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ASSESSING MULTIMEDIA QUALITY FROM THE USER'S PERSPECTIVE

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ABSTRACT

To assess multimedia quality from the user's perspective, elicitation of information through the use of custom-designed questionnaires is proposed. The paper discusses the type of information needed from users in order to accurately assess the quality, and provides reasons why that information is necessary. Quality perception is a relative concept which very much depends on the nature of the content, the individual making the assessment and the context in which any such judgement is made.

Keywords: Multimedia, quality, assessment, and questionnaires

1.0 INTRODUCTION

Integration of digital data held in a number of formats is central to the development of multimedia titles. In multimedia, the formats involve: digitised images, audio, text, graphics, animation and video. This integration is achieved by obtaining the various types of media *assets* (visual, sound etc.) and where necessary converting them from analogue into digital format. In this way each type of data is stored in a very stable format which is readily available for use together with the other digital forms.

The development of a multimedia title for any particular subject is not normally difficult in purely technical terms, but its complexity means that it can present an arduous challenge if it is to be done properly. Many software packages exist to digitise data and then manipulate it within the various multimedia authoring tools that are readily available. Hardware for digitising is similarly available off-the-shelf and is also now affordable. The problem with developing a multimedia title is not usually a technical one.

It is not enough to simply integrate video, audio, text and graphics into a single package and present it on a CD-ROM, in the hope that it will be enjoyable or useful and/or educational. A multimedia title has to be based on a number of sound principles which take into account, not only the technical requirements of the product, but also the nature of the individual using that product and the context in which he is using it. Understanding what is required to assure multimedia quality involves appreciation as to how the knowledge of human perception of a product within certain environments may be harnessed during the development of the product.

A lot of multimedia products have been generated dealing with a vast range of subjects: from the familiar video games, through educational packages and so on to highly specialised subjects relating to personal pursuits, and in the workplace. Some of these have been successful in the market place while others have languished on the stockroom shelf or have lain virtually unused by the purchaser. There is therefore a requirement to look at the criteria that make a title successful, and in other cases to establish reasons why they may have failed - all this is done with a view to establishing how they may be improved. This is the object of this study and the method of approach concentrates on the appreciation of how the content of a title is perceived by its users. This does not mean making a critical assessment of the semantics of the content; but rather looking at the overall presentation of the product.

Emphasis is given on "*the user view*", as it is believed that the user is the most important person in the multimedia market value-chain - being the person who makes the ultimate decision on whether or not to purchase or use the product. There are many definitions regarding what a user is and for the purposes of this work, a user is classified as the person whose interest in using a multimedia title lies merely in deriving information, knowledge or enjoyment from the subject matter of the title. Hence, a user in this context is what is often known as the "end-user"[1].

[1] Once the user is identified, a profile of the user may be created and then used as a reference for constructing the multimedia title.

2.0 INTRODUCTION TO MULTIMEDIA

Contrary to popular belief, multimedia is not only "many media". Multimedia, as described earlier, is a hybrid of text, image, audio, graphics, animation and video, which is delivered to the consumer electronically. Another way of looking at this is to say that multimedia means the use of a computer to combine and present a number of different types of media information, together with facilities that allow users to navigate, communicate and interact with the data presented. An important point here is that multimedia is able to add interactive features which allow users accessing the information to respond to it immediately.

Before proceeding further, it is perhaps better to explain a number of aspects of the terminology associated with multimedia development. A multimedia product consists of a program which may be written using a packaged *multimedia authoring system* or by using *a multimedia authoring language* which allows more control over the results but requires a greater commitment in terms of human programming resources. It may on the other hand be created with a bespoke system which uses a conventional *imperative programming language* such as C^{++}. The multimedia under development uses *assets* which are the digitised video clips, images, sound and text associated with it. Control of these assets is a vital function in multimedia development and, on average, accounts for 80% of the effort associated with a particular development project.

