

**COMPARISON OF ASSESSED
WORK MARKING SOFTWARE:
IMPLICATIONS FOR THE IDEAL
INTEGRATED MARKING TOOL
(IMT)**

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Comparison of assessed work marking software: implications for the ideal Integrated Marking Tool (IMT)

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Abstract

The authors devised an experimental marking tool using *Microsoft Access*. Its features were assessed together with those of commonly available marking software and systems that had been identified by a survey of web and other sources.

The marking tools identified, consisting mostly of software designed for the needs of US High Schools, could be categorised by their features. The categories included the ability to calculate and record marks; provide statistical feedback to staff; provide standard written comments to students; and receive work and/or transmit feedback over a computer network.

None of these products had the intuitive feel the authors were seeking, and so we propose a model of an ideal Integrated Marking Tool (IMT). The IMT would allow lecturers to mark work using an electronic pen, replicating their current paper-based approach. It would also provide scores for named assessment categories; calculate marks; provide statistical analysis and provide written feedback to students (collated from an editable bank of comments that would build as the number of similar pieces of work passed through assessment). A full report of the above would be printed or transmitted over a computer network for the student and for the central university system. Issues of plagiarism in written work would also be addressed.

The model is extended to cover wider networking potential and appropriateness, including the possible network delivery of elements of the IMT, especially the comments database, and the linkage of recorded results to the student records, where they might be shared with other authorised staff.

This paper sets out these criteria, and includes comparisons with commercial examples such as *Mindtrail*, presenting an opportunity for the delegates to discuss the merits of the IMT model and comment on their own experiences with such products.

Introduction

Computer-assisted assessment should be providing summative marking tools to help staff mark and, theoretically, save time. Yet the majority of marking is still handled the "old-fashioned" way using a pen. Ironically, much of the CAA effort so far has been related to large systems that interact directly with students (Lecturer-system-student approach). The majority of papers at the last CAA conference were related to this approach. And yet a recent CAA Centre survey found that the majority of staff were using CAA for formative and diagnostic assessment, not summative assessment, thereby not reducing their marking burden at all (Martin 2001). Despite some successes, such as that reported by the University of Luton (Bull and Stephens 1999), the vast majority of marking is still a manual process.

There is also the need to improve the way in which written work is marked and the results of this process made available to students as feedback. This needs spring from four separate sources. Firstly, there is the pressure on lecturers to provide accurate and meaningful evaluation procedures for student work against a background of increasing staff: student ratios, External Subject Review requirements and Teaching Quality Assessments (Thomson 2001). Secondly, there is the requirement to ensure that marking and feedback are always consistent. Thirdly there is an increasingly short amount of time for external examiners to view assessments and electronic viewing might speed the administrative burden. Finally there are the needs of students themselves who, if the returned work is to have any learning significance, should be able to expect the evaluation to be a rich resource of feedback and comment with which to develop their understanding.

Individual lecturers are trying to deal with ever increasing amounts of assessment within a time bottleneck, which is a consequence of this individual approach to marking (Lecturer-to-student approach). It seems appropriate, at a time when IT is being involved in all kinds of work related solutions, that it should perhaps play a greater part in the individual marking process. And yet there seems to be an absence of any front-running software in this regard compared to the high profile of Question Mark (REF), for example, in the CAA system-to-student approach.

Anecdotal evidence reveals that many lecturers have their own customised IT solutions to the problems of awarding, tracking and distributing marks, and of feedback to students within their own departments, schools, faculties and university examinations offices.

Types of marking software

In the main, we can say that there are two distinct types of software; 'home-grown' tools that use proprietary application software, and tools designed specifically for the purpose. The first type is usually the result of customising products such as *Word* or

Excel. There are examples that use two applications, such as *Word* and *Excel* together, and one of this type is being presented at this conference (Denton 2001).

In our own software development the first two authors created an *experimental marking aid program* using Microsoft's database management package, *Access* (See Figure 1).

