatar-based innovation specifically. While findings of studies concerned with the user experience on the Web may provide some interesting insight, the transfer is difficult, as virtual worlds are in many respects significantly different from the traditional web. Navigation in a 3-D environment, avatar-mediated communication, user-generated nature, and interactivity with virtual tools pose unique issues for co-creation. As Hoffman and Novak [36] correctly point out in a recent update of their paper that “in examining flow in virtual worlds such as Second Life, there are a number of ways in which our original conceptual model [35] could be augmented: “The social context of virtual worlds, the increased interactivity, the virtual representation of physical spaces, and the manipulation opportunities especially demand a re-examination of the flow understanding for the traditional Web.”

Before turning to the empirical study, we introduce the research setting that was set up to study the consequences of compelling co-creation experiences.

#### **4. The research setting: Ideation Quest in Second Life**

To shed light on the co-creation experience and its consequences, we started the Ideation Quest initiative in Second Life. In three consecutive projects, the virtual environment featured several stages and creative tasks within Second Life. Participants were invited to immerse themselves in the problem context, explore inspirational stimuli, take part in creative challenges such as word association and brainstorming, before submitting ideas and evaluate other submissions. Implementing an avatar-based innovation project to generate insights on the interaction experience was necessary, since existing corporate projects were only frequented by a small number of avatars. In addition, the interest of the approached companies in academic research was rather limited. The virtual environment featured a number of very specific design characteristics that resulted from insights generated in an exploratory netnographic study [42] of Second Life places and communities, complemented by formal and informal discussions with expert residents. After this initial research phase we designed, realized, and conducted the project. The elements and core characteristics are briefly

explained by deconstructing the process as it applies to the participants' point of view. A five-step process was used to orchestrate the activities and interactions among its participants.

**Stage 1:** Upon arrival, participants were welcomed and received introductory information aiming to spark a sense of purpose and to set the stage for the following activities. In the so called Welcome area, one of our guide avatars introduced the functions and features of the ideation quest, the various stages participating avatars have to master and supported means of communication and interaction.

**Stage 2:** During the second stage of inspiration, participants were confronted with informational and entertaining stimuli material in the form of 3-D content, pictures, or video. They were confronted with an initial scenario, consisting of an immersive environment that framed the problem (e.g. green energy in the Green Ideation Quest). We strived to appeal to multiple senses. Instead of describing the situation, we relied on 3D models. Consider the Green Ideation Quest: Objects included a coal plant, an atomic reactor, oil pump and overall the environment made a "dirty" energy impression. To stimulate participants' creativity, the process featured a number of challenges such as word association, knowledge questions and sentence-completion tasks. We extrapolated the mechanism of collecting points from game design to tap into the users' competitive drive and provide feedback on their contributions. The users' goal was to collect as many points as possible along the different dimensions of (1) creativity, (2) collaboration, and (3) expertise. Each task in the IQ allowed participants to earn points on these dimensions in the one or other way. E.g. the word association game increased the creativity score by one when mastered by dropping more than seven words. Knowledge question increased expertise and discussion tables collaborations points. Furthermore participant's submissions could be rated by others in the exhibition area.

**Stage 3:** Emphasizing the social nature of virtual worlds, semi-structured group discussions were integrated to explore customer needs, work out problems, or examine innovative opportunities. An object called Discussion Table was employed to encourage discourse by planting conversations and provocative ideas. Our avatar guides directed each time 4 participants to one table. If all avatars sit down, the table asked one pre-defined question per minute to spur the dialog.

**Stage 4:** During the idea-generation phase, avatars were asked to visualize and express their ideas either in the form of a 3-D model or a text

description and illustrative images. E.g. we integrated a toolkit [3, 4], which employed a module library, from which participants could choose to visualize their own green idea. Additionally, the Second Life building tools were available, so that participating avatars with comprehensive Second Life knowledge were not constrained. We made sure to encourage users to build by providing space (sandbox), the integration of their creations into the inspiration stage and the display of their creations.

**Stage 5:** All ideas were displayed for the stage of idea review, in which participants were able to review, comment on, and judge other submissions for inspiration and to leverage the social community aspect. 3D models built with our toolkit as well as new ideas or recommendations written on note cards were accepted.