In fact, multimedia has a number of unique attributes, especially when it is compared to a conventional software product. Consequently, the rules and conventions governing its use vary considerably from custom-and-practice in the software world. Multimedia is capable of providing a user with vast amount of information, stored in physically small data reservoirs (CD-ROM, databases, DVD etc.) which were previously unattainable in terms of what they could practicably offer. This revolution has been accompanied by tumbling prices of storage media, computer memory and great, yet economical, enhancements to processing power. In addition to this, many multimedia products offer interaction with the product that provides an added-value in great proportions.

The authors recognise that there are two basic types of multimedia product available to users.

1) "Fixed" multimedia consists of products with content that is purchased in a complete form. They may be stored on CD-ROM, DVD, or may be accessible on the Internet, or downloaded from an FTP site directory. These products are often highly interactive and cover a wide range of domains including: education, public information, work-place applications, computer games and "the arts".

2) "Real-time" multimedia generally involves systems that are on-line (within LANs, MANs, WANs etc.) and largely portray an existing current time-frame of a particular situation. This type of multimedia allows the user to analyse situations, make decisions and effect changes immediately. It is extensively used in operating theatre surgery, remote learning via tele-conferencing and in diagnostic work in heavy engineering applications.

The authors' research has encompassed studies into "real-time" multimedia applications and quality [8, 9, 10], but for the purposes of this paper, it is the "fixed" multimedia format that is under consideration.

Multimedia technology has gained popularity recently in social, economic and political terms because it is a powerful way to present information. Information can be presented in such a way that invokes the use of more than one of the senses simultaneously. Information may be very receptive and is exemplified by considering why television is such a powerful medium, when compared to radio and newspapers. According to a survey conducted by Meng [1], the percentages of information-retention conveyed through the human senses are as follows:

Table 1: The retention of information by senses

Sense	Percentage of Information Retention
Sight	75%
Hearing	13%
Touch	6%
Taste	3%
Smell	3%

From Table 1, it is easy to understand why information disseminated through television has a high retention rate, because it involves both sight and hearing simultaneously. The newspaper and radio involve the use of either sight or hearing at one time: their (often-tremendous) power lies in the unique ability of writers or speakers to communicate through a single medium.

Even though television can be a popular medium to convey messages, its disadvantage is that communication is one-way only. The viewer is merely a "dumb" recipient of the data without any interactive capability. Multimedia, however, opens up a whole new paradigm for information dissemination and sharing by adding an interactive element to it, and so making the end-user an active player in the process. Although predicting exactly what will happen with multimedia is complex. The way different cultures and technologies associated with multimedia are converging is shown in Fig. 1.

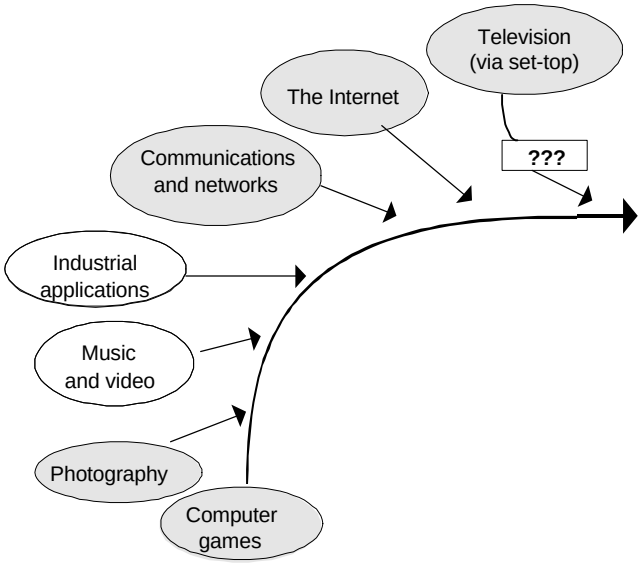

Fig 1: The Convergence of Technologies

In Fig. 1, associated with the entry for "Television (via set-top)" there is a label marked ???, attached to the converging arrow. This is because at the time of writing it is impossible to predict exactly which course of action will be taken next. It seems very likely that electronic commerce will be conducted using relatively simple Internet access via set-top boxes attached to television sets in peoples' homes and workplaces. This will almost certainly play a big role in the future in everybody's life and private, fiscal and commercial businesses will be conducted via the Internet etc.