Category	Mark	Weight	Percent	Remarks
Structure	8.8	0.2	44	Choose
Integration	9	0.2	45	Choose
Management theory	8.2	0.2	41	Choose
References and bibliog	7.8	0.2	39	Choose
Presentation	12	0.2	60	Choose

Remarks: No References

You have not included any references. Given that 20% of the assessment mark was assigned to this area I feel you were encouraged to give this serious consideration. I can advise you that demonstrating you ability to synthesise background reading, especially theory, into practical exercises is a critical area that you need to develop. Theory and practice are not separated in the real world, nor are they separated in this assessment. Consider in future key aspects that apply to the assessment and then see what 'gurus' or recent writers in journals have to say. You should then be able to apply them to the task in hand.

Figure 1 Experimental Marking Tool Developed by Stephens and Sargent

In this experimental tool, modules were set up with five named assessment categories, each associated with a weighting. In addition to the awarding of marks, we used a system in which comments were associated with each category. Remarks were added directly to a Remark Bank. These remarks could then be called up using a shortened version of the full remark (called a quick remark), and added to a developing student report, which was itself fully editable. In this way, more than one comment could be added concerning any particular assessment category. Links between the assessment categories and the remarks themselves served only to assist in locating the remark.

However, these 'home-grown' solutions never seem to be overly satisfactory or easily adopted by other colleagues.

The second type of marking tool consists of software packages that have been specifically created to help with the marking process. Many of these products are

available from one or more websites as either freeware, shareware or demonstration versions.

Literature research

In order to help construct a list of desirable features of an ideal IMT, and to determine whether the ideal IMT already existed, we set about a search of databases, search engines and websites which had proved useful as a source of educational software in the past. A list of these and the software products discovered is available at our website:

<http://www-staff.lboro.ac.uk/~lsdps/index.html>

together with their main features as described in the articles or websites where they are mentioned.

Types of Marking Tool found

i. Basic tools

The majority of products found via the web were intended for PCs running Windows, and often coexisted in a number of development versions.

Most of these products related to the American High School environment. The simplest consisted of a means of recording marks and outputting these as a report. They might also include the ability to convert the crude mark into a grade, applying weighting where appropriate.

Output was typically in the form of summary reports. These reports might be based on the individual student, the class, or the teaching term, etc. Some also included statistical charts. The data was usually presented on screen in a spreadsheet format, and many were able to export this to commercial spreadsheet packages.

Because these products were aimed squarely at High School teachers, there was a tendency to store additional data concerning the student, such as attendance and class plan, and to provide assistance with scheduling lessons. 'Blackboard' (see Figure 2) focussed on documenting student progress.

As such, these products did not constitute an IMT and should be thought of as documentation systems.

