

THE EVALUATION OF A MULTIMEDIA APPLICATION FOR GALLERY INTERPRETATION: THE EUESPERIDES PROJECT IN OXFORD

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ABSTRACT

The paper describes the Euesperides research project set in Oxford. This involved: a) the design of a multimedia prototype program for an archaeological exhibition b) formative evaluation of the prototype with parts of the targeted audience, and c) summative evaluation of the use of the program in the exhibition. The evaluation study showed that the multimedia program was an effective interpretative tool both in its own right, as well as an integral part of the exhibition.

KEYWORDS

interactive multimedia, hypermedia, formative evaluation, summative evaluation, Ashmolean Museum

1. INTRODUCTION

The Euesperides project was part of doctoral research at the University of Oxford investigating the potential of interactive multimedia for museums and archaeology. The project involved the design of a prototype program for a museum exhibition (Economou 1995) and its evaluation.

The program presents the history and archaeology of the ancient Greek colony Euesperides in North Libya, based on material from the site kept at the Ashmolean Museum, Oxford. It combines information from the excavation of the site (images from vases, coins, inscriptions, aerial photographs, etc.), with the historical background of the city. The Euesperides prototype was designed for the temporary exhibition "From the Gardens of the Hesperides: The excavation of an ancient Greek city in North Africa", which was organized by the Ashmolean Museum and was hosted at the Museum of Oxford in September-October 1995.

The Ashmolean Museum organized the first systematic excavation of Euesperides in the 1950s and today holds a small number of artifacts from this relatively unknown site (Vickers et al 1994). The program (designed with Apple's HyperCard) aimed to offer contextual and interpretative information about the objects on display and also, to demonstrate aspects of archaeological theory and practice (Economou 1996a). It was possible to use a touch-sensitive monitor at the exhibition and a special kiosk was placed in a corner of the gallery to house all the computer equipment, leaving only the monitor visible to the public.



Fig. 1 Family group using the computer station located in a corner of the gallery

2. THE EUESPERIDES MULTIMEDIA PROGRAM

The program was structured in three main parts, which comprised of smaller units. From the 'Main Options' screen visitors could select to visit:

- **Where is Euesperides?** (an 'Introduction' to the geography, history, and re-discovery of the city).
- **What was Euesperides?** (the 'History' section, with a timeline and information from the primary sources, e.g. pottery, inscriptions, coins, ancient texts).

- **How did we find out about Euesperides?** (the 'Archaeology' part, which offered information about the excavation of the site and the finds).

After at least one of these parts had been explored, a new button would appear:

- **What did you learn about Euesperides?** ('Quiz'). This included ten multiple choice questions which related to the information presented in the program.

A feature which proved very useful (as was shown during the evaluation) was the 'Program Plan', a screen with a diagram of the main parts of the program represented graphically as rectangular boxes. These were also active areas which could be touched to lead to the relevant part indicated by their name.

3. FORMATIVE EVALUATION

Throughout its design, the prototype was tested with a variety of users, from schoolchildren (fig. 2) and the Education Guides of the Ashmolean Museum, to graduate students and curators. Different approaches were used during this phase: informal sessions where the users were observed interacting with the prototype; encouragement of users to 'think aloud' and make comments; more structured evaluation, where the users were asked to fill in a structured questionnaire after using the program; computer interactive logging of the path that users took through the program.



Fig. 2: Formative evaluation of the Euesperides prototype with schoolchildren.

Formative testing was a continuous process during the design of the program, offering useful feedback and ideas. As it included different age groups, users with a varied background, level of interest, knowledge of the subject, and computer experience, it offered a perspective on a wide spectrum of the intended audience of the exhibition. Evaluation also helped to pinpoint programming problems and 'bugs' and led to changes and readjustments in the structure of the program, the content and language used, and generally the design of the user interface. For example, observation showed that schoolchildren had difficulty with the pronunciation of Greek names and led to the idea of adding sound buttons next to difficult words which could be touched to give the relevant pronunciation. The section titled 'Written Sources' became 'Ancient Writers' which is more understandable to younger users and the 'Program Plan' button was given the more intuitive title 'Where Am I?'.

The evaluation sessions confirmed one of the most important rules of interface design, the need for user input. One cannot overstate the importance of feedback from the users from the early design stages of any hypermedia program (Raphling 1994). In this case, even testing an unfinished prototype with small groups suggested useful changes before it was too late and provided ideas.

