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## Streamlining plagiarism detection: The role of electronic assessment management

Dr Cath Ellis  
School of Music, Humanities and Media, University of Huddersfield,  
Email: [c.a.ellis@hud.ac.uk](mailto:c.a.ellis@hud.ac.uk)

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### Abstract

This paper considers the problem of managing the workload implications of plagiarism detection as part of the larger issue of assessment management and within a holistic approach to educational integrity. It looks specifically at the potential for Electronic Assessment Management (EAM) to provide some of the solutions to this problem. It draws on the work of Mantz Yorke whose research into assessment management calls for the establishment of appropriate structures and mechanisms which support systems that achieve the dual imperatives of efficiency and effectiveness. This paper considers the workload issues related to plagiarism detection under these dual imperatives, looking first at the issue of effectiveness and then turning to consider the issue of efficiency. Finally, it argues for why and how these issues should be taken into account in the procurement of digital plagiarism detection software and how the use of these tools should fit within a rigorous and consistent holistic approach to educational integrity.

### Introduction

Across the Higher Education sector, there is a widespread perception that the problem of student plagiarism is worsening. The blame for this tends to be laid at the feet of the so-called information revolution; it has made it considerably easier for students to access material (both scholarly and not) which, thanks to the technology of cut and paste, is also significantly easier to transfer into their work. Wherever the blame is laid, wherever the causes are seen to lie and whenever the problem was believed to have arisen, there is widespread discussion in the scholarly literature and in the media suggesting that the incidence of cheating in general and plagiarism in particular is on the rise. As Chris Park (2003) puts it, the “evidence is multi-dimensional, coming from many countries [...], embracing both undergraduate and postgraduate students and including public and private higher institutions of education, large and small” (pp. 471-472). He goes on to suggest, however, that the evidence on the increased incidence of plagiarism over time is “thin on the ground”, citing only two longitudinal studies which both show a dramatic increase in cheating (Park, 2003). John Walker (2010) agrees suggesting that too much of this discussion is based on anecdotal rather than empirical evidence. In Sean Zwagerman’s (2008) philosophical response to the ethics of plagiarism detection he speculates that “an increase in the amount of cheating uncovered” may simply be the product of “an increase in the number of studies investigating the extent of cheating” (p.678). Hart and Friesner (2004) quote studies published in 1941 and 1964 which indicate that cheating was a significant problem even then and in the title of his article published

when the world wide web was nascent, Lester Paldy (1996) refers to cheating as a problem that 'won't go away' (see also Alschuler & Blimling, 1995). Together these suggest both that the perception that the problem is getting worse may not be founded in fact and that the information revolution may not be entirely to blame. Regardless of whether the incidence of plagiarism has grown or not, the perception that it *has* suggests that as an issue it both remains significant and has undergone important change. Certainly, the means and mechanisms used by students to plagiarise have changed. Concomitantly, the tools and strategies used by academic staff to detect plagiarism and prosecute students for it have changed as well.

What has emerged from this is a kind of 'arms race': Park (2003) quotes Colon saying "the Internet may make it easier to copy, but it also makes it easier to expose the copier" (Colon, quoted in Park, 2003, p.482). This 'arms race' has been developing at a time when institutions have more reason than ever to protect their institutional reputation. This comes as a direct result of the increased demands for accountability and transparency across the sector whether as a result of more rigorous Quality Assurance processes or, as is the case with new fee structures such as those recently introduced in the UK, from increasing student expectations, or simply from media attention (see Macdonald & Carroll, 2006). At the same time, it is occurring at a time of diminishing resource with academic and administrative staff being asked to do more with less.

This paper considers the problem of managing plagiarism as part of the larger issue of assessment management. It looks specifically at the potential for Electronic Assessment Management (EAM) to provide some solutions to the problem. While the issue of assessment management falls, as Mantz Yorke (1998) explains, into the interstices "between a number of aspects of higher education (teaching and learning; assessment practice itself; educational management; and quality assurance)" its effective management is, as he points out, "of considerable significance for the student experience" and is 'critical' for institutions (p.101). Writing in the late 1990s, he observed that this area is under represented in the literature and as a "need that has yet to be fully addressed" (pp. 101-102). A decade and a half later, this remains the case. Alistair Mutch's (2002) work on assessment strategy, which also draws on Yorke's research, is a notable exception. He asserts that while "Academics are frequently enjoined to think 'strategically' about assessment" there is precious little time "spent on defining what is meant by 'strategy'" (Mutch, 2002, p. 163).