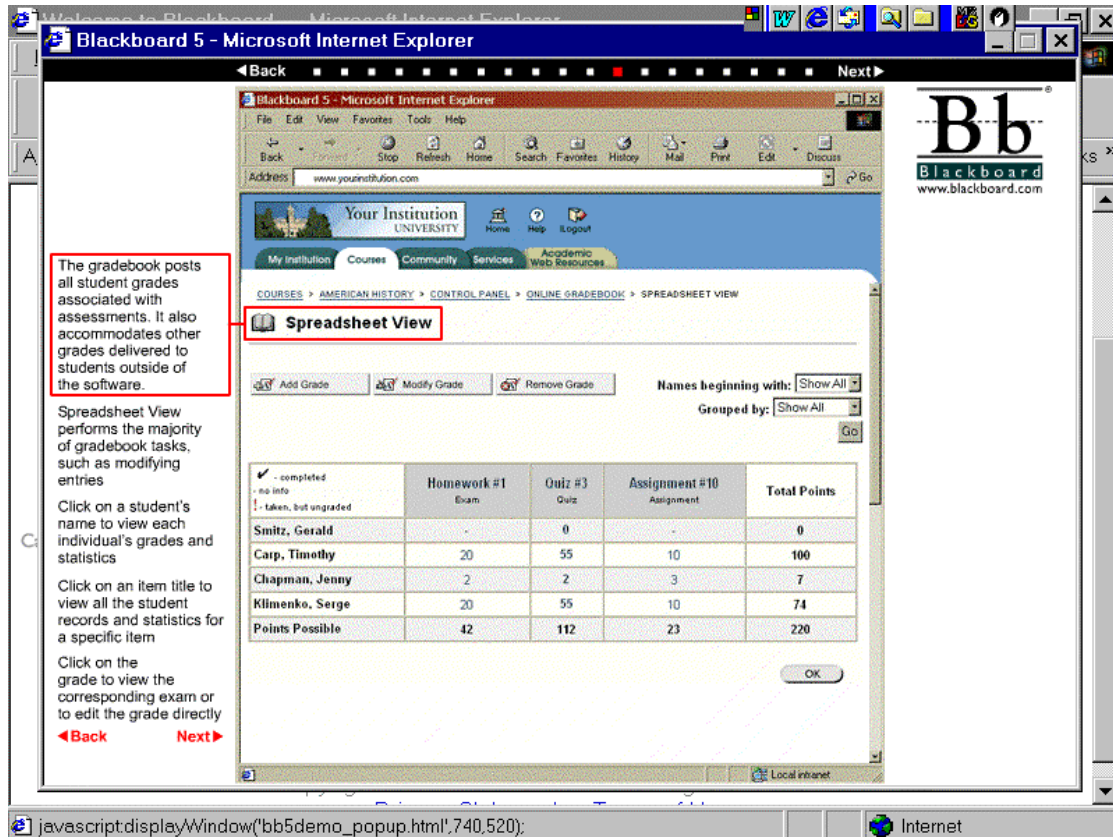


Figure 2 Blackboard software as displayed on the Web

ii. Enhanced tools with more features

There was a type of marking software that offered flexibility in marking and provided feedback to students. These products allowed for the definition of a number of assessment categories of the lecturer's own devising (eg. Structure, Content, Citations etc.), and for comments to be made about specific aspects of the student's work. For example, they might include a Remarks Bank that stored remarks tagged to the assessment category name. The lecturer could then pick the appropriate remark from the lists when generating the student report. Once chosen, the remark could be discarded, or another selected, edited or a completely new remark created.

Some packages included a weighting for assessment categories and thus marks were automatically calculated to take weighting into account. Frequently the marks were exportable to spreadsheets.

Probably the most complex and sophisticated pedagogical marking aid that we found is *Mindtrail*. This product associates a variety of objects into a 'knowledge tree'. For instance, you may wish to create a folder for assignments on Henry the IV in a module titled English Literature (see Figure 3). Each assignment would have a list of students associated with it, and perhaps the ability to decrease marks for late submission.

Also associated with each assignment would be a number of marking categories, such as 'Presentation and Structure'. Within these are the marking criteria. The lecturer selects the appropriate one and a predetermined number of points and a comment are added to the student's report.