It may be expected therefore that the future will involve an electronically based culture and economy, with most information being disseminated via public communication channels, and the population responding by appropriate multimedia interaction back through those same channels.

Multimedia is an interactive, computer-based gateway tool to a broad-based variety of content forms. In order to appreciate how it differs from other media forms, it has to be considered in the light of the four of its essential features:

1. It uses an increasingly powerful range of computers which manipulate vast amount of locally or globally communicated information
2. The software links in multimedia provide seamless integration of various assets in their own individual formats
3. Navigational tools allow the user to move at will across the tree, or branched linear structure, of the product
4. There are very powerful facilities for users to interactively interrogate the system and express their own ideas and opinions.

These four features are elementary to multimedia and the constituent elements (text, audio, image, etc.) are integrated into a good quality title, by adept use of one of the following:

- off-the-shelf and ready-to-use multimedia authoring tools,
- multimedia authoring languages
- bespoke systems programmed in conventional imperative languages such as C^{++}.

Having recognised a number of salient features of multimedia and its role in modern technology, this still leaves the question of what is meant by "quality" and what should be included in any assessment of it.

3.0 THE QUALITY OF A MULTIMEDIA TITLE

Quality is a relative concept. It is rare for two people to be in agreement over the quality of a particular product or service. What may appear to be "quality" to one person may not be so to another. This work has viewed the issue of quality by looking at it from the point of view of consumers, because they are the ones who make the ultimate decision on whether or not to purchase a title. This view was taken in order to adopt as pragmatic an approach as possible: consumers are the ones who may or may not experience a sense of reward by using it. Indeed, this notion of multimedia as an "experience" is central to the whole question of how to approach the subject of quality. A multimedia title is a consumer item and as such its market is heavily affected by consumer acceptance [2]. The quality of the title has to be associated with consumer needs; and it may be said to be a "quality" product if it is easy to use, well presented and satisfies a given need. Any definition of multimedia quality necessarily has to include human and social issues, and when developing a multimedia title, technical factors, the human perspective and issues of the context in which it is being used, all have to be considered.

Multimedia system quality, as proposed by Donaldson and Cowderoy [2], consists of an ability to meet user expectation, together with a number of internal and external quality features.

- Expectation and the individual needs of the user are entities that have to be considered separately
- External quality attributes are those witnessed by the consumer when the product is viewed as a whole. (e.g. well-blended colours, syntactic correctness of the text and video continuity in a moving sequence)
- Internal quality relates to how the underlying technology and the assets that it uses are geared to support the external perception.

Most research into multimedia quality in recent years has emphasised technical CD-ROM evaluation. Very little work has concentrated on evaluating the quality of the multimedia title in terms of its semantic impact. Such research has placed heavy emphasis on asset quality and the

technical perception of the multimedia and these are undoubtedly of vital importance. Factors such as interface features, search and retrieval functions and output functions were the primary consideration. For example: effort is concentrated on screen design, use of colour, spacing and help screens [3]; while on the other hand, search management, search results and overall ease of use are the main thrust in Schwartz's paper [4].

Factors such as the human perspective, user expectation and the contextual issues are not often addressed, however a few researches have produced checklists for assessing CD-ROM software [5, 6]. The lists cover multiple domains such as: hardware requirements; usability; multimedia searching; assets; user feedback; integration of media; output pathways; product support; opening fanfare; aesthetics; creativity; and robustness of the title. These checklists do not go into any depth and may only be used as a starting point in evaluating the quality of a title. They do not pay attention to the human centered perspective and contextual issues; and even less on any evaluation of the quality of how the content is presented.