In order to initiate a vibrant meeting place where participants come back to interact with like-minded peers and discuss the topics related to the project, frequent events were conducted and updated information was sent to the community.



**Figure 1:** KTM Ideation Quest arrival and word-association (top), Philips Ideation Quest ideation platform and knowledge questions (middle), Green Ideation Quest<sup>1</sup>

The main benefit of hosting the idea competition was a realistic but also experimental setting, which we were able to adjust and manipulate. By engaging participants in hands-on idea generation and evaluation rather than hypothetical scenarios, the experiment added more realism. Besides integrating

<sup>1</sup> To visit the Green Ideation Quest in Second Life: <http://hyvebox.de/secondlife/>

in-depth interviews and an online survey, we were able to observe and track participants' behaviors allowing the exploration of avatars' experience and behavior in depth. To add further realism we collaborated with two companies to conduct the first two projects: KTM, world leading producer of motocross motorcycles, and Philips, Europe's largest manufacturer of consumer electronics. The topics for the idea generation were chosen accordingly (Table 2).

A total of 599 avatars visited the three Ideation Quest Projects in Second Life™, which took place in summer 2008 and spring 2009. However, we only considered those avatars that spent more than ten minutes on the site as Ideation Quest participants. Visitors spending less time were regarded as explorers who either randomly teleported into this area or came with the intention to visit other activities on the same island. Details on the three projects are given in table 1. While the first two projects were mainly to gain more insights into the design requirements for compelling experiences, the participants of the third project – the Green Ideation Quest – were the respondents to the questionnaire of the empirical study.

**Table 1: Project details**

Project Name	KTM Ideation Quest	Philips Ideation Quest	Green Ideation Quest
Topic	The future motor biking experience	Sustainable living in the year 2020	Ideas for a more sustainable future
Company involvement	KTM Motorcycle AG	Philips Design	None
Project start / end	6/13/2008 - 7/16/2008	6/20/2008 - 7/16/2008	2/23/2009 – 3/20/2009
Second Life Island	ui2 campus island	Philips island	ui2 campus island
Avatars joining project	166	167	266
Time spent on average	76 minutes	80 minutes	85 minutes
Research conducted	Qualitative interviews Participant monitoring	Qualitative interviews Participant monitoring	Qualitative interviews Participant monitoring Quantitative survey

## 5. Consequences of the virtual co-creation experience - Conceptual framework

In this study we seek to shed light on the role of a compelling experience for effective co-creation. The applied conceptual framework and derived hypotheses are based on the flow theory, research on co-creation experience, and creativity literature.

For the web context, Hoffman and Novak [37] proposed that creating a compelling website depends on facilitating a state of flow. Compelling experience, similarly to flow or peak experience is characterized by intrinsic enjoyment [37]. It is considered as “extremely gratifying” [50 p.22], engaging, and highly involving [15]. Consumers completely immerse themselves in the activity. They no longer differentiate between the virtual and the physical world, between real and virtual yet to be realized innovations [8, 66, 67]. As a compelling experience is “extremely gratifying” [50 p.22], enjoyable, and engaging, it causes a number of positive consequences. For example, it attracts consumers and positively influences attitudes and behaviors [15, 16, 21, 45, 50]. Ideally, co-creation projects offer consumers such “optimal” and compelling experiences [53].

Time and Contribution: Optimal and compelling experiences lead to increased persistence and interest in activities [15]. Participants try to maintain and re-experience compelling, flow-like experiences. Such an experience encourages consumers to be highly creative and perform at peak levels [16, 20]. During flow-like experiences, people reach unconscious, playful levels of thought considered as vital for innovative outputs [16, 20]. This leads to the first set of hypothesis:

H1: Compelling experience has a positive impact on participants' actually spent time.

H2: Compelling experience has a positive impact on the amount of participants' contributed content.

Further Interest: Consumers' interest in further engaging in co-creation activities is influenced by consumers' previous experiences associated with the activity. Positive experience and successful outcomes stimulate future interest in co-creation activities. Negative experience and failures, as confirmation of incompetence, lead to frustration and decreased motivation [19, 20]. Playful and enjoyable activities provide value [19]. They offer a state of “jouissance” which people try to maintain and seek to repeat [6]. It is the quality of experience creative consumers feel when involved in the activity which drives them to continue and keeps them motivated [16]. We state:

H3: Compelling experience has a positive effect on participants' interest in future participation.