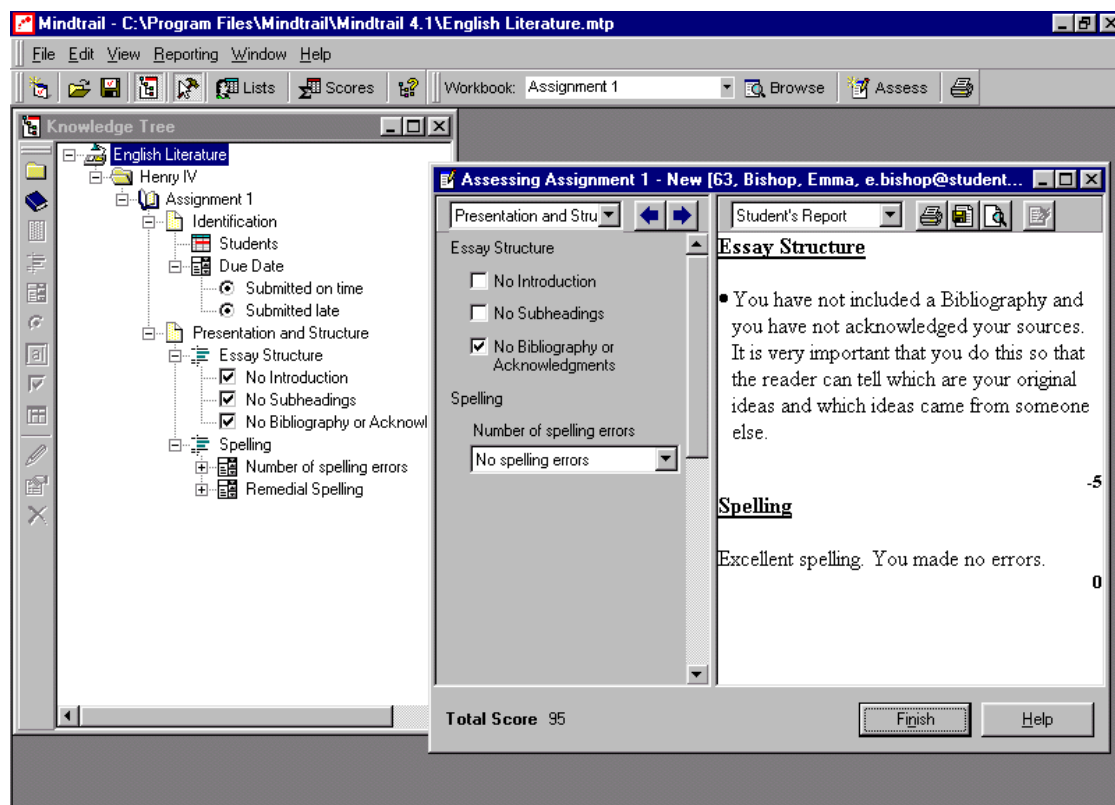


Figure 3

Screen shot of *Mindtrail* software

The marking system is somewhat more flexible than this might indicate. Criteria can be mutually exclusive (eg. Good use of headings / Poor use of headings / You did not use headings), and marks positive or negative. In addition, special marks and comments can be edited into the report whilst marking to reward, or otherwise, especially good or bad points. However, the overall feeling is that evaluation has been taken from the hands of the lecturer once the marking process has begun. This may work well when

looking for the presence of simple points of fact. More complex evaluations would be difficult because of the link to a fixed mark and comment.

The output report is editable, and can be delivered as a printed document or an RTF file. Summary statistics can also be printed or saved to a spreadsheet.

Markin32 was an example that allowed electronic submission, and enabled the lecturer to annotate the text using a number of simple, standard codes inserted into the text as superscript, by clicking the appropriate button. For example, a superscripted "Sp" would indicate a spelling error. Two other types of annotation were possible: 'feedback' added at the end of the document, and covering up to two general areas (eg. structure and content); and 'comments', inserted at points within the text with a superscripted number to link them to the actual comment.

This is similar to the system used by the Open University, but is quite cumbersome and time consuming in use.

Output from *Markin32* could be on printed paper, or as an RTF file, but an HTML version was especially interesting, not only for its use of the web, but also because the annotations appeared as links within the text, and the comment text displayed when the link is activated.

Other relevant approaches

In the interests of completeness, we would also like to mention both the *Intelligent Essay Assessor* and the *CourseMaster Automated Assessment System* (Foxley 1998). Both these systems require students to produce material that is submitted electronically and marked by a program applying a set of criteria. The work is returned to the student marked, whereupon the student is usually free to resubmit. By repeatedly resubmitting, the student will hopefully learn by their mistakes and gain better marks. In that they clearly aid marking by removing the lecturer from the process entirely, they do fall within the bounds of this article. However, at this stage, they seem more appropriate for marking specific types of submitted work in which the inclusion of specified elements is required.

