

# Streamlining Plagiarism Detection: The Role of Electronic Assessment Management.

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## 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; that 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. Arguments were being made, however, about the increase in plagiarism when the world wide web was nascent and evidence in the literature that plagiarism is 'endemic' stretches back to the 1940s.<sup>1</sup> Whatever is to blame, wherever the causes lie and whenever the problem arose the scholarly evidence is clear: the incidence of cheating in general and plagiarism in particular is on the rise. As Chris Park 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' (Park 2003).<sup>2</sup> As the incidence of plagiarism has grown, the means and mechanisms used by students have also become more sophisticated (particularly with so-called 'essay mills'). Concomitantly, the tools and strategies used by academic staff to detect plagiarism and prosecute students for it have grown in sophistication as well. What has emerged is a kind of 'arms race': as Colon puts it 'the Internet may make it easier to copy, but it also makes it easier to expose the copier' (Park 2003). 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 the new fee structure in the UK, from increasing student expectations, or simply from media attention.<sup>3</sup> 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 the workload implications of plagiarism detection as part of the larger issue of assessment management. It looks specifically at the potential for Electronic Assessment Management (EAM) to provide solutions to this problem. While the issue of assessment management falls, as Mantz Yorke 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 (Yorke 1998). Writing in the late 1990s, he observed that this area is under represented in the literature (Yorke 1998). A decade and a half later, this remains the case. 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. Yorke here is interested in the 'big picture' of assessment management but

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<sup>1</sup> In the titles of their articles from the mid-1990s Paldy refers to cheating as a problem that 'won't go away' (Paldy 1996) and Alschuler and Bliming refer to it as an 'epidemic' (Alschuler and Bliming 1995). Hart and Friesner quote studies published in 1941 and 1964 which indicate that cheating was a significant problem even then (Hart and Friesner 2004). Together these suggest both that the perception that the problem is getting worse may not be founded in fact and that the information revolution isn't entirely to blame

<sup>2</sup> Elsewhere in this paper, Park indicates 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 (McCabe and Bowers 1994; Diekhoff et al. 1996; Park 2003).

<sup>3</sup> See for instance MacDonald and Carroll's case studies on the University of Newcastle, New South Wales, Australia, and on Sheffield Hallam University, South Yorkshire, United Kingdom (Macdonald and Carroll 2006).

my paper is particularly interested in one subcomponent of it: what he refers to as operationalization.<sup>4</sup> It offers a point of focus within it; this is, specifically, a response to Yorke's call for the establishment of 'appropriate structures and mechanisms' which support 'systems for assessment activity' 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).

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, 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' (Macdonald and Carroll 2006). 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 and Carroll 2006).<sup>5</sup>

Even with a holistic approach in place, as Macdonald and Carroll themselves acknowledge, '[t]here may always be some students [...] who will cheat' (Macdonald and Carroll 2006). As the literature shows, there are many and varied reasons why students cheat. Park lists the causes as: genuine lack of understanding, 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 (Park 2003). In this context, it is clear that detection continues to play an important role in institutional academic integrity and assessment strategies. 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 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' (Park 2003). There is a large and growing body of evidence that the use of digital detection tools, such as Turnitin and SafeAssign, do have a significant deterrent effect (Davis and Carroll 2009).

The use of digital plagiarism detection tools remains controversial in the academy. Many academics have been and remain suspicious of these tools and their place within the academy and this suspicion is well represented in the literature. Maruca talks about plagiarism detection tools through a

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<sup>4</sup> 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, and Tambi 1999).

<sup>5</sup> 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 careful data collection and analysis on the occurrence of cases (Macdonald and Carroll 2006). The holistic approach also stresses the importance of 'designing out' plagiarism by taking opportunities to eliminate assessment tasks which are more likely to tempt students to plagiarise (for example by making it easier to do so or seem less likely that they will be caught). If this is not possible, for whatever reason, finding ways of mitigating against plagiarism (for instance by requiring students to defend their work through a viva voce examination) are also important. For more detail on strategies for designing out and mitigating against plagiarism, see (Carroll 2007; Carroll and Appleton 2001). For more information on how technology can be useful in this process, see for more detail see (Hart and Friesner 2004).