The advent of an ever-increasing array of EAM tools and strategies and the widespread move across the sector towards EAM means that redressing this under representation is more pressing than ever. This paper, therefore, proposes to make a contribution in this area. Yorke is interested in the 'big picture' of assessment management but my paper is particularly interested in one subcomponent of it: what he refers to as operationalisation. In doing so it recognises the importance of that bigger picture which he describes, and even the importance of its place in a larger, institutional strategy for quality assurance (such as Total Quality Management (Kanji, Malek, & Tambi, 1999)). My methodological approach in this paper is informed by Mutch's (2002) assertion that institutional "policies and procedures" should "flow from a clear set of principles rather than [sic] substituting for them" (p. 167).

Specifically, this paper offers a point of focus within it: a response to Yorke's call for the establishment of appropriate structures and mechanisms, which support systems for assessment activity and which achieve the dual imperatives of efficiency and effectiveness. He argues:

...a well-constructed system for the management of assessment will ensure that what is expected to take place actually does take place (i.e. that it is effective). It should also ensure that what is done is done efficiently, in that no time and effort are wasted as the institution pursues effectiveness. (Yorke, 1998, p. 106)

As such, this paper considers the workload issues related to plagiarism detection under these dual imperatives, looking first at the issue of effectiveness and then turning to consider the issue of efficiency.

### **Effective Plagiarism Detection**

As many scholars have argued, simply relying on the detection of plagiarism as a way of 'dealing with it' is a weak strategy. Macdonald and Carroll (2006), for instance, make a compelling argument for a 'holistic' approach whereby "we should start from the premise that we need to get assessment right in the first place" (p. 234). They insist that the:

key to ensuring that a holistic approach to plagiarism is adopted [is] where the emphasis is on promoting good scholarly, academic practices rather than focusing on potential problems and channelling all the institution's energies into deterring through detection and punishment. The latter is not the basis for a healthy learning environment whilst the former at least contributes to it. (Macdonald & Carroll, 2006, p. 244)

In this 'holistic approach' they stress the importance of addressing such things as teaching students the necessary skills to comply with academic regulations and conventions, promoting academic integrity as a primary value for staff and students, staff development, a consistency in approach to detection and prosecution, and the careful data collection and analysis on the occurrence of cases (Carroll & Appleton, 2001; see also Hart & Friesner, 2004; Macdonald & Carroll, 2006).

Even with a holistic approach in place, as Macdonald and Carroll (2006) themselves acknowledge, "[t]here may always be some students [...] who will cheat" (p. 244). As the literature shows, there are many and varied reasons why students cheat. Park (2003) lists the causes as: a genuine lack of understanding, an efficiency gain (to get a better grade in less time), time management, personal values/attitudes, defiance or dissent, students' attitudes towards teachers and class, denial or neutralisation, temptation and opportunity, and a lack of deterrence (pp. 479-480). In this context, it is clear that detection continues to play an important role in institutional academic integrity and assessment strategies *even where* holistic approaches prevail. The use of digital detection tools by individual academic staff, who are on the 'front line' of this plagiarism 'arms race', remains important.

This is particularly pertinent when we consider the last of Park's (2003) list of causes: deterrence. Here he cites the work of Davis and Ludvigson, saying: '[t]o some students the benefits of plagiarising outweigh the risks, particularly if they think there is little or no chance of getting caught and there is little or no punishment if they are caught (p. 480). There is a large and growing body of evidence suggesting that the use of digital plagiarism detection tools, such as Turnitin and SafeAssign, do have a significant deterrent effect (Davis & Carroll, 2009). On these grounds alone, their value and usefulness in a holistic approach is clear.