3.1 Multimedia Standards

There are as yet no provisions for the more esoteric areas to be covered by any standards. To date, standards developed only deal with specific technical aspects such as compression, CD-ROM storage and network protocols. In the course of their work, the authors have made extensive reference to the software quality standards ISO 9126-1 and ISO 9214 that are concerned with the concepts of "usability" and "quality-in-use". There are not as yet standards that take care of the integrated nature of multimedia, although the new international standard ISO-14915 is being prepared with multimedia usability in mind. Questions such as (e.g.) user-interface design, or determining the minimum required audio-card performance tend to be left to the developer's fairly unscientific assessment of the target consumer's expectation. Thus, before a standard can be developed, a framework is needed in order to assess a title. This framework builds on the results of the previous work indicated, together with a critical reassessment and proposals of what is required to give a true picture of the quality associated with the product.

It is important however to stress that multimedia is very dependent on its interaction with the mind of the person using it. It has been stated that there are a number of perspectives that may be considered (technical, human and contextual). These may all be related to the degree to which user-expectation is met or if there is a sense of reward (or hurt!) in some form, from using a particular multimedia product. Achieving user satisfaction is therefore an integral part of the developer's task and has to be in the forefront of any decisions. It is all very well to produce something that is technically impressive, but leaves the user with no sense of satisfaction or achievement. Similarly to produce a multimedia title by deliberately cutting economic corners and thus excluding many of the attributes of a proper "experience", is likely to be counterproductive.

In practice the framework developed consisted of being able to have a means of recognising the salient features of the experience of the "users" carrying out the tests. As will be seen, these could not be allocated to a simple series of "boxes" because the complex interaction of technical, personal and contextual issues are to be taken into account.

4.0 METHODOLOGY

In the previous section, a pragmatic approach to define the quality of a multimedia title was discussed. Quality was described as being largely dependent on user acceptance; if something is generally accepted in the market place, it may be justifiably said to be a "quality product". This then means that a number of factors have to be determined that will indicate the reasons for the user's acceptance or rejection of a product?. Since good quality may reasonably imply a certain degree of acceptability, the first step must be to gather feedback from users and so gain valuable insights into what criteria may satisfactorily define the term quality. Designing the form with this in mind has a number of key advantages and assurances:

- This provides a structured way to communicate with the users of the multimedia title in question.
- With each questionnaire, data can be collected and collated from a large sample, if required.
- The document is, with suitable thought put into its design, easy to complete and is less time consuming or intimidating compared to an (say) interview.
- Since the user (potential consumer) is the one providing the information, it is important that any fact gathering exercise should be as convenient to the user as possible.

Development of the questionnaire itself involved four main steps:

i) identifying the objectives
ii) designing the questionnaire
iii) testing
iv) conducting the questionnaire sessions

4.1 Identifying The Objectives

This first step is essential as the purpose of developing the questionnaire is to use it as a structured and standardised system for assessing the user's perspective of quality. It was therefore seen important to define exactly what was wanted, and then to be prepared to make suitable amendments as the workable picture of the questionnaire emerged.

4.2 Designing The Questionnaire

The design and layout of the questionnaire is very important and require considerable effort and creative thought to ensure that it achieves its goal. In terms of semantics, the questions have to be kept simple, straightforward and easy to understand; while syntactically they have to look neat and easy to follow without intimidating the user in any way. The format has to ensure that the respondent feels at ease and confident when answering the questions.

Several areas have been identified, for assessing quality of the title from the consumer's point of view.

a) Users have generally tended to associate quality with the technical feature in the first instance - the most acid test of usability is after all whether it will work on the machine into which its software and data are loaded! As stated above, previous research has focused on this and has tended to associate quality with technical superiority. This view translates into an oversimplified operational definition of quality: "whatever looks technically superior *is* quality". Such a view assumes that the criteria for quality used are: (e.g.) interface features; search and retrieval functions; and output functions. This notion of quality is inadequate, since it avoids specifying the most important element - the *characteristics* of the quality. In particular, quality criteria are never presented in such a way that they are dependent on context of use, or of the individual whims of the users.

b) Aspects of the user's own personal characteristics are important, since the differentiation between a good program and a user-acceptable program may depend upon the attitude, motivation and expectation of the user. Failing to probe deeper into this most essential area of human-centered perspective makes a "technical-only" definition of quality, sterile as a real definition for quality. This does not imply that technical issues are not important but by *only* focusing on technical issues means that the true assessment of quality still eludes a truly defining paradigm. Once a title has been created, care has to be taken to ensure that the product's intention is clear; be it informative, instructional or purely for entertainment. It is not sufficient that a product effectively only demonstrates a number of state-of-the-art technology features - impressive though they may be!

c) It was the authors' intention to adopt as pragmatic and practical an approach to assessment as possible. This has to mean coping with the user and their immediate circumstances and environment.