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' (Maruca 2004). Peter Levin uses the same policing discourse in his critique, arguing that Turnitin is 'demeaning of meaning' in that it places student writing into 'one of two categories: original or potentially plagiarised' (Levin 2006). On the other side of the debate, scholars such as Davis and Carroll argue that it can 'be a useful support to other traditional teaching methods when used formatively' (Davis and Carroll 2009). This paper suggests that in the aforementioned 'arms race' and alongside other formative, developmental and mitigating strategies, the use of digital plagiarism detection tools remains important because of their deterrence effect alongside 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. 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 discipline-specific expertise as well as marking experience of the individual doing the marking. Inevitably, the power of this 'tool' varies from marker to marker; for instance 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. The use of 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.<sup>6</sup> 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. 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.<sup>7</sup>

One thing that is common to all of these tools 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 explain, they have 'the purpose of highlighting students' unoriginal work' (Davis and Carroll 2009). As such, they still require interpretation by qualified and trained staff in order to ascertain whether or not un-original text found by them constitutes plagiarism or not.<sup>8</sup> This is

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<sup>6</sup> 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.

<sup>7</sup> For a more comprehensive list of plagiarism detection tools see (Barrón-Cedeño 2012 p.50)

<sup>8</sup> In this instance the 'qualified' refers to academic qualifications whereas 'training' refers to being trained in the use of the tool itself. Davis and Carroll cite the research of Peacock, Sharp and Anderson 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, Sharp and Anderson 2006 cited in (Davis and Carroll 2009). My own anecdotal experience of providing staff development training and support to academic colleagues both within and outside my own institution as well as my experience backs this up. I have experienced countless instances of academic staff misinterpreting originality reports as if they were plagiarism reports. In a similar vein, my experience as an academic misconduct officer and my long-term twitter search on the term 'turnitin' has uncovered numerous instances of students misinterpreting Turnitin originality reports in similar ways. Many students' tweets demonstrate a misunderstanding that their key aim should be to achieve a low or 0% return on their originality report: @verobellax3's tweet on Wed 6 June 2012: 'My turnitin copy percent was zero © ohhay'. @Yossy623, tweeting on Wed 24 March 2011, offered advice to @itsonwithlvonne: 'Try to cut down the big quotes..when u turn it in on turnitin for final it will show high % of plagiarism'. Other tweets show clear misinterpretation of Turnitin originality reports as

especially true where students have deliberately attempted to 'cheat' or fool the digital detection tools to mask the cheating they have undertaken in their writing.<sup>9</sup> Advice on using these strategies for 'cheating' the system are available on the internet and all of them usually 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. The whole process of managing plagiarism detection is most usefully considered, as Mark Prensky suggests, as a machines vs 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 (Prensky 2011).

The simple fact of the matter is that 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 plagiarism has occurred.

Having said this, there remains the fact 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 which 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 and therefore identified as unoriginal does not, in itself, offer proof that the writing is actually original to 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.

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, 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 the '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 and usually 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. It goes without saying that all of these truisms bring with them substantial human resource implications.

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plagiarism reports: @gardsmyd on Thu 29 July 2011 'According to turnitin.com My paper is 10% plagiarized. All my flags were my SOURCES. THANKS, ASSHOLES.'; @megstermonster on Sun 9 May 2011 'i hate turnitin.com its probably gonna make me change a bunch of shit even though its my own work.' Some tweets even demonstrate the misunderstanding of academic staff such as @raquel036 who tweeted on Fri 22 October 2011 'yay.my professor said i got a 3% result in TurnItIn & my score is one of the best he's seen while he's taught at DeVry and used this tool :O'

<sup>9</sup> For research on attempts to circumvent plagiarism detection tools, see (Gillam, Marinuzzi, and Ioannou 2010; Barrón-Cedeño 2012).

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. Apart from the very specific requirements that these tools have in order to work effectively (they may only pick up, for instance, quoted material inside double not single quotation marks or indented quotations) they are also employed by some of the 'cheating' strategies (as mentioned above) that are widely promulgated on the internet. It remains the case that academic staff (humans) are more likely to be able to dismiss un-original text as not plagiarised (eg. 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. These staff are also already burdened with a significant and growing amount of marking labour. Anything that can streamline this process is, therefore, vitally important, especially in an age of austerity. Any approach to streamlining the use of digital detection tools, however, should be considered as part of the whole assessment management process. 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 operationalization of a system that was primarily paper-based. Arguably finding efficiencies in paper-based systems will never be possible because of the labour-intensive nature that handling paper-based data brings with it. Over a decade later, 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 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 operationalized 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 which can achieve economy of scale are particularly attractive. Economy of scale is primarily achieved by tools which allow for:

- the reduction or ideally the total elimination of duplication of effort and/or unnecessary processes;
- batch handling of things which were previously handled individually (such as mark entry);
- the automation of processes that were previously undertaken manually (such as date and time stamping and logging student submissions, issuing proofs of receipt etc)
- people 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 in the case study below.

