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Electronic Military History: A User-Centred Approach to a Web-Based Information System

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Abstract

This paper describes the design and implementation of a web-based information system relating to military history. The data is "non-traditional" in nature being chronologically based and relates the participants in World War 1 to their locations. Its purpose is to allow interrogation by a wide cross section of the community who seek to find the location of particular servicemen who took part in the Great War. The interface uses time dependent maps to enable inquirers to follow the progress of individual participants in the conflict. Activity Theory is used as a means of relating the system to the users by its focus on the computer as a tool which meshes into the users real life activity.

INTRODUCTION

Interest in this project arose from difficulties encountered by researchers both professional and amateur when trying to locate the whereabouts of individual soldiers who participated in the First World War. More specifically the problem was not so much as an absence of data but an over-abundance. Making sense of the vast amount of data available on the Australian War Memorial (AWM) website is a difficult task. Although indexes can be searched, histories accessed, databases interrogated and so on, it is in raw data format. It is the the compilation of the contents of these indexes and databases into a meaningful information system that is the purpose of this research. Activity Theory was chosen as a relevant basis for the design of the project because of its user centred nature and its explicit links between user's needs and supporting technology.

Becauses the internet makes the data available to a wide cross section of the community including children searching for information about the grave of a war-time grandfather a simple and easy to navigate format was called for. Hence with the aid of a research grant a project team was set up to investigate the feasibility of developing a web based interrogation system based on available war records data.

AIM OF THE RESEARCH

The specific aims of the project are link together the available web-based National Archives data and other paper based data into a usable informatin system. To keep the project within manageable proportions the major problem to be solved was to provide information in a form whereby inquirers could trace the various locations of individual soldiers as their battalions were moved between the World War 1 battlefields in Europe. Extension of the system to other conflicts (WW 2 and Vietnam) would be relatively straighforward once this project had solved the initial problems. In general, the process for locating a soldier is as follows. Currently existing web-based systems allow a soldier's name to be input. Output is in the form of the personal details of that soldier including the name of the army group to which they belonged and, if killed, the name and location of the cemetery in which they are buried. The data from this database is not connected to any other hence the user must pursue other (paper based) means to glean more information. The next logical extension of this process therefore is to provide map based links to the movement of the army group to which the soldier belonged as they were moved around throughout the course of the war. It would then be possible to use the web to trace the whereabouts of a soldier throughout the passage of the conflict until they returned home or were killed.

THEORETICAL BACKGROUND

Much of the recent research conducted by our HCI group (Verenikina & Gould, 1998) is based on cultural-historical activity theory (Kuttii, 1995, Engestrom, 1995, Kaptelinin, 1994, Bodker, 1996,1991, Nardi, 1995). Activity theory (AT) provides a broad conceptual framework that can be applied to the human-computer interface in such a way as to empower the system user with the necessary tools to work though the computer interface to achieve desired outcomes without the need for them to embark on lengthy periods of training. The appeal of activity theory can be explained in its broad view of the human psyche and behaviour and its well-structured categories for analysis. From an activity theory perspective, people are embedded in a socio-cultural context and their behaviour cannot be understood independently of it. The activity system is the fundamental unit of analysis, where activity does not refer to individual actions but rather to a system that incorporates individual

agency, mediation of action through tool use, and the recognition of historically developed rules and practices of division of labour (Fig.1).