This concept is interesting, but does not appear to support marking in all its diversity. Even so, it is a development that needs to be kept under review.

What was missing?

None of the marking tools we found could import all types of file including word processing, spreadsheets and databases. Perhaps more importantly, there was no obvious ability to annotate electronic assessment in an intuitive way.

There is however, a web page design software tool called *E-quill* that enables editing of any document using an electronic 'ink' analogy, as shown in Figure 4. Using a mouse or

a pen device, circles could be drawn and items crossed through or ticked. In addition, notes could be attached and specific spellings changed. This more intuitive approach was one the authors were keen to see included in an ideal Integrated Marking Tool.

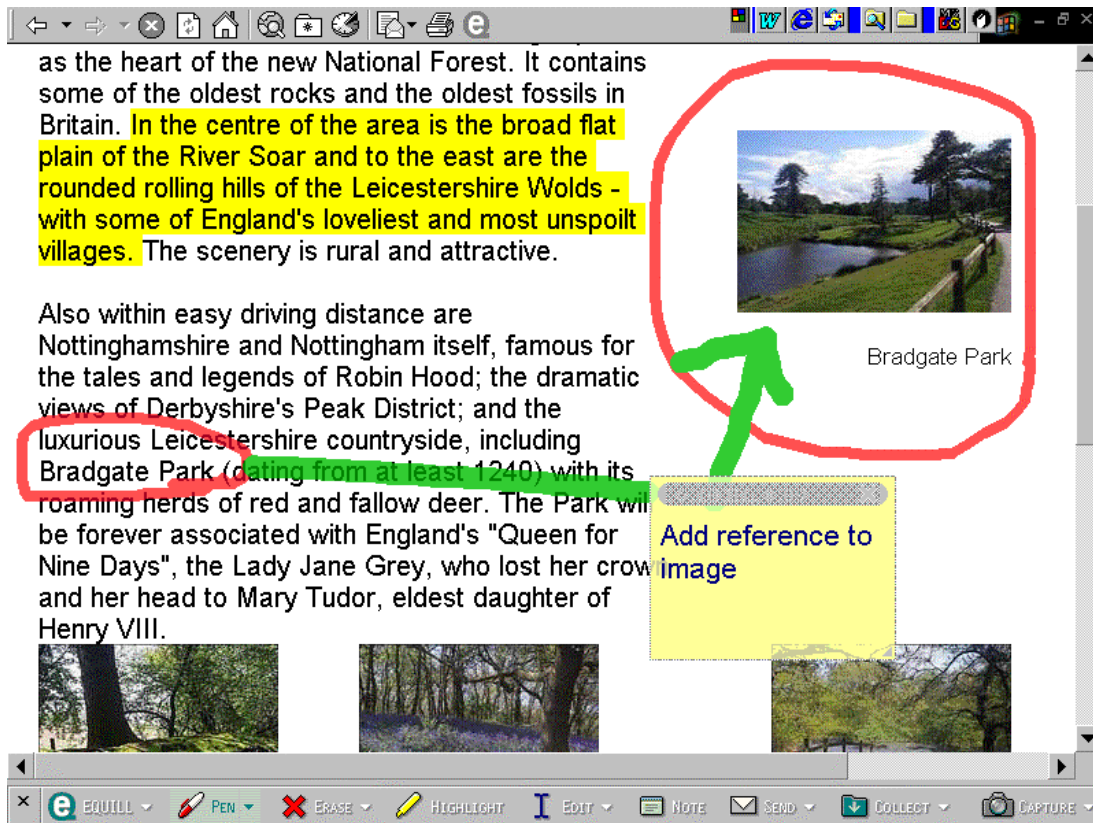


Figure 4 Equill software to annotating a web page

The ideal features

From our evaluation of the various packages identified, a series of other ideal features emerged. Good features exist in some of the products but not all. The best features were taken to define the Ideal IMT.

