Personality based Information Management

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Abstract

Educational multimedia facilitates an infotainment duality, which is the ability to entertain users whilst being informative. Although studies have investigated the impact of users' cognitive and learning style on information assimilation (retention), the impact of personality type has not been fully explored. This research investigates whether personality types impacts user level of information assimilation. An adaptive 'Quality of Perception' experimental methodology was used to assess quantitative levels of information assimilation, and qualitative factors including: participant enjoyment, self-assessed level of assimilation and confidence. Suggestions are provided to facilitate the effective support of personality in educational multimedia material.

1. Introduction

Multimedia is a multi-sensory interactive user experience; a combination of at least one continuous (i.e. sound and video) and one discrete (i.e. text, images) medium. Multimedia facilitates infotainment duality, which means that multimedia is not only able to transfer information to a user, but also provides the user with a subjective experience. Since humans have a natural ability to understand multimedia content [13], multimedia presentations have become a popular medium for education, training and development. Despite increased focus on e-learning experience, such applications often overlook the point that each user is different.

Previous research has investigated how people learn and whether cognitive style impacts information assimilation (IA) [5]. There has been, however, to our knowledge, no research looking at the impact of user personality. In our work, we intend to investigate whether a relationship exists between user personality and

multimedia user experience (both IA and user satisfaction). This allows us to identify whether knowledge of a student's personality can be used to enhance the learning experience via information management.

The structure of this paper is as follows: in section 2, we provide the reader with a more in-depth understanding of the main topics involved in our research. In section 3, we discuss the experimental and assessment methodologies used in our work, as well as the implementation of the experimental material. In section 4 we detail the experimental methodology, whilst in section 5 we provide an overview of the research findings and discuss how our research may be applied to the area of education. Section 6 concludes our study and suggests future work.

2. Measuring user Personality and Perception

2.1. Personality Tests

The earliest model of personality was designed by the Greek philosopher / physician Hippocrates, however rapid development in the early 20th century led to increased interest in personality type definition. An exponent of this was the Swiss psychoanalyst Carl Jung who categorized the mental function into sensing, intuition, thinking and feeling [8]. This categorization led to much research concerning the definition and identification of personality types, which in turn led to the design of numerous personality test questionnaires. The best known personality tests includes: the Myer Briggs type Indicator (MBTI) [10]; Big Five [7]; the NEO-PI [3]; and the 16 Personality factors (16PF) [2].

2.2. The Measuring of Multimedia User Experience

Multimedia is not a single monotone dimension; it is a multi faced concept that means different things to different people. Different media (e.g. video, audio, text, animation, captions) are presented, with information being either, or both, informative (educational) and entertaining. To effectively measure this complex 'user experience', numerous techniques have been used in literature. Task performance is commonly used to measure the user experience (especially when encountering cognitive overload). Kies, Williges and Rosson [9] used task performance subjectively through self reporting and objectively via an assessed quiz. Procter et al. [11] used ease of understanding, level of interest and comprehension (recall) as quality measures. Wilson and Sasse [15] showed users varied multimedia quality and used stress measures as a measure of the user experience. Apteker [1] used a seven point Likert feedback scale to determine whether lower quality multimedia could be used without negatively impacting user perception. Procter [11] asked users to define aspects of video quality using a three level rating (low, medium or high), in order to determine adequate quality provision. Finally, Gulliver and Ghinea [6] and Serif et al [12], all use the Quality of Perception (QoP) metric to measure the impact of multimedia factor variation on user experience. QoP facili-

tates the capture of multimedia duality by using graded questions to identify information assimilation and subjective user satisfaction.

3. Methodology, Material and Assessment Techniques

A 2-stage experiment was developed. In the first stage we used an adapted Myer Briggs Personality Indicator to discover the participants' personality. In the second stage a multimedia interface was used to show the users a number of presentations (containing video, audio, text and captions). QoP (Quality of Perception) was incorporated in our experiment to measure how each user assimilated information from different multimedia content. This section elaborates on the personality test and introduces the experimental material and describes QoP in more detail.

3.1. Personality test

An adapted Myer Briggs test was used to identify participants' personality preference. Personality categories are defined as: Extroversion (outwards) or Introversion (inwards), which concerns the way a person interacts with the environment and/or people; Sensing (via senses) or Intuition (unconscious), which concerns the manner in which a person processes information; Thinking (logical) or Feeling (subjective), which concerns the way in which a person evaluates information; and finally Judging (step-by-step/rules) or Perceiving (subjective judgments), which concerns how a person comes to a conclusion [14].