Word of Mouth and Evangelism: Individuals tend to share positive and negative experiences with others if the topic is important to them and they consider it also of interest to others [29, 56]. They engage in positive word of mouth if they associate enjoyable and rewarding experiences with it [56]. Recent marketing literature, however, argues that word-of-mouth does not comprehensively capture the missionary intention of delighted, committed, and devoted customers. Pimentel and Reynolds [54] have shown that truly devoted consumers not only spread positive word of mouth but eventually engage in recruiting in order to actively convince others of their beloved brand. Rozanski, Baum and Wolfsen [64] portray the actions of brand zealots whose extreme loyalty and emotionality towards their favorite brand can inspire them to extreme acts: “Some loyal consumers experience a relationship that goes well beyond the fulfillment of a functional need. They are militant in their commitment to their brand: creating positive word of mouth for the brand, experiencing the product to its fullest and, if defrauded, launching frontal attacks on the company. ... These brand zealots have the potential to become the brand’s biggest allies or, at the other extreme, a renegade army. ... Their strong feelings result in attempts to convert others, ultimately causing changes in public opinion or legislation” [64].

Based on this evidence, we propose the term co-creation evangelism for describing a more active and committed way of spreading positive opinions and trying fervently to convince or persuade others to get engaged in the co-creation project. By choosing the word evangelism we would like to emphasize the missionary component of this type of consumer behavior [46] after a experiencing a compelling interaction.

H4: Compelling experience has a positive impact on participants’ intended evangelism.

Intention to live more sustainable: A compelling experience positively affects someone’s attitude [36, 37]. Participants who co-create creative content become familiar with it. They may at the same time become interested in and attached to it [5]. Familiarity and knowledge lead to increased levels of involvement [73] and commitment [61]. This is especially the case if participants associate a compelling experience with it [68]. Consumers may become aware and enthusiastic about the content they co-design and co-create [55]. In our case, they may intend to live more sustainable. Literature on mass-customization, for example, states that consumers will show high interest in and willingness to pay for

their self-designed products if they enjoy the design process due to a “flow” experience [24]. We state:

H5: Compelling experience has a positive effect on participants’ intention to live more sustainable.

## 6. Empirical study

To test the developed hypotheses, we conducted an online survey in which we asked avatars who previously engaged in the third avatar-based innovation project – the Green Ideation Quest – about their experience and intention of future participation and about their interest in persuading others to join the project. Additionally, active participation and commitment was measured by observing the time spent on the island and the words written in chats and brainstorming sessions. Out of all 266 Green Ideation Quest participants, 114 completed the survey. This corresponds to a total return rate of 42.8% for the survey. The high participation rate was achieved by asking avatars, who spent time in the Green Ideation Quest, for survey participation via personal instant message. In addition we offered a donation of USD 5 per participant to a nonprofit organization and LD 300 (=USD 1.10) for each participant. On average, the age of the participants of the survey is 1.5 years. With a self-provided Second Life skill-level of 3.54 on average (1 = newbie, 5 = expert), our data indicate that not only expert users participated in our survey. However, the majority of participants can be considered as highly involved residents of Second Life. On the “familiarity with SL functionality” scale our sample shows an average of 3.68 (1 = basic, 5 = sophisticated). Twenty-five avatars said that building is their preferred activity in SL, 28 concerned with learning activities, and 27 prefer socializing. Attending live performances (eight avatars), scripting (four avatars) and other activities (22 avatars) account for the rest of the sample. Fifty-six avatars have been in SL for one year or less, 44 have been in SL for two years and 14 have been in SL for three years or even longer. More female (63) than male (51) participants answered the questionnaire.