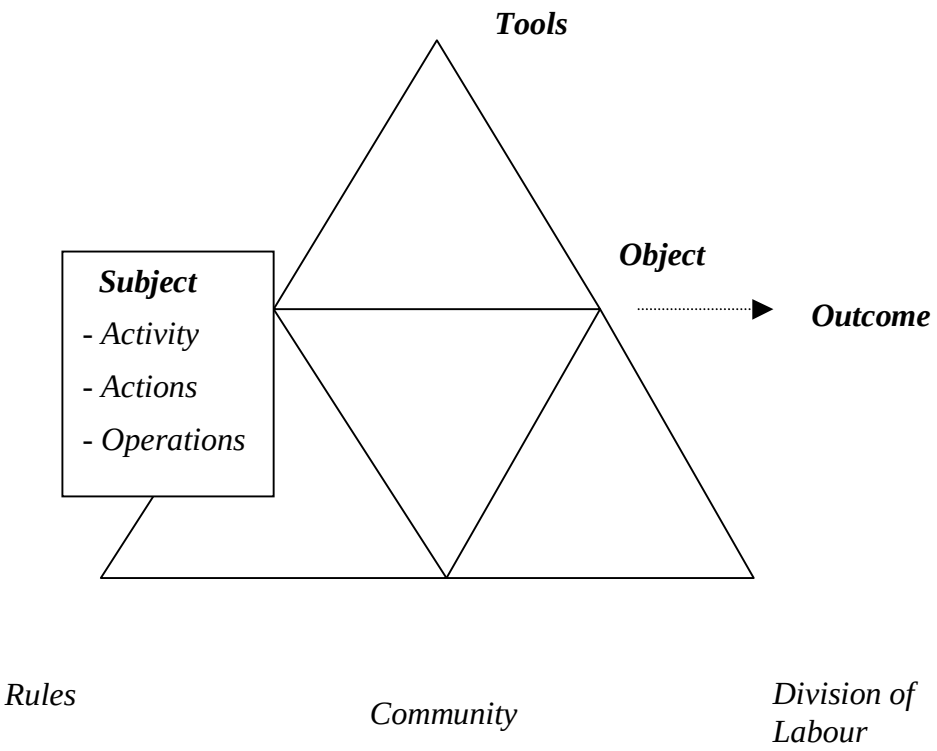

Figure 1: Structure of individual activity as incorporated into the socio-cultural context (adapted from Leontiev, 1981 and Engestrom, 1987)

The AT approach deviates from the cognitive approach in that the computer is seen as distinctly different in both character and composition to its human user.

AT provides a different view of the user as an active entity in their real life setting, whose behaviour is driven by their needs and motivation. In their life, and at their workplace, people perform a number of different activities to achieve goals and satisfy needs.

In order to understand the user's needs it is essential to work with user(s) in their environment in such a way as to discover a set of professional activities and corresponding, underlying motives. Thus collaborating with the user in a non-laboratory situation becomes imperative (it is their needs not the designers that are crucial).

Second, correct tool (interface) design can only be achieved by specifically examining the structure of the activities being performed so that the correct balance of operations between human and machine can be determined. In this way goal formation can be encouraged by successive improvement of the tool. This is aimed at assisting the user achieve the motives previously identified.

CHECKLISTS

In attempting to move from the theoretical structure of Activity to its practical application the use of check lists has been suggested (Kaptelinin & Nardi, 1997). Bodker and Petersen (1998) propose that checklists be used to present theory in an operational form thus enabling them to be used as a mediating tool in the investigation and design process. They give examples of four checklists which they have developed each focusing on particular areas of relevance to their study of artefact usability. Kaptelinin and Nardi (1997) make a distinction between checklists for design and checklists for evaluation. Their checklists cover the main basic principles of Activity Theory namely the activity heirarchy, object orientedness, tool mediation (fig 1) as well as the development of the system and the processes of internalisation/externalisation. These terms have been made more relevant to useability by calling object orientedness "Environment", internalisation/externalisation is "Structure and Dynamics of Interaction" and mediation and development simply "Development". We have taken these

extensive checklists and formulated a version of the design checklists to suit our needs. They cover various aspects of the way the information system supports human actions.

The modified checklists from the Kaptelinin/Nardi original are presented below and are structured into the four Activity Theory areas nominated above. They are:

a. Hierarchical structure of activity

Understanding the use of any technology should start with identifying the goals of target actions, which are relatively explicit, and then extending the scope of analysis both "up" (to higher-level actions and activities) and "down" (to lower level actions and operations).