4. SUMMATIVE EVALUATION

After the program was completed and installed in the gallery, summative evaluation was carried out to record its effect on visitors (Economou 1996b; Economou 1996c).

The main aims were:

- Firstly, to draw a demographic profile of the visitors (who visited the exhibition and who used the application).
- Secondly, to describe the volume and pattern of visitor use (how were the exhibition and the program used).
- Thirdly, to explore the emotional and intellectual impact of the computer program and its relation with the exhibition (how were visitors affected).

by it, how the program influenced the way they viewed the exhibition).

4.1 METHODOLOGY

The evaluation of the Euesperides prototype attempted to measure the program's effectiveness at various levels, taking into account the complex set of components: design, content, relation with the exhibition, emotional impact on the participants, effectiveness of information delivery. In order to gain deep understanding of the use of the program, it was necessary to relate quantitative with qualitative results and use several research methods:

- interviews with museum staff;
- interviews with visitors using exit questionnaires (both users and non-users of the program);
- observation and visitor tracking;
- computer logging of users' choices;
- analysis of comments in the visitors' book;
- postal questionnaires after the visit.

A problem which touched upon all the summative evaluation projects was that the person organizing and carrying out the evaluation was also the designer of the program. This raised the issue of objectivity and the ability of the evaluator to distance herself from the project to be studied. On the other hand, the close familiarity with the application and the in-depth knowledge of all its details facilitated aspects of the survey, such as the interpretation of the users' references to specific screens or the analysis of the interaction logs. Furthermore, the application of a range of evaluation methods, as well as the use of techniques to ensure well-spread sampling, assisted in controlling personal biases.

4.2 SUMMATIVE EVALUATION FINDINGS

The experience from both the formative and summative evaluation showed that people were usually very happy to test the computer program and offer ideas. Visitors seemed to appreciate the fact that their opinion was asked and valued.

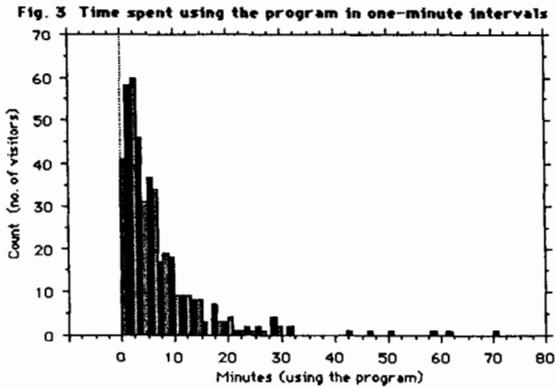
The results indicated that the computer program was an effective interpretative device both in its own right and as an integral part of the exhibition. In fact, they were unexpectedly positive for a rather

untypical experiment, set (due to practical difficulties and the building work carried out at the Ashmolean Museum) in the Museum of Oxford, a local history museum which had no relation with the subject of the exhibition.

4.2.1 THE COMPUTER PROGRAM IN ITS OWN RIGHT

As was shown by the observation study and the analysis of the interaction logs, the computer program attracted a large number of visitors. Most computer users enjoyed the application and were satisfied with the level of information it provided. Although several aspects of its user interface and navigation could be improved, the majority of users found it easy to use. The majority chose to describe it as 'interesting and exciting' and 'useful', as well as 'hi-tech and modern'.

The interactive program was clearly one of the most successful exhibits in the gallery, with high attractive and holding power. It received the highest number of visitors and the highest number of repeat visits of all exhibits. Visitors invested substantial amounts of time with the computer, more than with any other individual exhibit. In a field where the average holding power of an exhibit is measured in seconds, the tracking study showed that the average time spent at the computer station was 3.7 minutes, while most visitors stayed more than two minutes at the computer. This is more than three times the average time spent at the exhibit in the second ranking. The analysis of the interaction logs indicated that visitors used the computer program even longer, 7.7 minutes on average (5.6 minutes median time). (Interaction logging included a larger sample and recorded time automatically, but in a few cases might have recorded the interaction of two successive users as one—possibly the logs over 40 minutes in figure 3). This was probably to be expected, since the computer program demanded more time for visitors to process its messages, familiarize themselves with the novel technology, and explore every part of the information it presented. This was the most complex exhibit, but obviously, also one of the most attractive and enjoyable. At the same time, when assessing these results, it is necessary to take into account that the specific exhibition was not rich in objects and had problems in the way it was laid out. Under different conditions, a computer interactive might not have featured as well.