### 6.1. Measures

Three indicators were adopted from Delle Fave and Massimini [22] and another two indicators from Füller [26] to measure compelling experience. We have chosen 5 items to operationalize compelling experience covering the enjoying, emerging and involving aspect of it. The intention to engage in future co-creation activities was measured with two

items similar to Bagozzi and Warshaw [3], Barki and Hartwick [4], and Loken [43]. Three items from the Evangelism scale as suggested by Matzler et al. [46] have been taken and adapted to the context of this study. The three items to measure intention to “live more sustainable” are based on Ajzen [1]. All items were measured on a five-point Likert scale (1=strongly agree, 5=strongly disagree). All incorporated measurement models are reflective. Additionally active participation was operationalized with two measures, time and words written. The time avatars spent on the project island was observed with sensors, which generate timestamps per minute. The dialogue between avatars in brainstorming sessions was recorded; words were counted with software and assigned to the corresponding avatar name. Thus, we were able to measure actual active participation instead of felt active participation [28].

## 6.2. Data Analysis and Results

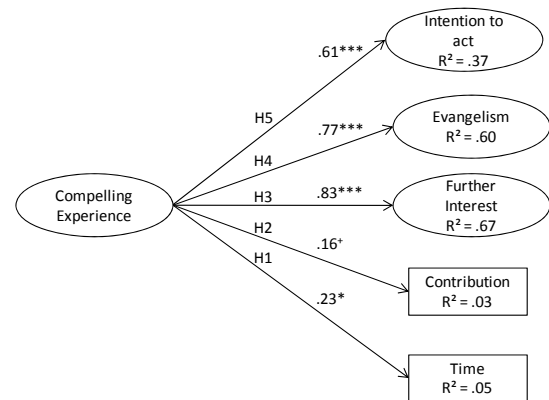
Because validated measures known from literature have been either directly applied or only slightly adapted, confirmatory factor analysis could be used to determine the psychometric properties of the measures. First, reliability and validity of the measures in the measurement model were tested to calculate the composite reliability of the constructs, the average variance extracted [23], and the Fornell-Larcker-Ratio [23] for discriminant validity. The results are displayed in Table 2.

**Table 2:** Psychometric properties of scales

Construct	Item	Indicator loadings	Mean (SD)
Compelling Experience (CR =.88, AVE =.59, FLR =1.10)	1. The Idea Quest helped me to get inspired.	.75	2.19
	2. I enjoyed the mere participation.	.84	2.26
	3. I got involved.	.72	2.46
	4. I enjoyed the experience, and/or the use of my skills.	.73	2.27
	5. Participation was fun.	.79	2.31
Further Interest (CR =.81, AVE =.69, FLR =.96)	Participating in Ideation Quest led to the result that ...		
	1. ... I intend to engage in the future with the ideas of the Ideation Quest.	.90	2.18
Evangelism (CR =.78, AVE =.54, FLR =.98)	2. ... I would like to further contribute to the development of the Ideation Quest.	.75	2.45
	1. I would make a perfect sustainable living salesperson.	.66	3.12
	2. I try to convince as many as possible of sustainable living.	.85	2.6
Intention to act	3. If someone tries to decry sustainable living, I will tell him off unmistakably.	.67	2.78
Intention to act	After participating in Idea Quest,		

(CR =.83, AVE =.71, FLR =.46)	1. I will try to consume less energy.	.73	1.83
	2. I am more aware of the pollution problem.	.96	2.06
Time spent	Minutes spent		90.19
Contribution	Words contributed		292.6

Besides discriminant validity for compelling experience (FLR =1.10), the local fit measures for the applied constructs meet all required standards concerning average variance extracted (>.50), composite reliability (>.60), and discriminant validity (Fornell-Larcker-Ratio <1) [12]. Compelling experience highly correlates with further interest. Therefore, discriminant validity is not given between those constructs. However, as further interest and future activities are conceptually different, both strongly depend on previous experiences, and the face validity of applied items to measure compelling experience and further interest seem to be high, we are confident that the high correlation is based on the strong relationship between experiences and further interest rather than on measurement bias.