This means that three areas have been identified which are necessary to represent the character of quality. These areas are:

1) A human centered perspective
2) Technical perspective
3) Contextual perspective

To gain a more complete picture, two other "views" are sought from the user, which are essential to study:

4) The overall impression of the title
5) General comments by the user

The human centered perspective concerns the influence of the consumer as the individual who is perceiving the quality of the multimedia concerned. In the questionnaire, it is addressed in the user profile section, where the consumer's background and the specification of the platforms used, are ascertained (for example: questions on the user's computing experience, the user's occupation, the machine used, and the capacity of the machine's memory). This allows the evaluator to gauge any effects arising from features of the user's own personality and background. It is also used to provide an in-depth study of the needs of the user as "a consumer", since consumers with different backgrounds will often have different needs. (It should be noted that to provide an understanding of technical limitations experienced during the test and their effect, there are questions relating to the platform used in the assessment).

The technical perspective covers a wide spectrum of topics and is used to evaluate quality in technical term such as quality of the interface, installation, audio, text, search facility and others. Since the view covers a large area, it is divided into several subsections as follows:

- hardware and software dependencies
- the interface between the consumer and title
- the design of the programme

The hardware and software dependencies cover areas such as installation process, system requirement and any additional hardware or software needed (for example: questions regarding whether sufficient documentation on the system requirements was supplied, the level of difficulty to install the title). Meanwhile, other aspects such as the use of mouse, screen size, interface, system feedback, colour combination, search facility, help and documentation are grouped into the next subsection.

In designing a title, elements such as text, audio and video are integrated to form the body of the product. Tools to permit navigation within the product are amalgamated and the whole is presented as an interesting title which should invoke interest and give the user some sense of reward. To assess the quality of these elements, the "design of the programme" subsection of the questionnaire is divided into parts such as: illustrations, sound, audio, text, contents, navigation and the output functions such as printing and file-storage options. Respondents were asked about the

quality of each element and matters associated with them. Quite a broad range of questions is asked, such as opinions as to the use of jargon and the evaluator's expectations from the content.

The contextual perspective section assesses social, cultural and environmental impact from the view-point of the user. It may also be used to create awareness in the differences that arise in the subjective nature of the assessment from within the different cultural sectors of society that are involved. This means the inclusion of questions such as: what is the quality of packaging? how well does the presentation match the consumer's expectation? how easy it is to use the title?.

A number of options are available as to how the answers sought may be obtained from whoever is responding in the test. Two methods have been used in the questionnaire:

- *Closed* questions provide the respondent with a simple "yes" or "no" choice
- *Rating scales* offer the respondent a range of responses along a single dimension

  A four-scale rating has been adopted instead of the usual five. This avoids allowing the respondent to take the "soft option" of the middle way. By using four-scale rating, the respondent has to make a firm choice regarding the question
- *Ambiguity* is avoided by having all questions limited to a single topic. In addition to this, questions are worded precisely and accurately. Simple sentence structures are used to avoid bias.

4.3 The Testing Phase

The testing phase was conducted in order to improve the questionnaire. During this phase, a group of people from different backgrounds (e.g. different ages, educational background and occupation) was asked to assist in testing the pilot questionnaire for a particular multimedia title. Each individual was given a time-slot to navigate themselves through the title, and then to answer and evaluate the questionnaire. At the end of the session, a short interview was conducted in order to solicit comments from the respondents on structure, format, content of the CD-ROM being used, together with their overall impressions of the questionnaire. The oral questions also covered the respondents' expectations before purchasing a title and gauging what they believed to be attributes that may be associated with high quality.