Several months after their visit, most of the visitors who responded to the mail survey were able to recall several details of their experience. Visitors remembered not only what they did and what they felt during their visit, but also described what the exhibition and the program was about, what they contained, and the thoughts that these triggered. Their answers suggest that the visit to the exhibition, and particularly the interaction with the computer program, were highly memorable and of lasting impact. An almost equal number of memories referred to the design and the content of the program, indicating that visitors were not only impressed by the use of a new medium, but had also paid attention to the content of the application and the messages it presented.

4.2.2 WHO USED THE PROGRAM

The computer program appealed to all age and gender combinations. It appears that the computer program attracted equally male and female visitors. In fact, the analysis of the interaction logs showed that slightly more female than male visitors used the computer. With the exception of few other studies (Allison & Gwaltney 1991; Hilke et al. 1988), most evaluations of computer interactives in museum settings show a predominance of male users (Doering et al. 1989; Giusti 1994a; Giusti 1994b; McManus 1993; Menninger 1991; Sharpe 1983).

The visitors who used the computer cover a very wide age range, from approximately five to eighty-one. Confirming the common perception about the users of interactive multimedia, the largest of the six age groups of computer users

consisted of visitors under 11 (fig. 4). School children and teenagers visiting the exhibition were very likely to use the interactive program.



Fig. 4: Young visitors using the computer program at the exhibition

However, and unlike most similar studies (Allison & Gwaltney 1991; Doering et al. 1989; Giusti 1994a; Sharpe 1983), the majority of computer users were over 25, while there was also a high percentage of users over 55 years old (table 1).

Table 1. Frequency Distribution for Age of Computer Users

Code	Age Range	Count	Percent
1	up to 11	91	23
2	12-17	24	6
3	18-24	69	18
4	25-34	87	22
5	35-44	25	6
6	45-54	25	6
7	55+	73	19
Total		394	100

Visitors to the exhibition, computer users and non-users alike, were a very international group, with over fifteen countries recorded during the interviews from all continents, although the majority were from the UK.

Unlike most non-users who came to the exhibition on their own, the majority of computer users came in groups of two or more, which is in accordance with other similar studies (Doering et al. 1989; Giusti 1994b; McManus 1993; Menninger 1991).

Both users and non-users were highly educated, with more than half attending or having completed a higher education course at the time of the interview. However, very few had formal qualifications in archaeology or ancient history or specialized knowledge of the subject matter of the exhibition. More users reported that they had a special recreational interest in archaeology or history than non-users who stayed in the exhibition less than three minutes.

Although most users had considerable familiarity with computers, the program was also used by visitors who had very little or no experience with electronic media. The computer experience of users and non-users is broadly similar, indicating that previous computer experience did not affect the choice to use the program at the exhibition. For designers of computer programs for exhibitions this suggests that the standard and quality of their products should be of a level capable of satisfying experienced computer users, but at the same time, retaining ease of use and clear navigation so as not to alienate novices.

4.2.3 HOW THEY USED THE PROGRAM

Visitors' behavior at the computer was diverse and indicated interest and engagement. Most visitors used the interactive program in groups, often talking to each other about it, pointing to parts of the screen, and relating them to previous experiences or objects they had just seen in the exhibition; several visitors appeared amused, excited, and animated when using the program.

Most users created unique paths through the application, taking advantage of the options offered and exploring various parts. However, some general trends emerged. Interestingly, the analysis of the interaction logs indicated that the most popular type

of navigation of all age groups was linear. It appears that older visitors in particular, were more likely to explore the program in a linear fashion, using the "Next" button repeatedly. Younger visitors on the other hand, showed a greater tendency to navigate randomly and explore several areas superficially.

A clear and attractive interface, the use of visual elements, graphics, and sound, information on people and their lives, as well as the popularity of certain themes (such as the 'Myths') were factors which appear to have influenced users' choices.

4.2.4 WHAT THEY LEARNED

Most visitors who used the program could later describe what it was about or at least refer to parts of it during the interviews. Those who could not answer or who gave wrong answers had spent less time with the computer. Five to six months after the exhibition, the majority of respondents could describe the program in a similar or even more accurate and complete way than during the interviews.

