Computerising an archaeological excavation: the human factors

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SUMMARY PAPER

It is not our intention to add yet another example to the literature on "how to computerise an excavation"; on the contrary, we are interested rather in the management implications once computerisation has taken place. Our thoughts are drawn from the experience of running a project in the summer of 1986 in Gubbio, Italy in which one of us (SS) co-directed a season of excavation and survey with Caroline Malone of the Keiller Museum, Avebury while the other (JBM) was responsible for the computerisation itself.

The Gubbio Project is an interdisciplinary study of changes in intra- and inter-settlement organisation in the valley of Gubbio since the Paleolithic and culminating in the foundation of the Umbrian city state. The archaeological component of the research has involved detailed excavation of particular sites, off-site and field survey studies and more limited rescue-style excavations. Work abroad poses many problems, not least of which are a shortage of time and resources. At Gubbio, financial and logistical support is greatest during excavation, when local government and community support is readily available. More pressingly, legal constraints require that the material excavated be studied close to the point of discovery. In these circumstances, the possibly academic issue of whether excavation and post-excavation analysis can be run in parallel becomes very real.

Efforts were, thus, directed towards designing a system which would allow excavation and anaylsis to proceed in tandem. The site selected for the 1986 season was Monte Ingino, predominantly a midden deposit dating from c. 1400-900 BC and sealed by the outworks of a Mediaeval castle. A traditional supervisory management structure was set up with a ratio of about one supervisor to five excavators, the supervisors working to one of the directors. Simultaneously, it was arranged that specialist in human and animal bone, floral remains, conservation, small finds illustration and analysis should be present both to study material excavated during a previous season and to carry out work on material as soon as possible after it had left the ground.

To ensure that information could be processed quickly, and a virtually complete archive, including post-excavation analyses, could be brought back to Britain, a network of microcomputers was made available to the specialists.[1] In addition, stratigraphic

data was to be recorded on-site using lap-held micros and transferred immediately to the larger microcomputers for processing using a specially written Harris Matrix program. The overall aim was to use the computers as a means of speeding up the feedback of information to the excavators so that excavation could proceed in a more 'informed' fashion.

These aims were fairly modest and have been discussed at some length, although usually at a theoretical level, in the literature: we were, then, unprepared for the problems which we encountered. Two main issues deserve comment.

It is often argued that stratigraphic data should be entered directly into the computer on the grounds that to do otherwise decreases the quality of the data by introducing transcription errors. While holding to this view, we had to abandon direct data entry at the last moment because of factors which we had not foreseen. In particular, it became apparent that it was naive to see the recording of stratigraphy as a scientific act of 'data logging'; on the contrary, the process is highly interpretive and creative. Two points should be made. First, supervisors found it very important to be able to 'spread out' context information from closely related or contiguous contexts during recording: the stratigraphy could be complex and confused and supporting information was often required. Second, supervisors used context sheets as 'thinking tools' in the process of evaluating the stratigraphy; the act of writing down and scoring through entries, and of drawing sketches or even doodles was an integral part of the process of recording the data. Neither of these properties of "paper and pencil" could be duplicated practically using lap-held micros. It became clear that, regardless of the theoretical advantages of on-site computers, our supervisors and excavators could not use micros as 'thinking tools' in the same way as they could use "paper and pencil"; to ignore this human factor would have endangered the excavation itself.

We had also assumed that, given that the presence of the specialist and microcomputers, information could be passed back for more quickly to the supervisors, especially if there were any major problems; the technology might be expected to make communication faster and more efficient. This expectation was, indeed, realised but at a high cost. Archaeologists are used to the sequential processing of information: first, the data is excavated; second, it is analysed and any problems and inconsistencies are cleared up; third, specialist work is carried out. At Gubbio, these stages were carried out in parallel and we were not prepared for the very considerable psychological pressures and scheduling problems which arose as a consequence of having so much information moving around so quickly. Supervisors complained that they were spending too much of their time answering the (usually legimate) queries of specialist; in particular, they found it difficult to keep full control over the excavation when faced with problems revealed by the computers concerning inconsistencies in the stratigraphic record. There

was, in consequence, a distinct danger that the quality of the data being collected might suffer because of too much attention being directed at problems over that which was already in hand. Questions concerning the authority of specialists viz-a-viz excavators were also raised, putting additional pressures on the directors. We were, in short, faced with the same issue which has faced proponents of parallel processing architectures: because of the additional burden of coordinating communication, a parallel processing structure may actually prove less effective than a sequential one.

It is now becoming something of a fashion to recommend that excavation and post-excavation work be carried out in parallel; certainly, the current generation of microcomputers provide nearly all of the facilities required to implement such ideas. We are, however, now somewhat uncertain as to whether the transition from sequential to parallel modes of working will be accomplished without problems. There is really very little in the literature about the management of excavations; still less are most archaeologists qualified as managers, coming either from academic backgrounds or from the 'real world', but nevertheless unusual, background of the Units and rescue excavation. Yet our experience leads us to believe that if we are to try to integrate microcomputers fully into the work of excavation, and to realise the theory of 'concurrent' excavation/post-excavation, then it is the issue of management, and not that of hardware and software, which must be addressed as a matter of urgency over the next few years. In the old style of excavation, there is plenty of 'slack' to hide the problems; however, even a small increase in the efficiency of our working methods starts to reveal them. This is not, we think, something which any of us has seriously thought about: that, if we start to be successful in computerising excavations, then it is is not the technical but rather the human factors which will need most attention.

1. The hardware and software for the Gubbio Project has been generously lent by British Olivetti and Olivetti S.p.A.

   The particular configuration in use consisted of three M24 microcomputers (IBM PC/XT clones) running MS-DOS, each with an integral 10 Megabyte hard-disk and one 360K floppy disk drive. Daisywheel and fast dot-matrix printers were used, allowing for both letter-quality and graphical output. The machines were linked by a LAN. An additional machine was kept in Britain for development work.

   Software made available included an MS-Pascal compiler, dBase III [Ashton Tate], Framework [Ashton Tate], GW-BASIC, and Wordstar 2000 [MicroPro]. In addition, a suite of application programmes, written by one of use (JBM), was used in Italy.