**Notes:**  $\chi^2 = 86.30$ ;  $df = 72$ ,  $p = .120$ ;  $\chi^2/df = 1.199$ ;  $NFI = .905$ ;  $CFI = .982$ ;  $TLI = .978$ ;  $IFI = .983$ ;  $GFI = .901$ ;  $AGFI = .855$ ;  $RMSEA = .042$ ; \*\*\*  $p < .001$ ; \*\*  $p < .01$ , \*  $p < .05$ , +  $p < .10$

**Figure 2:** Consequences of a compelling co-creation experience

Next, multiple fit indices were examined to evaluate the overall causal model. The  $\chi^2$  test is not significant. Satisfactory fits are obtained as the GFI, CFI, NFI, TLI, and IFI are greater than or equal to .9, and the RMSEA is less than .08 [7, 13]. The test statistics of our model provide the following results:  $\chi^2 = 86.30$ ;  $df = 72$ ,  $p = .120$ ;  $\chi^2/df = 1.199$ ;  $NFI = .905$ ;  $CFI = .982$ ;  $TLI = .978$ ;  $IFI = .983$ ;  $GFI = .901$ ;  $AGFI = .855$ ;  $RMSEA = .042$ . Overall, the model indicates a good fit to the data. Main Effects: The results given in Figure 2 provide support for all

hypotheses H1-H5 tested. Compelling experience positively affects further interest ( $\gamma = .83^{***}$ ), evangelism ( $\gamma = .77^{***}$ ), intention to act ( $\gamma = .61^{***}$ ), time spent ( $\gamma = .23^*$ ), and contributed words ( $\gamma = .16^+$ ).

## 7. Discussion and Conclusion

Our findings demonstrate the importance of providing a compelling experience. A compelling experience is responsible for participants spending more time and contributing more content to the innovation project. Indeed, it leads to increased persistence and interest in further co-creation activities [15], which is considered an important prerequisite for creative input and promising solutions [15, 16, 18]. In addition, someone's engagement in a virtual co-creation project also leads to higher awareness and mobilizes one's desire to act on the topic discussed. A compelling experience positively affects participants' attitudes towards the topic [36, 37]. Enjoyable and compelling experiences contribute to evangelism and to the desire to conform to the discussed topic. Participants become more aware of the pollution problem and intend to act more sustainably by wasting less energy in our case.

This research contributes to a theoretical understanding of a new medium for co-creation during an open innovation process. Original to this study is the concept of avatar-based innovation which was used as a starting point to advance the perspective that virtual worlds present opportunities for companies to engage with customers in new and interesting ways during open innovation. Therefore, on one side, the research adds to the early investigations into the phenomenon of virtual worlds, and on the other side, it contributes to the research stream of different customer-centric open innovation approaches.

The second set of theoretical contributions refers to establishing the importance of the virtual interaction experience. Through exploring the consequences of the co-creation experience in virtual worlds, this study is an early step on the path toward a more comprehensive understanding of consumer behaviour in these new media environments.

This study indicates several areas of action for managers. The first implication refers to embracing avatar-based innovation. Using the latest technological advances can help leverage a firm's innovation process, both by harvesting the medium-related benefits, and by tapping into avatars' creativity. Given the illustrated potential, managers need to acquaint themselves with the phenomenon of

virtual worlds and consider using avatars as equal partners in the new product development process.

The second implication relates to the need for open innovation practitioners to fully acknowledge the importance of the co-creation experience. If companies decide to use an avatar-based innovation strategy, they must recognize that an invitation for avatars to actively participate in co-creation is not enough. Present corporate activities in virtual worlds imply that the critical challenge to use the emerging technology is not so much in devising the technological infrastructure but in creating and maintaining a rewarding experience for visitors. Companies need to go beyond implementing the visual presence and instead seek to actively engage customers by recognizing their motivations and delivering benefit to them. Developers should endeavour to emphasize intrinsic motivation rather than extrinsic motivation. The inhabitants of virtual worlds want to be engaged and involved and, therefore, provide a fertile ground for creative activities. The key to becoming successful in virtually collaborating with customers will depend on the ability to aggregate participants, retain them and encourage them to make contributions.

In conclusion, virtual worlds offer an inspiring perspective for enhancing innovation activities through virtual customer integration. Firms' recognition of the customer as a valuable partner in an open and interactive approach to innovation has extended to the emerging technology of virtual worlds. With the right approach, companies can enhance their innovation efforts by learning how to engage and co-create with avatars – the latest visual representation of their potential or actual customers.

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