The use of digital plagiarism detection tools remains controversial in the academy. Many academics have been and remain suspicious of them and their place within the academy. Maruca (2004) talks about plagiarism detection tools through a discourse of 'policing' in her critique of the most widely used and best known digital detection tool: *Turnitin*. Its name, she argues, conflates "turning in work to be graded, with one more familiar in the realm of policing, the 'turning in' of a criminal violator" (p. 19). On the other side of the debate, scholars such as Davis and Carroll (2009) argue that it can "be a useful support to other traditional teaching methods when used formatively" (p. 59). This paper suggests that within the aforementioned 'arms race' and alongside other formative, developmental and mitigating strategies, the use of digital plagiarism

detection tools remains important not just because of their deterrence effect but also because of their capacity to detect instances of plagiarism which occur despite the use of these other strategies.

It is important, at this point, to acknowledge the different detection tools on the market. For the purposes of this paper, I focus on plagiarism in written forms of assessment. Some, but not all, of the issues I discuss are also relevant to other forms of plagiarism in, for instance, music composition, art and design, etc. The oldest detection tool is the scholarly knowledge of the marker. This is what I refer to as the 'alarm-bell': it goes off in a marker's head when they read material in a student's writing which raises concerns. This can take many forms: it may be unreferenced material with which they are already familiar or which seems out of place in the writing around it or with the previously demonstrated abilities of the student. This detection 'tool' has been used for centuries and relies upon the breadth and depth of the discipline-specific expertise and the teaching experience of the individual doing the marking. Inevitably, the power of this 'tool' varies from marker to marker. Research active and more experienced staff are more likely to have greater depth and breadth of reading in the field of enquiry than non-research active and early-career staff.

Academic staff now also have a wide range of digital tools at their disposal to augment and support their 'alarm bells'. Mainstream search engines (such as Google and Google Scholar) have also earned their place as important weapons in the detection armoury. The 'advanced search' option to search for exact phrases is used routinely by academics to augment their 'alarm-bell' approach. In addition, there are several proprietary tools on the market whose specific role is to undertake so-called 'originality checks' against their own databases of written materials. These databases tend to include repositories of previously submitted student work (to detect collusion, the reuse of previously submitted work and the purchasing of essays), the web, journal articles and books.

The market leader is *Turnitin*, developed by iParadigms. Turnitin is one of a suite of plagiarism detection tools developed by iParadigms, which also includes iThenticate (designed for professional publishing) and WriteCheck (designed for student use on a pay-per-report basis). The Turnitin suite of tools also includes an online marking tool called GradeMark and a peer-marking tool called PeerMark. The other leading tool is SafeAssign, which has been developed as part of the Blackboard Virtual Learning Environment (VLE). It operates in a similar way to *Turnitin* but does not include an in-built marking tool for tutor or peer marking, but relies instead on other tools available within the Blackboard VLE suite. There are several other online or downloadable tools, Viper, Grammarly and Copycatch to name a few (see Barrón-Cedeño, 2012).

One thing that is common to all of these tools, whether they be human or digital, is that they all require human engagement to be effective. This is obviously true of the scholarly knowledge of the marker and the use of search engines, but is less obvious when it comes to the use of digital detection tools such as *Turnitin* and SafeAssign. These tools are *not* plagiarism detection tools. In fact, they are originality checking tools in that, as Davis and Carroll (2009) explain, they have "the purpose of highlighting students' unoriginal work" (p. 58). As such, they still require interpretation by qualified and trained staff in order to ascertain whether or not unoriginal text found by them constitutes plagiarism or not. Here 'qualified' refers to academic qualifications whereas 'training' refers to being trained in the use of the tool itself.

Davis and Carroll (2009) cite the research of Peacock, Sharp and Anderson (2006) which demonstrates that, despite the claims of the tool manufacturers that it is easy to use and clear, "many academics have not found the interpretation [of originality reports] so easy" (Peacock et al., 2006 cited in Davis & Carroll, 2009, p. 60). This is especially true where students have deliberately attempted to 'cheat' or fool the digital detection tools to mask cheating. Advice to students on using these strategies to 'cheat' the system are available on the internet and virtually all of them aim to produce

a 0% unoriginality return by ensuring that no text in the document matches anything in the tools' databases. It follows, then, that the investigation of writing which produces a 0% unoriginality return needs particularly close and careful scrutiny (see Barrón-Cedeño, 2012; Gillam, Marinuzzi, & Ioannou, 2010).