Probably the most telling aspect of our search was the absence of a sufficiently intuitive feel to the software. It is for this reason that the authors suggest that none of the existing marking products we found is likely to become widely adopted in UK higher education. There is an inherent design flaw in the approach used in all current marking software packages.

Interface

It is our suggestion that the definition of the ideal IMT should start with what it is trying to replace - that is the pen. Lecturers like to 'scrawl' on scripts. It is a quick method that does not require the keyboard or mouse skills that current software tools do. By using a pen as the input device, the individual marker may feel more at ease with a new system. The pen could be linked to a pre-formatted pad in much the same way as CAD systems work, or linked to the work via a touch screen.

If student work were submitted electronically, it would appear on the screen and the lecturer would be able to use the pen device to circle, cross out and generally scribble - much the same as they do now.

The same pen system could be used by the lecturer to call up previously stored comments that might either be added to the text or included in a student's feedback report. Placing the assessment categories on-screen and allowing the lecturer to select their preferred marking style (A-E, percentages, excellent- poor etc.) may also enhance acceptability. Marks could then be selected from a scale using the pen device, and weighted and summed automatically to prevent staff making simple numerical slips.

All of this data could then be stored together with the marked version of the student's work, and thus be available to send electronically to external assessors or double markers.

For this reason, it would be important for the IMT to work easily with different email systems.

Input screen for comments and marks

The appearance of the data input screen is crucial. Both in our own experimental system, and in the *Mindtrail* system, it is easy to find yourself lost among the windows and options. Any system that has a steep learning curve will not be readily taken up, and lecturers may well feel that it is adding to the marking burden rather than assisting it. Provided the screen can remain uncluttered, the use of a single data input screen is preferable. A graphic representation of what such a screen might look like is shown in Figure 5.

Microsoft Access - [Get Results : Form]

REPORT: EMAIL EDIT PRINT DATA: VIEW EXPORT EDIT: STUDENTS REMARKS

STUDENT NAME: Smith, JR REGISTRATION: A018887 EMAIL: j.r.smith@lboro.ac.uk

MARKING CATEGORIES	WEIGHTING		MARK
	1..10	%	
<input type="radio"/> A Introduction	2	15.4	4
<input type="radio"/> B Examples	4	30.8	4
<input type="radio"/> C Conclusion	3	23.1	5
<input checked="" type="radio"/> D Citation	2	15.4	2
<input type="radio"/> E General Presentation	2	15.4	4
<input type="radio"/> F {none}	0	0	0
<input type="radio"/> G {none}	0	0	0
<input type="radio"/> H {none}	0	0	0
<input type="radio"/> I {none}	0	0	0
<input type="radio"/> J {none}	0	0	0

MARKS FOR MODULE/CATEGORY

Computers in Society 78.5 %

Citation

1 2 3 4 5

SELECT A REMARK

Poor url citation

ADD WORDS HIGHLIGHTED TO REMARK BANK

ADD REMARK TO CATEGORY

REMARKS FOR THIS CATEGORY

VIEW E-SUBMISSION

You have failed to reference many of the items you quote.
 The form in which you have cited web sources is wrong. Please look at your class handouts for the correct format.
 Some of the sources you cite are far too general to be of real use

Form View NUM

Figure 5 Mock-up of comments and marks screen for an IMT

The screen shows each of the marking categories at the top, but the scoring system and the remarks, shown to the right, and in the lower half of the screen, are only those of the selected category at any one time. This helps to keep the clutter to a minimum, whilst retaining a comprehensible layout. This makes the IMT sufficiently intuitive to be useful while still gaining the advantages that come from using IT and remaining flexible enough to exploit developments, such as the direct screen marking with a pen described above.

List of features

Submission of work

The system should allow for work to be submitted by any means. The limitation of using only electronically submitted work is too great. Indeed the majority of lecturers may prefer to work from a hard copy of the student work. Ideally, if submitted electronically plagiarism software should run on it before the lecturer starts marking.