Interaction with the computer program appears to have helped users learn about specific themes related to Euesperides' history and archaeology. The interview questionnaires included some questions on the content of the program, attempting to test what information visitors had retained. The overall users' performance in the questions testing cognitive gain was not very high, but the visitors who did answer correctly, mentioned that they had found out the answer from the program. It also appears that they remembered this information five to six months after their visit, indicating that the use of the program had a memorable effect. Very few respondents to the post-visit mail survey answered wrongly at the survey, after having given the right answer during the exit interviews. In general, the educational impact of the program appears satisfactory, given the fact that few visitors explored all parts of the program and viewed all the information presented.

The personal opinion of most visitors was also that they had learned new things by using the program. The majority mentioned that everything they learned about Euesperides was new to them, while several referred to specific themes presented in the program.

More importantly, for some visitors the computer program appears to have raised questions in their

minds, making them think about archaeology, ancient civilizations, the discovery of the past. It also made several visitors aware of the way archaeologists work and of the types of evidence used by historians and archaeologists to extract information about the past, in many cases consolidating previous knowledge.

4.2.5 EFFECT OF THE PROGRAM ON VISITORS' EXPERIENCE AS A WHOLE

In direct contrast to the fears of many museum professionals, the data from the Euesperides survey indicate that the computer's presence in the exhibition enhanced visitors' experience and that the program was a useful and attractive component of the exhibition.

While visitors spent a good deal of time at the computer, they compensated for this fact by spending more time in the exhibition. The time visitors spent at the computer does not appear to have adversely effected the time they spent in the rest of the gallery. Computer users spent over seven minutes longer in the gallery than non-users. Even when the time at the computer is deducted, the remaining time they spent in the gallery (4.8 minutes mean, 2.1 median time) is still considerably higher than the time spent by non-users. It appears that the computer program encouraged visitors to explore and engage with the rest of the exhibits.

Due to the particularities of the exhibition 'From the Gardens of the Hesperides' in Oxford, there was a difference in the visiting pattern of visitors who entered directly the temporary exhibition gallery from outside and those who came across the exhibition at the end of their visit to the rest of the museum (fig. 5). The first group, which is considerably smaller, had come to the museum specifically for the exhibition, already motivated and interested in the subject, and spent a long time on average in the gallery. Most of these visitors also stopped at the computer kiosk and used the program.

The second and largest group consists mainly of visitors who encountered the exhibition unprepared, did not have any particular interest in the subject, and spent little time in the gallery. Several visitors from this group expressed their confusion and surprise when encountering without warning the sudden change of subject from the permanent displays

which explore the history of Oxford to the temporary exhibition about the excavation of an ancient Greek colony. For one third of this group, the Euesperides exhibition functioned simply as a 'corridor' on the way out. Most did not even notice the existence of the computer station which was situated in a corner, away from this 'path to the exit'.

However, the most interesting observation was that the Euesperides interactive program acted as a strong attractor for a section of this less interested group. Several visitors headed directly towards the computer after entering the exhibition and a number of them stayed longer to look at the objects after using the program. In some cases it appears that the novelty of the technology and the interactive character of the program triggered their curiosity and prompted them to view with greater interest the rest of the exhibition. As a couple of visitors mentioned in their letters, the computer program was the main exhibit that attracted them to the display, without which, they probably would not have stopped to look at the exhibition.

For most users the computer interactive contributed considerably to their enjoyment and understanding of the display. Most visitors stated that the program helped them to enjoy the exhibition and understand why some of the exhibits are important for studying the past. The application offered them information about the materials and techniques used when the objects on display were made, as well as about the social and historical background to the exhibits. The majority of users interviewed thought also that the program made them more interested in the display in the rest of the gallery. Several users mentioned at the interviews that the program made things clearer, put them into perspective, and motivated them to go and look again at the objects. Very few visitors found that the program disrupted the atmosphere in the gallery.

Observation confirmed that the program encouraged visitors to go and look again at the objects. More computer users made repeat visits to other displays than non-users, and the number of repeat visits of computer users was higher on average than that of non-users. Computer users also made more stops at exhibits in the gallery. Generally, it seems that visitors who used the computer program were either already interested in the subject and the exhibition,

or became so after using the program, which encouraged them to look again and spent more time exploring the displays.