One approach that some institutions have used to address this issue is to build a single tool that deals with all aspects of the assessment management process. One of the most successful examples of this approach has been the design, development and implementation of the Electronic Tutor Marked Assignment (ETMA) system at the Open University. As a very large and entirely distance-learning institution, moving to electronic submission, marking and return makes economic sense. Few other institutions, however, have the scale and capital reserve required make such an approach cost effective. Other problems emerge with this strategy as well, not least of which is rigidity that makes it difficult to adapt to different disciplinary and cultural circumstances and the on going expense of supporting and maintaining the tool.

## Operationalisation

This paper reports 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 work-flow 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 work-flow approach allows existing processes within the system to be mapped alongside alternative approaches which 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 necessarily 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. There are three key design principles behind this solution: institutional agility, affordability and role clarity. 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 relatively small and easy to build by using the skills set already owned by the institution. The sustainability of the system is also important to its affordability in that the cost of the on-going support, updating and development of these 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 Electronic Assessment Management; the trick comes from getting them to work safely, reliably and seamlessly together.

## Role Clarity

The final design principle is role clarity. This refers specifically to distinguishing clearly between roles which are administrative and therefore require administrative skills, and those that require academic judgement and therefore must remain the responsibility of appropriately qualified academic members of staff. Any role or duty which can be moved from an academic member of staff to an administrative member of staff is a priority in this design approach. Any role or duty which can be automated and therefore taken away from staff altogether is another priority. Here the principle at work is: if you can get a machine to do it, get a machine to do it.

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 operationalization 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.<sup>10</sup> This development allows tutors using Grademark to read and mark student work to see an 'overlay' that 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 appears with a very light, pink highlighting making it both easy to distinguish from other 'original' text but also relatively unobtrusive to the marking process.<sup>11</sup> Turnitin is the only tool which offers this feature (SafeAssign does not offer an inbuilt marking tool so this efficiency gain is not available within it).

The way this works in practice is that any text which 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 as the marker works through the paper. 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

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<sup>10</sup> Because the Turnitin suite of tools is web-based, this upgrade became immediately available to all license holders at the same time.

<sup>11</sup> This distinction between 'unoriginal' and 'original' text is made on the understanding that originality checking within any of these detection tools is far from comprehensive. Thus text which is deemed 'original' by the tool must be understood as potentially 'unoriginal' whereas text which is deemed 'unoriginal' by the tool can be considered to unambiguously 'unoriginal'.

accusation of academic misconduct.<sup>12</sup> 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) is being undertaken. 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 'work-flow' approach outlined above, other affordances also bring significant benefits in terms of both efficiency and effectiveness in the operationalization 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 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 as a .csv file which can then be imported into the institutional student management system.

A final point to make about this design approach is the importance of on going 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 work-flow obsolete. Similarly, if affordances of tools disappear, 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

This paper has offered a specific and targeted response to Mantz Yorke's imperative that we seek to operationalize assessment management strategies in ways that are both effective and efficient. It has done so by considering specifically the role that technology can play in achieving this. To do this it has explored the specific issue of plagiarism deterrence and detection through the use of digital detection tools. It has argued that by operationalizing assessment management through a business-process approach, it is possible to build a system that is entirely electronic. By doing this, it has shown how both the effectiveness and efficiency of assessment management can be improved and how this is specifically important for plagiarism detection purposes. In a time 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 on going viability of institutions across the sector.

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<sup>12</sup> The presenting of evidence can also be undertaken in an electronic or paperless way by printing the relevant materials to PDF and highlight/annotating the documents using the text-markup tools available through Adobe Acrobat Professional software. Alternatively, the Turnitin originality report itself can be printed to PDF if it is considered to provide adequate evidence. In PDF format, these documents can easily be distributed electronically to all appropriate parties (the academic conduct officer, the student etc) or, if required, colour printed as paper-based documentary evidence.

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