Pre-processing

The system should compare submitted work against a list of student names in the student record to produce an updated report of those from whom work is still outstanding. In this way responsibility for keeping track of student work would pass from the individual lecturer and, ideally, become a comprehensive and well supported university wide procedure.

Plagiarism

There should be easy use of plagiarism-detection software, run to meet individual lecturer's requirements. For example, automatically comparing all scripts against each other or checking against the Internet or against text from book chapters.

This should be run automatically before the marking begins.

Creation of Module

The system should be able to create modules with a number of user-definable marking categories. Ideally, the number should be infinite, but in practice, a maximum of twelve is probably sufficient. Each category should be set up with a weighting value, and the system should then make all appropriate calculations.

Each marking category should have the potential to have a large number of remarks associated with it. Each remark should consist of a full remark for inclusion in the student report, and a very short 'quick remark' for listing, for instance, in drop down menus.

Marking Process

Once set up, the marking process should be simple, and involve as few screens or windows as possible. The lecturer should identify the student from a drop down list of student names associated with each module.

The lecturer would be presented with a list of the assessment categories by name, and an on-screen device to select the mark. This could be a line of five buttons or a slider. The device should be labelled 1, 2 .. 5, or POOR ... VERY GOOD, or E ... A. The choice of label should be selectable, and reselectable at any time. The lecturer would select the assessment category by clicking on it, then make, or remake, the selection of a mark.

On the screen, there would be a 'Remarks' window with a vertical slider. This window would be used to accumulate and edit the remarks that would go to make up the student report. The contents of the window would change with the selection of each assessment category as above. The lecturer would be free to type in and edit any remark they felt appropriate. Alternatively, the lecturer might select from a drop down menu of stored remarks from the remark bank. These would be added to the window

when chosen, and it would be up to the lecturer to edit or reorder the remarks in the window.

Initially the remark bank would be empty. As the lecturer creates new remarks that they wish to save, these would be highlighted and added to the remark bank with an 'Add' button.

There would need to be a maintenance route available for tidying up the remarks bank, as it will undoubtedly become littered with ill chosen remarks, similar remarks and errors.

Student Report Generation

Student reports should be easily generated both individually and as a batch by clicking an appropriate button.

Each report should consist of a module title, the student name and the overall grade, followed by a summary of the assessment category names, their weighting and the mark obtained. Beneath this would come a list of all the non-blank remarks as edited by the lecturer under each assessment category name.

The report should be available as printed paper and as an RTF file.

Data output

The entire dataset should also be exportable to a spreadsheet for further analysis if required.

Network Feedback

Having suggested the possibility of electronic submission, it seems equally appropriate that a report back to the student might also be in electronic form, via a computer network.

There are broadly three ways networks might be used for distribution. Firstly, students might be able to log into a networked computer to submit their work or, later, to receive back reports.

The second method is to use email, either as the main message or as an attachment. Email with attachments is ubiquitous these days, and has the advantage of already being designed for distribution to named individuals. It also takes little account of the route or type of network that it is to run over, so it is a solution that is likely to be successful in most environments, although there could be security issues.

The third method is to use web technology, either internally over an Intranet, or on the Internet. There are also security issues here. However, the required technology exists

fairly commonly. Indeed, there is nothing in the design of the marking system as described above that could not also be delivered over the Internet, providing a flexible system that could be used almost anywhere and on any computer connected to the web, without the need to install special software.

Of these three techniques, it is probably the email that could be made to work quickly and most simply.

In summary then, the ideal IMT should include:

1. An intuitive marking device such as an electronic pen
2. Permit all types of submission including electronic student submission of various types.
3. Centralised pre-testing for plagiarism
4. Easily editable remarks bank that develops during assessment
5. Variety of marking schemes (simple to sophisticated approaches)
6. Automatic grade computation
7. Automatic report generation
8. Electronic feedback via student email
9. Electronic storage of marked work and lecturer's comments, marks and annotations
10. Easy links to university central systems

The authors are working to this end and invite comment at:
<http://www.lboro.ac.uk/departments/ls/disresearch/talip.html>

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