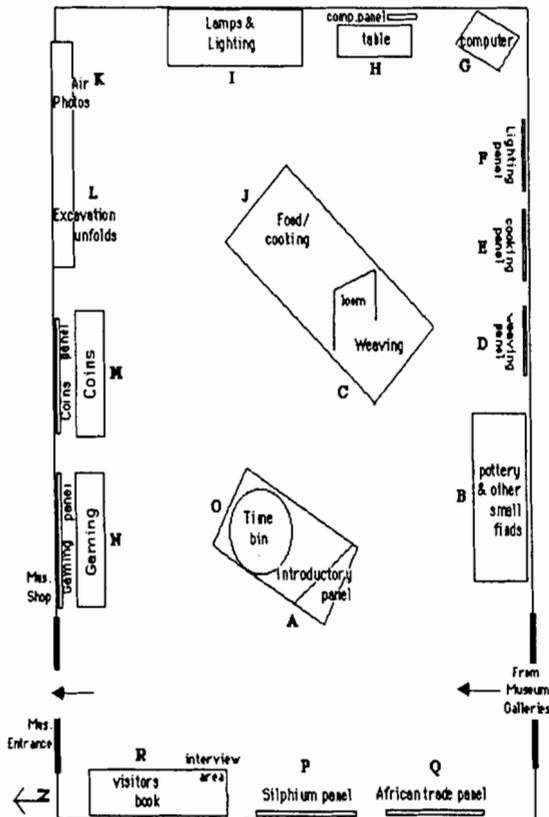


Fig. 5 Gallery plan of the exhibition with all the stops visitors made marked with capital letters

However, it also seems that the program sometimes overshadowed, at least temporarily, the rest of the displays. About a quarter of the users interviewed stated that they got absorbed in the program and lost interest in the objects around them. Because of the potent attraction and absorbing power of the computer screen, it is difficult to integrate computer interactives successfully with the surrounding static displays. It appears that several visitors were absorbed in the Euesperides prototype while using it, but some of them would afterwards explore the ex-

hibition, stimulated and intrigued by the information they had seen in the application.

Although the results from the Euesperides evaluation are encouraging about the potential of interactive multimedia in museums, it is disappointing that the rest of the exhibits did not feature as well. This was not necessarily a case of the modern technology overshadowing the other, more static displays. On the contrary, in some cases the 'halo' effect of the computer program appears to have attracted visitors to examine the rest of the displays (especially visitors who came from the rest of the museum, without any preparation or special interest in the subject of the exhibition).

The overpowering role of the computer program might be explained by the fact that the exhibition was of small scale, based on a largely unknown subject, with very fragmentary material and problems in the way it was organized and laid out. At the same time, these might be the reasons why the program was so popular and effective. In a display which was not rich in artifacts and where the background information and often obscure associations were the ones that gave meaning and showed the importance of the objects, the interactive program played an important role in organizing the complex set of links, interpreting them, and making them easily available in an attractive way.

A number of visitors mentioned in their written memories of the exhibition several months after their visit that they had gained more information from the interactive program than from any other exhibit and that the application had clarified the main concept of the exhibition.

5. BEYOND EUESPERIDES

Overall, it was encouraging to observe that even a low-cost and experimental application, like the Euesperides prototype, can be a versatile and powerful tool in a museum exhibition. However, great caution is required when assessing the results of the Euesperides project and generalizing their applicability. The location of the exhibition, the character of the museum which hosted it, the exhibition's subject matter, the design of the computer program, and the location of the computer station in relation to

the rest of the display are only some of the variables which affected the survey and its results.

Under different conditions, in a different setting, and with a different material, the use of a multimedia interactive might not have been appropriate or effective. Careful thought needs to go into the decision to use multimedia in any museum presentation, balancing the technical, aesthetic, conceptual, and pedagogical viewpoints. Museums need to resist the pressure to appear fashionable and ensure that computer applications do not jeopardize the integrity and quality of the institution, nor the collections and ideas presented. Museum professionals should not forget that multimedia applications are just another tool for presenting and interpreting objects and ideas; the emphasis should be on the message, not the medium. At the same time, the experience from Euesperides and other findings are showing that the power and attraction of the medium are very impressive and can in certain circumstances be used to attract visitors to the message. This was one of the most interesting results of the study.

Additionally, even when the choice to use multimedia is made, careful thought needs to go into the kind of application that would be appropriate and the way that this should be implemented. For the exhibition 'From the Gardens of the Hesperides', which displayed only a small number of objects (most of them, on their own, of limited interest to the non-specialist), the integration of the specific interactive prototype in the gallery proved successful. This might not have been the case, for example, with an extensive collection of Renaissance paintings, where providing further information to be studied at leisure in a separate room (as is done in the MicroGallery of the National Gallery, London) might be more effective.