The original Myers Briggs test has 93 forced choice questions, yet due to limitations of time, participants were categorized using an adapted test questionnaire. Statements were grouped relating to the personality type and users were asked to decide, for all four sections (relating to E/I; S/N; T/F; J/P), which group of statements (left or right) best fitted their action preference.

3.2. Experimental Material

The experimental material was designed to present the user with a large range of infotainment content comprising a wide range of information channels (i.e. video, audio and textual sources). The layout of the multimedia interface (see Figure 1) includes a: Video field {V} – which contains video clips (with associated Video Sound {VS}); Video caption field {C} – containing edited textual representation of the audio; Text field {T} – which contains textual information, which supports the topic being displayed in the video field. The nine video clips were used previously in research by Ghinea and Chen [5] and Gulliver and Ghinea [6] to investigate respectively the impact of cognitive style and the impact of captions on deaf IA. The text field contains additional textual information that supports, but does not duplicate, information in the video field. The caption field displayed a textual representation of the video audio. This was constructed using a java applet, which displays captions in synch with video audio.

Figure 1: Multimedia Interface

3.2.1. Measuring User Information Assimilation (QoP-IA). QoP-IA is expressed as a percentage measure that reflects the percentage of correct answers that a user gave to questions. All questions had an unambiguous answer, making it possible to determine whether a participant answered them correctly or not. Moreover, for each question, the source of the answer was easily determined, as it was only present in one specific information field: V, C, VS, T. Caption (C) data was edited to ensure minor variation in wording between C and VS data sources. Accordingly, questions answered specifically could be related to specific information sources. It is therefore possible to determine from which information sources participants assimilated information. This makes it possible to determine and compare differences that exist in a users' information assimilation.

3.2.2. Measuring User Satisfaction (QoP-S). QoP-S is subjective in nature and consisted of three component parts: QoP–LoE (the user's Level of Enjoyment whilst viewing the multimedia content), QoP–LoA (the user's judgment concerning the information that they believe they assimilated) and QoP-LoC (the user's judgment concerning how confident they were with the information that they had assimilated). This distinction helps us to gain a clear understand the user experience. For example: a user may enjoy a multimedia presentation, but may actually not assimilate much of the factual information being presented. Despite this, the participant might be highly confident concerning the information that was assimilated.

Measuring Subjective Level of Enjoyment (QoP-LoE): To measure QoP-LoE, the user was asked to express, on a Likert scale of 0 - 5, how much they enjoyed the video presentation (with scores of 0 and 5 representing "no" and, respectively, "absolute" user satisfaction with the multimedia video presentation).

Measuring Subjective Level of Assimilation (QoP-LOA): QP-LOA represents the user's self judgment concerning the level of information that they believe they

absorbed. QoP-LoA was assessed as a percentage – for example, "I think I absorbed about 50% of the information that was presented".

Measuring Subjective Level of Confidence (QoP-LoC): QoP-LoC is the user's self judgment concerning the confidence they have with the information that was assimilated from the interface. QoP-LoC was also assessed as a percentage – for example, "I am about 90% sure that I understood that correctly".

4. Experimental Process

This experiment was conducted with 58 student participants from both college and university educational backgrounds. We chose participants that closely reflected the student population within our University to allow potential findings to be used in the preparation of higher educational material. There were 24 females and 34 males, aged between 17 and 33. None of the participants used in this experiment had previously participated in any QoP experiments, which minimized participant pre-knowledge. All participants described themselves as being computer literate and speaking English fluently.

Participants were given a declaration, which they read before starting the experiment. This declaration form gave full details about the experiment, and clearly outlined the participant's ethical and informational rights. If happy, the participant then completed the personality test questionnaire, which included four sections, with each section containing two groups of statements. Participants were asked to choose a group of statements that most applied to their choice of actions.

To keep multimedia presentation and data collection as consistent as possible, the interface was consistently presented to participants using a screen resolution of 1024 by 768 pixels. Head phones were also used consistently to help minimize background noise during the experiment and avoid participant distraction. It was explained to participants that the experiment involved interacting with a multimedia interface. The user was informed that after each presentation they would be asked a number of short questions about the content that they had just seen. All participants were clearly informed that the experiment was not designed as a test and that participants should try to interact with the interface in a natural fashion. After each of the nine presentations, the screen was blanked, so the user was unable to refer to the screen during questioning. Participants were then asked QoP questions relating to the presentation. As discussed in section 3.2.1, the questions were designed to examine the type of information assimilated by the user {video (V), text (T), caption (C) / video sound (VS)}. Three additional QoP-S questions were included to measure user enjoyment (QoP-LoE); how much they think they had absorbed from the interface (QoP-LoA); and how confident they were about their answers (QoP-LoC).