With this complicated mix of human and digital tools, I argue that the whole process of managing plagiarism detection is most usefully considered, as Mark Prensky (2011) suggests, as a machines versus humans evaluation: evaluating the different affordances that machines and humans bring to the quality of pedagogy. He suggests: "Already for certain things [...] the machines hold the edge. But for other things [...] humans are still unmatched" (para. 7). While there are tools which are clearly much better and quicker than humans at detecting the existence of unoriginal text in a piece of student writing, there is not yet a tool which is as sophisticated as qualified and trained humans at being able to judge whether or not the text is plagiarised.

Having said this, the fact remains that these tools' capacity to detect all unoriginal text is limited. The databases on which they draw are far from comprehensive. They are particularly poor, for instance, at detecting items taken from the web, that have been recently updated (articles from breaking news sites for instance). The books they have within their databases are a tiny subset of all extant published works. Anything that is available on the web but protected by a firewall (such as the pay walls of essay purchase sites) is also unreachable by their crawlers. The fact that a passage of text has not been 'matched' by a detection tool does not, in itself, offer proof that the writing is actually the original work of the student. It is at this point that academics need to trust their 'alarm bells' and use their disciplinary expertise to identify the source or sources that they suspect have been copied by the student.

Of course, finding evidence to support or 'prove' an accusation of plagiarism that has aroused suspicion despite going undetected by a digital tool is as difficult and time consuming as it has always been. The widespread use of digital detection tools may actually foster an overreliance on them and therefore a sense of complacency whereby academic staff may begin to ignore or distrust their 'alarm bells' if these suspicions are not backed up by the digital tools. This is a significant cause for concern and should be both carefully managed and integral to any professional development or training provided. It is important that, as part of any holistic approach, academic staff are encouraged to use *all* tools available to them.

It follows, then, that this requirement for human intervention means that a number of important truisms emerge in terms of the use of digital detection tools. The first of these is that items of student writing which are submitted to a digital detection tool are not, in this simple act, plagiarism checked. This is because a trained and qualified person with appropriate authority to act upon instances of plagiarism that are discovered must interpret the originality reports in order for this checking to have *actually* taken place.

Secondly, a strategy of only submitting items of student writing which have set off the 'alarm-bell' in an academic's mind to a digital detection tool does not constitute comprehensive plagiarism checking. If this strategy is adopted, the first problem that emerges is that it does not treat all students with equal rigour and could provide grounds for student appeal or complaint. The second problem is that it will almost inevitably result in instances of plagiarism, which could otherwise have been identified, going undetected. This is because these tools will allow academic staff to find instances of plagiarism that they would not have otherwise identified (because not all instances of plagiarism will set off everyone's 'alarm-bell').

Thirdly, it is necessary that the item of student writing that is being marked must be the same as the writing that is being originality checked. This problem arises in marking systems where students are required to submit a copy to a digital detection

tool for plagiarism checking purposes while submitting another copy somewhere else for marking purposes (usually because some academics insist on marking on paper or in order to continue to defray the cost and labour of printing to the students). In this scenario, even if all of the originality reports are appropriately checked (as outlined above), unless all of these are *also* compared to the scripts being marked, then rigorous and consistent plagiarism checking has not occurred.

Fourthly, once plagiarism has been detected, the work of compiling documentary evidence, presenting it as a formal accusation, investigating it and undertaking a formal 'prosecution' can be frustratingly 'fiddly' and enormously time consuming. It is for this reason that so many academic staff are so notoriously reluctant to pursue instances of suspected plagiarism, especially for what are perceived to be 'borderline cases,' even with digital detection tools often making the evidence easily identifiable and retrievable. It goes without saying that all of these truisms bring with them substantial human resource implications.