Checklist Criteria	***Means by Which Criteria are Realised Within the Project***
People who will use new technology	*Wide cross section of community (10 yo+)*
Goals of target actions	*Time/geographical/conflict based goals*
Parties involved in the process of design	*AT research group/AWM researchers*
Goals of designing a new system	*Make available individual soldier location throughout WWI*
Criteria of success/ failure of design	*The system should provide an easy and interconnected access to individual cases*

Table 1: Checklist categories for hierarchical structure relevant to the project

b. Environment (object-orientedness)

Human beings live in a social, cultural world. They achieve their motives and goals by active transformation of objects in their environments. This section of the checklist identifies the objects involved in target activities and constitutes the environment of the use of the target technology

Checklist Criteria	***Means by Which Criteria are Realised Within the Project***
Resources available to the parties involved in the design of the system	*Faculty grant/research students*
Rules, norms, and procedures regulating interaction between the parties	*Three teams (collection, database, web system) reporting to supervising lecturer*
Role of existing technology	*Extensive use of the internet*
Access to tools and materials	*General availability of internet – possible use of CD*

Table 2: Checklist categories for object orientedness relevant to the project

c. Structure And Dynamics Of Interaction (Externalisation/ Internalisation)

Activities include both internal (mental) and external components which can transform into each other. Computer systems should support both internalisation of new ways of action and articulation of mental processes, when necessary, to facilitate problem solving and social coordination.

Checklist Criteria	***Means by Which Criteria are Realised Within the Project***
Components of target actions which are internalised	*Familiarity with use of internet assumed*
Time and effort necessary to learn how to use existing technology	*Minimum*
Possibilities for simulating target actions before their actual implementation.	*Produce scenarios of potential users activities*
Support of problem articulation and help request in case of breakdowns	*Devise goal oriented help system*
Is the whole "action life-cycle", from goal setting to the final outcome, taken into account and/or supported?	*Covered by scenarios*
Does the system help to avoid unnecessary	*External and internal similarity in interface screen*

learning?	*design – based on Netscape navigator and match design of other war databases where possible*
Is externally distributed knowledge easily accessible when necessary?	*Links to existing information available from within this system*
Does the system provide representations of user's activities which can help in goal setting?	*Provide range of possibilities for navigating different paths through the data to enable expansion of original goals*

Table 3: Checklist categories for structure and dynamics onf interaction relevant to the project

d. Development

Activities undergo permanent developmental transformations. Analysis of the history of target activities can help to reveal the main factors influencing the development. Analysis of potential changes in the environment can help to anticipate their effect on the structure of target activities.

Checklist Criteria	***Means by Which Criteria are Realised Within the Project***
Use of tools at various stages of target action "life cycles" -- from goal setting to outcomes	*Design tools to support all actions listed in scenarios*
Transformation of existing activities into future activities supported with the system	*Eliminates need to consult alternative sources such as AWM archives*
The history of implementation of new technologies to support target actions	*Increase in availability of war data on the web*
Anticipated changes in the environment and the level of activity they directly influence (operations, actions, or activities)	*Increase and create new educational activities e.g. school projects*

Table 4: Checklist categories for hierarchical structure relevant to the project

SCENARIOS

A scenario can be defined as a description of what a user has to do and the method by which specific tasks would be performed. They have the specific advantage of being concrete and specific to the domain and problem at hand thus allowing software developers to investigate various design options (Smith, 1997). More specifically scenarios force the designer to document the psychological design rationale thus becoming more aware of the natural evolution of user tasks and the artefact, taking advantage of how consequences of one design can be used to improve later designs (Dix et al, 1993). The use of goal based scenarios has been described by Schank (1994) and applied educational software development by Dobson & Reisbeck (1998) and to informatics research by Bergqvist et al (1999). In this project scenarios were used by the design team in a role playing situation where the predicted actions of the users were played out and possible solutions to their behaviour recorded. This process was driven by the goals identified in the Activity Theory hierarchy and took the form of "what if" sessions.

Based on this investigation it was clear that use of the final system would be via three main scenarios. Entry to the system would be via two of what we called pre-scenarios. The pre-scenarios were the ways by which inquirers found enough information to enter the main system and are part of the whole ‘action life cycle’ from goal setting to the final outcome. Given that one main goal is to trace family members the first pre-scenario is to use the Australian War Memorial (AWM) databases to trace the battalion to which the family member belonged and use this as an input to our system. Alternatively if the family member was killed in action or subsequently died of wounds then the date of death or injury would be the entry point to our system. Both pre-scenarios are possible through existing AWM systems. Once our system was accessed the three main scenarios are facilitated. One was date/time based (uses pre-scenario two) and involved the inquirer entering the system with the goal of finding the location of a war participant on a particular date. Another related to the goal of tracing the battalion's progress (pre-scenario one) during the passage of the conflict through geographical locations and the third involved an inquirer searching for particular conflicts. It was assumed that pre-information for this scenario would be from sources outside either our system or AWM web based archives but most likely via military histories. The scenario of school children accessing our system in response to projects set by teachers on particular battles gave rise to this scenario. Other scenarios were considered but all were reducible to one of these three which were referred to as time, geography and conflict. The database was then designed to facilitate interrogation based on the time/geography/conflict structure and tables set up accordingly.