The testing phase was carried out in an iterative fashion until the final version was derived - ultimately, this version will be used as a standard system in assessing quality of a title. Once this has been obtained, the questionnaire may be made available for use as a foundation to evaluate quality of a particular title.

4.4 Conducting The Questionnaire Sessions

Once a prototype questionnaire had been prepared, tested and refined, the stage was set for the actual multimedia evaluation work to begin. The next section (*Section 5*) of this paper is devoted to that operation.

5.0 FINALISING A QUESTIONNAIRE FOR THE EVALUATION OF USER PERCEPTION OF MULTIMEDIA TITLES

Exactly how to address the evaluation of user perception of multimedia titles, required careful analysis of the feedback received from respondents during the initial (pilot) phase. This phase was used to obtain results that served as evidence to support the case for separately examining each of the issues human, technical and contextual. It was also used to highlight those features that represent good quality. In addition to analysing the questionnaire feedback, special attention was given to the "comments" section, since it was seen to be providing valuable insights into areas not covered by the questionnaire. These comments proved to be very useful for amending and modifying the preliminary version of the questionnaire.

Designing the questionnaire to obtain opinions on technical quality was fairly straightforward and as stated above has received some attention from other workers [3, 4, 5, 6]. However on turning to the elicitation of information relating to the human perspectives and contextual issues, the necessary course was not initially clear.

5.1 Using The Results From The Questionnaire

Results from the questionnaire were obtained by inspection of what the respondents had entered on their forms. The original intention had been to conduct this in a simple manner and to produce graphical representations of what had been noted down. However, the various themes that emerged indicated that opinion on multimedia is not something that can easily be apportioned within a simple analytical structure. It is highly individualistic and depends on the interaction of what is being used, why it is being used, by whom, how and in what context. This supports the authors' opinion that multimedia quality is dependent on several factors and that the approach through the three perspectives (technical, human and contextual) is correct.

Analysis of the feedback from the pilot study was conducted in the following fashion:

a) **Technical issues** are important in defining multimedia quality. In precursory researches, technical features were used as the main criteria in determining the usability and quality of the CD-ROM software. Examples of technical features considered were hardware requirements, multimedia search techniques and product support

b) **Individual differences amongst users** with regards to the following aspects will have an effect on user opinion:
   - aptitude
   - skills
   - attitudes
   - personality
   - characteristics
   - previous experience
   - motivation.

This list of aspects was used to confirm that different groups of multimedia users may react differently and express varying opinions about the same feature of the title. At the same time, this was used to provide vital clues in identifying groupings of users who could use the title effectively and gain the most benefit from it. This in turn helps multimedia producers to identify target users who will purchase the particular title. In the opinion of the authors, this can be used as the first stage of refinement of the target user-profiling process to be recommended to multimedia developers, publishers and producers. Truly understanding the motivation, expectation, senses of reward and/or hurt experienced by the target user group, is vital in achieving multimedia quality.

c) **Contextual issues** were stated in the earlier discussion as being concerned with the social, cultural and environmental influences experienced from the viewpoint of who and what the product is eventually meant to help.

Contextual issues cover a broad range of subjects which directly relate to the product itself in its immediate technical environment. They include features which will have an impact on dealing with the target audience, such as packaging, details of content and manuals. It is important to recognise here that a product used by an individual with a dedicated top-of-the-range processor and monitor, is inevitably going to appear as different from the same product when used by a school students who have limited access to much lower quality and less powerful hardware, that is available for common use.

In some respects the contextual concepts are related to human perspectives[2]. Using broadly the same scheme of classification as was used for assessing human perception, the results from the contextual section in the questionnaire were examined. The results reveal how differences arise in the subjective nature of assessment, from within the different cultural sectors of society involved. This confirmed the assumption that in defining multimedia quality, the contextual issue is necessary for the clarification of features which will support the usability of a product. As with the elicitation of information relating to "human" issues, this assists in letting the profile of stereotypical groups of users emerge.