Despite the museum community's increasing awareness of the need for multimedia evaluation (McNamara 1986; Raphling 1994; Dierking & Falk 1997), only a small number of relevant studies are available. The Euesperides project showed that one type of computer interactive attracted and engaged visitors in Oxford and enhanced their experience from the specific archaeological exhibition. Further research is necessary to investigate and compare the performance and effect of different types of multimedia applications and platforms in similar settings.

We need to understand better whether particular ideas lend themselves to specific types of interpretation media; record and compare the profile of computer users and non-users from a large number of projects; assess the effect of gender, age, social background, group composition, prior knowledge on the subject of the program; study the emotional and cognitive outcomes of different user groups.

The full potential of the technology in the cultural sector has yet to be realized and there are areas which need to be investigated further. However, the answer is not in technological solutions, but in deeper research and understanding. This experimentation and dialogue with the visitors can make interactive multimedia effective presentation and interpretation tools, capable of satisfying and enriching the experience of museum audiences.

REFERENCES

- Allison, D.K. and T. Gwaltney, "How People Use Electronic Interactives: 'Information Age—People, Information & Technology'" in D. Bearman (ed.) *Proceedings of the First International Conference on Hypermedia and Interactivity in Museums* (ICHIM '91) (Pittsburgh, PA: Archives & Museum Informatics, 1991), 62-73.
- Dierking, L.D. and J.H. Falk, "Audience and Accessibility", in A. Mintz and S. Thomas (eds) *The Virtual and The Real: Uses of Multimedia in Museums* (American Association of Museums, forthcoming).
- Doering, Z.D., J.D. Pawlukiewicz, and K. Bohling, *The Caribou Connection: Will People Stop, Look, and Question?* (Washington, DC: Smithsonian Institution, 1989).
- Economou, M., "Quest for the golden apples of the Hesperides: Hypermedia design for an archaeological exhibition", in Bearman, D. (ed.) *Multimedia Computing and Museums—Selected Papers from the Third International Conference on Hypermedia and Interactivity in Museums* (ICHIM '95/MCN '95) (Pittsburgh, PA: Archives & Museum Informatics, 1995), 248-66

- Economou, M., "Interactive Multimedia for the Public Presentation of Archaeology: The Euesperides Project", in T. Higgins, P. Main and J. Lang (eds) *Imaging the Past: Electronic Imaging and Computer Graphics in Museums and Archaeology* (Conf. Proceedings) London, British Museum, November 1994. (London: The British Museum, 1996a) Occasional Paper 114, 127-139.
- Economou, M., "The Euesperides project: Design and evaluation of a hypermedia program for an archaeological exhibition", *Archeologia e Calcolatori VII* (ii) (proceedings of III International Symposium on Computers and Archaeology, Rome, 1996b), 1105-1115.
- Economou, M., "Designing and evaluating a museum multimedia application: The Euesperides project in Oxford", *Spectra* 23 (4) (1996c): 18-23.
- Giusti, E., *Electronic Newspaper Evaluation*. (American Museum of Natural History, 15 February 1994).
- Giusti, E., *Hall of Human Biology & Evolution: Summative Evaluation* (American Museum of Natural History, 3 March 1994).
- Hilke, D., E. Hennings, and M. Springuel, "The Impact of Interactive Computer Software on Visitors' Experiences: A Case Study", *ILVS Review* 1 (1) (1988): 34-49.
- McManus, P., "A Survey of Visitors' Reactions to the Interactive Video Programme 'Collectors in the South Pacific'", in J. Peirson Jones (ed.) *Gallery 33: A Visitor Study* (Birmingham: Birmingham Museums and Art Gallery, 1993), 74-114.
- McNamara, P., "Computers Everywhere - But What Happened to the Research?", *The Journal of Museum Education: Roundtable Reports* 11 (1) (1986): 21-24.
- Menninger, M., *An Evaluation Study of the Interactive Videodisc Program on Illuminated Manuscripts* (The J. Paul Getty Museum, 1991).
- Raphling, B., "An 'Ideal' Way to Evaluate Interactive Computer Programs", *Current Trends in Audience Research and Evaluation* 8 (1994): 44-48
- Sharpe, E., *Touch-Screen Computers—An Experimental Orientation Device at the National Museum of American History* (Office of Public and Academic Programs, National Museum of American History, Smithsonian Institution, 1983).
- Vickers, M., D. Gill, and M. Economou, "Euesperides: the Rescue of an Excavation", *Libyan Studies* 25 (1994): 125-136.