There are several strategies that are commonly employed by individual staff and institutions to alleviate the labour involved in the systematic use of these tools. Prime amongst these is the use of unoriginality 'scores' to identify which originality reports require close investigation. These overall originality scores (which, for both *Turnitin* and *SafeAssign*, are presented as a colour-coded percentage), however, cannot be relied upon to provide accurate and meaningful information regarding instances of plagiarism. Writing which returns a high percentage may simply be using a large volume of secondary or published primary evidence or be in disciplines (such as law) where there are very particular turns of phrase which are required in the scholarly discourse. Similarly, a low percentage does not in and of itself indicate that the piece of work contains no plagiarism. Devices within the tools (such as those which eliminate quoted material or bibliographic data from consideration) can be employed in an attempt to only identify unoriginal material that is not referenced but these can produce misleading results. These tools tend to have very specific requirements in order to work effectively (they may only pick up, for instance, quoted material inside double not single quotation marks or indented quotations). It remains the case that academic staff (humans) are more likely to be able to dismiss unoriginal text as not plagiarised (e.g. because it is correctly cited) than these tools (machines) will be able to.

It remains, therefore, that for the effective use of digital detection tools, qualified and trained academic staff must be involved in scrutinising originality reports. This is, as already indicated, costly not least because of the sheer labour involved (especially for very large classes or modules) but also because it is an academic responsibility that requires academic judgement and academic staff are expensive. In addition, these staff are already burdened with a significant and growing amount of marking labour. Anything that can streamline this process is, therefore, vitally important. Any approach to streamlining the use of digital detection tools, however, should be considered as part of the whole assessment management process as well as being part of any holistic approach to academic integrity. As has been argued above, the effectiveness of digital detection tools as part of a plagiarism detection process requires human intervention, engagement and action. What this paper now turns to consider is how best to achieve this in terms of efficiency.

### **Efficient Plagiarism Detection**

Writing on Assessment Management in 1998, Yorke was inevitably only able to envisage (or at least consider) the operationalisation of a system that was primarily paper-based. Arguably achieving significant efficiency gains in paper-based systems will always be difficult because of the labour-intensive nature that handling paper-based data brings with it. A decade and a half after Yorke's paper was published, paper-based assessment management systems still prevail but, I would argue, not for much longer. Across the sector, around the world, higher education institutions are

keen to establish EAM systems. The motivating factors for moving towards EAM are multiple and complex but the most predominant are:

- environmental sustainability: to reduce the use of paper across the institution;
- efficiency: particularly to reduce administration costs through reduced paper handling but also to reduce marking time;
- data security: particularly for distance and multiple-campus provision;
- student demand: mainly because of convenience but also because of their perceptions of increased clarity, privacy and security.

Whether the adoption of EAM achieves any or all of these objectives depends largely on which tools are chosen and how they are implemented (or operationalized) within the assessment strategy. It is, arguably, less likely that the first of these motivating factors (environmental sustainability) will be as easily achieved as the last of them (student demand). On the one hand, simply moving to an online/electronic assessment management system does not guarantee a reduction in paper use. It may even increase the amount of printing being done. Even if there is a reduction in paper use, any environmental gain may be offset or even outweighed by increased electricity use. On the other hand, given the demands now being made of institutions by their student representative bodies, it is likely that any system that allows students to submit their assessment electronically will increase their sense of satisfaction. What becomes clear, therefore, is that the design of the operationalised assessment management system and the choice of tools to be used within it is crucial to turning these motivational factors into critical success factors.

Key to the effective design of assessment management systems is the following set of design principles. First, it is vital that EAM systems do not simply replicate paper-based systems in their design. If they do they will simply replicate all of the inherent inefficiencies of paper-based systems. Instead, the design should harness the efficiencies and benefits that the tools afford. In an era of diminishing resource, systems and tools that can achieve economy of scale are particularly attractive. Economy of scale is achieved by tools that allow for:

- batch handling things which were previously handled individually (such as mark entry);
- automating processes that were previously undertaken manually (such as date and time stamping and logging student submissions, issuing proofs of receipt etc.);
- reducing or ideally eliminating duplication of effort and/or unnecessary processes moving to a position which allows staff to do more than one thing at a time.

It is the last of these that is most relevant to the issue of achieving the effective and efficient use of plagiarism detection tools. This will be explored in more detail below.