It was stated previously that during the pilot phase of this work, respondents were interviewed at the end of each evaluation session. According to that (oral) survey, good quality multimedia is found to be associated with:
- an interesting and intuitive interface,
- well arranged content,
- a large amount of information,
- accurate information,
- the existence of a search facility.

Having noted these facts during the main data-gathering phase, the respondents' answers on the quality of the title as a whole were considered. From what the users in the various samples said, good quality is associated with the features such as:
- ease of installation
- an interesting and intuitive interface
- high quality illustration, sound and text
- good content

This confirmed that each section and subsection of the questionnaire were relevant. Checking this was essential because it would have been presumptuous to have assumed that what was set out without this kind of exploratory work, was exhaustive. Approaching the task in this way also provided valuable assurances that the line of questioning had been focused in the correct direction.

To demonstrate this, the answers provided in both the pilot phase (questionnaire and associated questioning) and the main data-gathering phase indicated that the users want "an interesting and intuitive interface". This may immediately be mapped onto aspects such as: ease of navigation; well blended colours; the existence of a method to notify the users when the system is busy; and a comprehensible method to indicate places where the users should "click" to move within the navigational bounds of the product.

The study also showed that there is evidence of what is generally perceived as "high" quality. This is associated with attributes such as:
- the extensive and effective use of illustrations in conveying the intended message to the users;
- high quality text is associated with attributes such as adequate information provision and easy comprehension of what is written;
- the semantic quality of the subject matter is important, it should be: up-to-date; well-organised; not cluttered with too many jargons; and
- the product meets the user's expectation.

[2] This raises the point that at a number of places in the questionnaire there is apparent duplication of some of the questions. In fact this is not indicative of a problem, but is rather strength because it allows different aspects of the same point to emerge and thus assists with fully explaining ambiguous answers.

In addition to the above features, there are some additional features that constitute what is generally regarded as high quality. These are not necessarily directly associated with the product but have a marked influence on its reception in the market place. For example:

- good packaging which does not just "appeal" to the intending user by virtue of its "glossy" market-friendly appearance. It is essential to provide all the necessary information to the target audience and other information deemed necessary to the users. A very simple example of this would, for example, be the omission of a statement on the packaging that a particular product was only suitable for use with a Windows-95® operating system.

Once again, these features were identified by the users in the prototype development phase and tied in very closely with what had originally been envisaged. This then confirmed the authors' views on the type of attributes that go towards making up a high quality product.

It has to be stressed however, that the demarcation line between high quality and good quality is not clear-cut[3]. Realistically, however, the main factor that distinguishes between "good" and "high" quality is the user's level of satisfaction together with satisfaction derived from meeting the expectation generated prior to and during use of the product.

It has been stated that the domain of quality-assessable items is broad and covers:

- technical details such as illustration
- peripheral matters such as packaging
- semantic issues relating to the content

There are, however, other features which should be taken into consideration when assessing the semantic quality of a multimedia title, such as the amount of information given and its accuracy. These features have an impact on user satisfaction and will have a knock-on effect on the perception of quality.

6.0 CONCLUSIONS

This work has considered how the quality of a multimedia title may be assessed from the user point of view by means of a questionnaire. Under these circumstances the definition of multimedia quality has to address three different issues, which are represented by technical, human and contextual perspectives of the product.

Determining the degree of influence that these different perspectives should have on the assessment is an important part of the challenge of providing a "quality" title. Each of the three issues was addressed at a high level, and then translated into a more detailed form for the purposes of the questionnaire.

Gillham et al [5], identified key criteria that can be used as an indicator of the quality of a title. The criteria are:

- does the product meet or exceed expectation?
- is the content suitable in depth and breadth?
- is navigation satisfactory?
- are the multimedia elements of satisfactory quality, quantity and appropriateness?
- is there a satisfying level of interactivity?
- is the system enjoyable to use and aesthetically pleasing?
- does the system perform adequately?