5. Data Analysis

5.1. Does personality impact user Information Assimilation?

We used a MANOVA test, with the personality factors (E/I, S/N, T/F, J/P) as independent variables and QoP-IA sources {video (V), text (T), caption (C) and video sound (VS)} as the dependent variables. Results show that the Extroversion-Introversion personality dimension significantly {$F_{(1)} = 15.000$, $P<0.001$} affects caption (C) information assimilation. Moreover, Figure 2 shows that *introverts* (group 0) answered significantly more questions relating to information shown in the captions than those who were deemed as *extroverts* (group 1). Moreover, we also found that, whilst *introverts* assimilate more information from textual and caption information, *extroverts* appear to listen more to audio data sources.
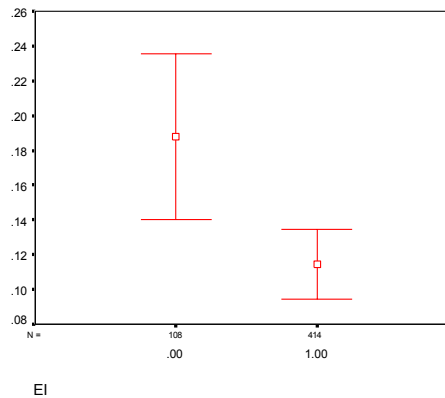

Figure 2: Extroverts (1) / Introverts (0) vs. Caption {C}

Analysis also demonstrated that the Thinker-Feeler and Judger-Perceiver dimensions impact user textual and captioned information assimilation {TF-Text: $F_{(1)} = 9.694$, $P=0.002$; TF-Caption: $F_{(1)} = 4.52$, $P=0.034$; JP-Text: $F_{(1)} = 23.486$, $P<0.001$; JP-Caption: $F_{(1)} = 8.215$, $P=0.004$}, with *thinkers* and *judgers* assimilating more textual information than, respectively, *feelers* and *perceivers*. We suggest that when critical points are being taught to students, that material is presented in both textual and non-textual forms to limit the disadvantage to those with certain personality types.

5.3. Does personality effect user satisfaction?
We used a MANOVA test, with QoP-LoE, QoP-LoA and QoP-LoC as the dependent variables, and the four personality dimensions (E/I, S/N, T/F, J/P) as the independent variables.

5.3.1. Does personality type effect QoP (LoE). No significant results were found between personality dimensions and QoP-LoE. Although variation occurred in user enjoyment across video clips, results were not impacted by personality

dimensions. This implies that measured personality type does not impact personal media preference, supporting the findings of Ghinea and Chen [5].

5.3.2. Does personality type effect QoP (LoA). Results showed that E/I {F(1) = 8.792, P=0.003} and T/F {F(1) = 5.14, P=0.024} personality dimensions significantly affects user self-perceived information assimilation, with our research showing that introverts and thinkers perceive themselves as assimilating respectively more.

5.3.3. Does personality type have an effect on QoP (LoC). User level of confidence was shown to be significantly affected by the E/I {F(1) = 14.276.14, P<0.001} personality factor. This finding supports the previous result and shows that extroverts have a lower level of confidence in their ability to assimilate information correctly. This would suggest that:

- When learning, *extroverts* are less self-confident than introverts. A positive relationship exists between *imagers* and those that are *extroverts*. A positive relationship also exists between *verbalisers* and those that are *introverts*. Accordingly, a personality weighted mix of visual and textual teaching material must be used by module designers to improve specific student IA.
- Subjects that are perceived as being visually expressive in nature will often attract *extroverted* students. Our research implies that these students will require more consistent affirmation of their progress and abilities. To support these students, more formative assessment points and means of feedback should be incorporated in such subject courses.

6. Conclusion.

The research reported in this paper was conducted to investigate whether different personality types impact a user's level of information assimilation when watching a multimedia presentation. An adapted Quality of Perception metric was used to investigate information assimilation, whilst facilitating capture of factors including participant enjoyment, self-assessment level of assimilation and confidence. This paper provides the reader with a better understanding of the impact of personality on the student experience of multimedia content. Interestingly, it is the opinion of the authors that students will often self-categorize themselves through course selection, and that different subject cohorts will naturally demand quite specific multimedia content provision. This paper has proposed a few general suggestions for the effective production of multimedia educational content, however further research is required in the field of education to determine whether a direct link to subject-based content provision can be achieved.

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