### **Operationalisation**

This paper now turns to report on a strategy that has been adopted in a higher education institution in West Yorkshire in the United Kingdom. It uses a business process solution which structures assessment management as a workflow and which sees the academic module or subject as the basic business unit. The workflow approach seeks to chart all the processes within it, from validation to archiving and including such things as timetabling, assessment submission, logging and date stamping of submissions, extension requests and approvals, academic misconduct processes, mark-entry, moderation and external examination (this list is far from exhaustive). This workflow approach allows existing processes within the system to be mapped alongside alternative approaches that can be planned, trialled, piloted and eventually implemented into the system. The visual approach is particularly useful in terms of making it much easier to 'see' what's not working, where there are 'knots' or



overcomplicated aspects of the system, where effort is being duplicated and where it is necessary to plug 'gaps' in the system or to build workarounds.

The key design feature of this approach, therefore, is to map the processes involved in assessment management and to join together different tools to support these processes electronically wherever possible in a way which satisfies both the efficiency and effectiveness imperatives that Yorke identifies in his research. Informed by Mutch's (2002) call for 'a clear set of principles', there are three key design principles behind this solution: institutional agility, affordability and role clarity (p. 167). These should then be used to inform and support procurement decisions. I will briefly amplify these one at a time.

### *Agility*

The principle of agility is bound up with concepts of lightness and flexibility. This concentrates, therefore, on a system which uses tools already in widespread use, which is easy and quick to build and test, and easy to change and adapt as circumstances change. Inherent within this system is the ability to quickly and easily build elements of the system to fill gaps (these can be understood as workarounds, or alternatively as 'glue' to get different tools to talk to each other). Concomitant with this is the ability to easily discard aspects of the system as they become obsolete.

### *Affordability*

The second design principle of affordability comes from several factors in combination. The first of these is the fact that it harnesses the affordances of ubiquitous tools that are already in use in the institution. Where bespoke tools are required (to fill gaps or 'glue' tools together) these are usually relatively small and easy to build, using the skill set already within the institution. The sustainability of the system is also important to its affordability in that the cost of the ongoing support, updating and development of the component tools is built into the system as they are 'covered' by the cost of the site licences in the first place. The general principle behind this, then, is that institutions probably already own most if not all the tools that they need to support EAM; the trick is getting them to work reliably and seamlessly together.

### *Role Clarity*

The final design principle is role clarity. This refers specifically to distinguishing between tasks that are administrative and therefore require administrative skills, and those that require academic judgement and therefore must remain the responsibility of appropriately qualified academic staff. In this design approach it becomes a priority to move as many roles or duties as possible from academic members of staff onto administrative members of staff. Similarly, any role or duty which can be automated and therefore taken away from staff altogether is equally important: if you can get a machine to do it, get a machine to do it.

## **Procurement**

One of the key considerations to emerge out of this strategy is that the evaluation of tools for inclusion in an institution's e-Learning and eAssessment suite must consider the issues of both efficiency and efficacy. This paper now turns to consider a practical example of how this strategy allows us to meet the dual imperatives of efficiency and effectiveness in the operationalisation of assessment management by looking specifically at the issue of plagiarism detection. To do so it considers the affordances of the Grademark and Originality checking tools within the *Turnitin* suite. In particular, it uses a new development that was introduced into the tool as part of a substantial redesign launched towards the end of 2010. This development allows tutors using Grademark to read and mark student work to see an 'overlay' that subtly highlights text in the piece of work that has been identified as unoriginal by the originality checking tool. The result, from the marker's perspective, is that relevant 'unoriginal' text is both easy to distinguish from other 'original' text but remains relatively

unobtrusive to the marking process. As discussed elsewhere in this paper, this distinction between 'unoriginal' and 'original' text is made on the understanding that originality checking within any of these detection tools is not comprehensive. Thus, text that is deemed 'original' by the tool must always be understood as potentially 'unoriginal'.

The way this works in practice is that as the marker works through the paper, any text that is highlighted but which is clearly not plagiarised (because it is, for instance, a quotation which is correctly cited, a common phrase, an essay topic etc.) can be dismissed as of no concern. Similarly, if highlighted text appears suspicious, it is easy for tutors to toggle to the originality-report view to investigate the passage in more detail. If an instance of plagiarism is detected, this tool makes it very easy for tutors to locate the/an original source of the matched text and thereby present evidence to support an accusation of academic misconduct. This tool therefore achieves both of Yorke's imperatives when it comes to the use of digital plagiarism detection tools: it is effective in that it guarantees that all originality reports receive the human consideration required but it is also efficient in that this human consideration can be undertaken at the same time as another task (the reading and marking of student work). In terms of informing a procurement decision, therefore, this tool was considered preferable to alternatives because it allowed academic staff to do two things at once.