The ideas expressed by Gillham et al [5] are clearly along similar lines to those of the authors regarding what has to be addressed in the assessment of multimedia quality. When quality is considered from the standpoint of the potential or target user, there is much more to multimedia quality than are to be found solely from its technical features. The notion of multimedia quality has to encompass all of the elements that relate to the characteristics of the quality itself. The characteristics distinguish between a good product as opposed to one which is merely described as being "user-acceptable". They also indicate how the term "high quality" may also justifiably be applied as a description in some instances. In drafting the questionnaire, strong emphasis was placed on both technical and non-technical issues and the inclusion of a section covering the overall impression showed how a comprehensive view may be obtained. This view encompassed the user's level of satisfaction, the impact of inter-activity and user's perception of the general feel of quality in the title.

It has been noted in the argument of this text that multimedia possesses a number of unique features and attributes when it is compared with conventional software products or with one of its single components in isolation. Assessing a multimedia title therefore, is not like assessing any other software product; nor it is like assessing the quality of a CD recording or a piece of video. Software products mainly use text, mathematics and, occasionally graphics: multimedia combines a number of data formats such as: text, graphics, audio, animation and motion video - each with their own cultural traditions and modus operandi. In each of these, individual characteristics have been combined to form a hybrid where the whole "experience" of multimedia, is greater than the sum of its constituent media elements. This can be very spectacular, informative and entertaining, if it is properly designed.

[3] This may appear to be a superfluous remark at first until it is remembered that good quality may be quite acceptable for a mass-market product, where the cost of producing a "high quality" product may be prohibitive.

The result of this hybridisation is that multimedia not only relies on conventional software disciplines, but also on merger of several mature disciplines from disparate backgrounds such as photography, sound, video, animation, textual authoring and graphics. There may also be input from aspects of subject areas such as: education, cognitive science and psychology. This *pot-pourri* of interests is still quite new in the world's technology stage and seeking to find its own identity. Consequently, aspects of these different inputs from different cultures have to be borne in mind throughout multimedia specification and development. In fact this was stated by Vaughn [7] as:

> "**……** You have to have a real yearning to communicate because multimedia is creating, essentially an entirely new syntax for communications.
>
> You must have an interest in human or cognitive psychology because you need to anticipate the brain waves of all the potential end users. What will they expect from the program?
>
> ……You should adopt a strategy that allows you to prototype and test your interactive design assumptions **……**"

This endorses the authors' view that the probable background, knowledge and nature of the end-user (in marketing terms: "the consumer") has an important influence in the design of a multimedia title. The end-user expectations, the features that lead to their satisfaction and their cognitive senses, all need to be studied in order that a product provides the right stimulus to make it a well-accepted title. These are human and contextual issues that make use of technology and must be treated as such, rather than the other way round with the technology being there and the user necessarily having to try to adapt their innate qualities, or having to commit heavy investment in bringing their contextual environment to an appropriate level to meet the requirements of the product.

Multimedia is not simply pictures and sound on a computer screen with speakers attached, it is a new form and a new concept. The confluence of a number of media is used to communicate complex ideas which appeal to more than one sense simultaneously. By integrating modern telecommunications technology the whole set of dimensions of this new form are radically altering the way that many hitherto "normal" functions happen. To achieve a consistent standard in multimedia it is difficult to determine standards for assessing the quality of a multimedia title. This research is one of a number of "first steps" in developing a more generalised framework [8] to assess quality of multimedia products. The questionnaire produced can serve as a guideline for the multimedia developers and it may then be used to assist the developer in providing the highest quality possible.

The approach used to draw up such questionnaires may also be used to obtain suggestions on how to improve the quality of a title and thus, by using the questionnaire, other objectives can also be achieved if further research is conducted. However, it has to be recognised that this approach obtains the final version of the questionnaire by means of an informal collection of suggestions, rather than as the empirical result of a distilled science. Developers therefore still have to make many choices on their own, but this approach goes a considerable length towards providing a stable platform upon which any judgement may be based.

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BIOGRAPHY

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