INITIAL PROJECT PLANNING AND DESIGN

The application of the checklists led to a design based on time-dependent maps showing the location of the various units which made up the Australian Infantry in WW1. In general each army group consisted of a hierarchical structure of brigades, battalions (Bn) and companies. After an initial assessment of the availability of data it was apparent from the archival histories that although the army group was commanded as a whole it was the battalion which functioned as a cohesive unit, the brigades being frequently broken up and sent to different areas of the conflict making it more difficult to display a single location. The battalion therefore was chosen as the "basic" unit of data. Maps showing the activities at this level were readily available as were a cross-referenced index of troop movements. The scope of the project was contained by the decision to build the prototype for one battalion only with the assumption that in the future, further battalions could be added with minimum problems.

PROJECT DESCRIPTION

In order to translate design criteria into a working prototype tables were prepared which inter-linked a date (scenario/goal 1)to a map (scenario/goal 2) to a significant movement of the battalion(scenario/goal 3). This three way linkage would provide access to all data and provide navigation paths for all the scenarios. Dates were not continuous in the sense that significant changes in the battalion's position and role occurred spasmodically. Hence a typical entry for the 35 Bn would appear as:

Date Range	**Location**	**Event**	**Map Path**
30/03-03/04/1918	Villiers Bretenoux	Holding front	d:\ww1.map11.gif
04/04-05/04/1918	Villiers Bretenoux	Gas Attack	d:\ww1.map12.gif
06/04-09/04/1918	Lys River	Relieved by 34Bn	d:\ww1.map13.gif
10/04-14/04/1918	Villiers Bretenoux	Attacking trenches	d:\ww1.map12.gif

Table 5: Linkages Between Main Sections of the Project

Connected to the event also were more details (usually 20 to 50 word description) which added to the information available at that site and which would appear automatically as a box offset so as not to obscure the map. A typical inquiry for example may begin with a date which would then have to be translated into a particular date range. This would now trigger a display of the relevant map and detailed event description. The maps show the location of the battalion in relation to the main front and the position of the German lines at the time. These are reproductions of maps describing the battles in the AWM's Official Histories of the First World War. In cases where the battalion was away from the front line (on relief) normal geographic/tourist maps are used. Links are provided from each page to present day tourist web sites where they are available. Entry to the site via the other scenarios proceeds in a similar fashion to this with the added feature that geographical inquiries is enabled via a drill down facility from hot spots on larger scale maps.

USABILITY TESTING

Limited useability testing has already been carried out on the prototype system. Further testing of the prototype will take place in a new useability laboratory set up by our research group with both testing and observation rooms connected to a data splitter allowing on-screen video recording via three cameras plus a feed from the system monitor. There are many approaches to usability testing. Zhang (1999) describes the coaching method, the question asking protocol, remote testing, retrospective testing, the showing method, the teaching method, the thinking aloud protocol, perspective-based inspection, feature inspection, the logging actual use method and proactive field studies. Hom, (1998) describes co-discovery learning, focus groups, journaled sessions and consistency inspection. Lingaard, (1994) describes performance measurement, cognitive walkthroughs, pluralistic walkthroughs, field observation and heuristic evaluation. Neilson (1999) describes the interview both structured and unstructured.

One important part of this and other projects has been the ongoing aim to develop a useability testing process specifically based on the Activity theory approach to scenarios. Although scenarios have been explored by researchers such as Bergqvist et al (1999) and Peterson, (1999) among others they have not been based on the Vygotskian/Activity theory approach and we feel that this is a fruitful area of research. Initial usability testing of our prototype have confirmed the applicability of the approach.

CONCLUSION

The working prototype has been developed in Visual Basic with a MS Access database containing tables for the battalions (only one funtional in the prototype), cemeteries, dates, events, text links, map links and a small sample of soldiers data extracted from the Australian National Archives web site for testing purposes.

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