By plugging this tool into the 'workflow' approach outlined above, other affordances also bring significant benefits in terms of both efficiency and effectiveness in the operationalisation of assessment management. The efficiency comes to both the administrative and the academic roles of assessment management and can also allow for work to be shifted from academic staff to administrative staff. Some examples of these affordances are:

- embedding the tool within a VLE allows students to securely and seamlessly submit their work through the familiar teaching and learning environment with a single log-in;
- the tool provides automatic date and time stamping, and logging of student submissions, automatically issues proofs of receipt to students, and eliminates the need to gather, sort and distribute submitted assessment to tutors for marking;
- it allows for tutors to use a common-comments bank (made up of ready-made comments and/or their own set of comments built up during the marking process) which automates the process of rewriting the same comments over and over again as common problems are identified;
- it allows the process of mark entry to be moved from a manual process requiring academic responsibility to a batch process requiring administrative skills by allowing for the export of grades from the marking tool, which can then be imported into the institutional student management system.

A final point to make about this design approach is the importance of ongoing vigilance in the evaluation of tools in use for procurement purposes. As proprietary tools develop and grow, checking and maintaining interoperability remains important. It can also come to pass that their development makes other tools in the workflow obsolete. Similarly, if affordances of tools disappear or change, new workarounds may need to be developed. It is important, also, to do this in comparison to other tools in the market. If, for instance, another tool is identified which offers all of the affordances of the existing tool but has further added value, it should be considered as a replacement to that which is already in use.

## Conclusion

It is clear that plagiarism detection on its own is an inadequate and unproductive strategy to address the issue of plagiarism. Instead, a 'holistic' approach to academic integrity is ideal. This paper has argued, however, that despite the controversy surrounding their use, the use of digital plagiarism detection tools forms a small but important part of any 'holistic' approach. Their role is small because one of the principle aims of such an approach is to drive down the incidence of plagiarism in the first place. Their role is important for two key reasons: first because they act as a powerful deterrent, and as such they can be an important factor in the 'driving down' process. Secondly, they are useful because they offer a means of more effectively identifying instances of cheating that occur regardless of this strategy. These tools must, however, be used in ways which are both consistently rigorous and rigorously consistent. To achieve this necessarily requires human intervention. This, in turn, brings significant workload implications and brings to the fore the fact that as well as being a vital part of any 'holistic' approach to academic integrity, digital detection tools must also be carefully chosen and used within a whole assessment management approach. Getting this right is a fine balance. On the one hand it must satisfy quality assurance requirements without needing a radically over-engineered (and therefore expensive) means of achieving it on the other.

To achieve this balance, this paper suggests that Mantz Yorke's imperative that we seek to operationalise assessment management strategies in ways that are both effective and efficient is crucial. It suggests that this can, for the first time, be realistically achieved in the area of academic integrity and plagiarism detection because of the affordances of technology, specifically digital detection tools. It argues that by operationalising assessment management through a business-process approach, both the effectiveness and efficiency of assessment management and plagiarism detection can be improved.

In a 'cut-and-paste' era, where cheating has never been easier or more tempting, developing students' integrity is more vital than ever. At the same time, in a period of decreasing resource and increasing pressure on academic and administrative staff, and on the higher education institutions for which they work, such simultaneous improvements in quality and economy are vitally important to the ongoing viability of institutions and the protection of their academic reputations across the sector. Digital plagiarism detection tools are a vital part of achieving success on both fronts.

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### About the Author

Since 2005, Cath has been working as a principle lecturer in English Literature at the University of Huddersfield. Prior to that she was a lecturer in English in the Faculty of Arts at the University of Wollongong, New South Wales, Australia. Her research interests include postcolonial literature and culture, and pedagogical research, particularly in the field of Technology Enhanced Learning. In 2010 she was awarded a National Teaching Fellowship by the Higher Education Academy and is currently leading a project evaluating the benefits of Electronic Assessment Management.