



Rights and Rewards Project

Workflow Mapping and Stakeholder Analysis: Final Report

S. Loddington, M. Bates, S. Manuel, C. Oppenheim

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1. Introduction

1.1 Background

The Registry of Open Access Repositories (ROAR, 2006), shows that there are 69 Higher Education (HE) Institutional repositories in the UK, with 60 of these being devoted to research material. There are very few institutional teaching and learning material repositories in the UK, and these repository types seem to exist on a much wider scale at present. An example of which, is the JISC's Online Repository of [teaching and learning] Materials (JORUM). There is a clear need for investigation into institutional repositories that contain teaching material. According to the Digital Repositories Road Map, which represents JISC's vision for 2010, we need to carry out analysis of existing business processes, workflows and dataflows; identify opportunities for innovative inter-working between repositories and between repositories and other applications (Heery & Powell, 2006). The Community Dimensions of a Learning Object Repository (CD-LOR, 2006) project team have already been looking into workflows with regards to learning objects and the Repository Management and Metadata (RepoMMan, 2006) have been investigating research output workflows. We are looking into workflows related to teaching material.

1.2 Introduction to the project

The two year *Rights and Rewards in Blended Institutional Repositories* project is funded under the Joint Information Systems Committee (JISC) Digital Repositories Programme (2005). The project began in August 2005, at Loughborough University, which is home to three project partners; the Department of Information Science, the Engineering Centre for Excellence in Teaching and Learning (EngCETL) and the University Library. Our primary aim is to create a demonstrator repository of teaching and learning materials at Loughborough University, which reflects the findings of the project.

We have already carried out a motivational study, in which a wide scale survey was undertaken with UK Higher Education (HE) academics, support personnel and library staff. The aim was to establish which types of rewards and incentives were influential with regards to contributing to a repository of teaching materials. Likewise, any barriers that exist amongst these groups and individuals were also sought. Questions were based upon past, current and future use of repositories. The results can be found on the project website at <http://rightsandrewards.lboro.ac.uk/index.php?section=21> .

1.3 Aims and objectives of the study

The aim of this study was to follow on from the survey by interviewing academics at Loughborough University to investigate the processes and people involved with creating teaching material and making it available. Others, who assist in these processes have also been identified. From this, academic, end user and other stakeholder requirements for a repository of teaching materials were revealed so that the project can best cater for these different groups when designing the final demonstrator repository.

The workflows identified from the interviews and from other research were mapped to show the similarities and differences between teaching material and research output workflows. Commercial workflow processes have also been investigated.

Heery & Anderson (2005) ask how do repositories relate across the ‘service domains’ of research teaching and administration? This is unclear within institutions at present. The stakeholders within each of these service domains – of research, teaching and administration – need to be identified within an Institution, in order to understand the differing requirements of each group and how their workflows might impact upon and be changed by the use of a teaching and learning repository. A stakeholder analysis was carried out on the groups identified from the workflow study. These groups fall into the distinct categories of ‘functional’ and ‘non-functional’ stakeholders. Functional stakeholders carry out roles directly relating to the day-to-day functioning of the repository, such as; academics, librarians, educational developers, support staff. Non-functional stakeholders are groups that need to be kept informed about developments and who have an overarching stake in the success of the repository in line with the needs of an institution.

2. Methods

2.1 The methods

Many of today's repository systems are focused around technology and interoperability. The IBM User engineering approach differs from this in that it focuses on the different user groups associated with the system. This design method is a significant evolutionary advancement in the process of developing offerings that satisfy and delight users, as well as the stakeholders who invest in bringing them to market. (IBM, 2006a).

The method focuses on the six principles of user centred design in order to develop a system which is based around the 'total user experience' as shown below;

1. Set Goals
2. Understand users
3. Assess competitiveness
4. Design total user experience
5. evaluate design
6. Manage by continual user observation (IBM, 2006b)

The second principle of 'understanding users' is what the interviews have been focusing upon. The stakeholder analysis which has been conducted as a result of the interviews has helped to understand the different user groups of a teaching and learning material repository. Subsequent principles such as 'designing the total user experience' will be focused upon at a later stage within the project where we will design a demonstrator repository.

2.2 The interview questions

The questions for the interviews were devised by the project team under similar headings as the Rights Rewards Survey. A brainstorming session took place to identify questions under the headings in table 1. Two separate pilots were undertaken with one academic in the Faculty of Engineering and one in the Faculty of Social Sciences and Humanities. The purpose of the pilots was to test the wording and appropriateness of the questions and to gather input from a sample of the target audience.

The fifteen questions (see appendix A) were split into the following six sections;

| |
|--|
| A. Teaching material |
| B. Other peoples material / copyright |
| C. Making material available to others |
| D. Support / stakeholders |
| E. Repository use |
| F. Finally... |

Table 1: The six sections of the interview questions

2.3 The interview participants

Ten academic interviews were conducted at Loughborough University on a one-to-one basis with a member of the project team. Six of which, were academics in the Faculty of Social Science and Humanities, three were from the Faculty of Science and one was from the Faculty of Engineering. The idea was to gather information from participants within a variety of disciplines. The participants were selected at random from the faculties and were contacted through e-mail invitation. The University's (primary?)VLE – Learn, was accessed to identify those who created large amounts of material using multiple file formats and then shared via the VLE. Thirty-Five e-mails were sent out, consequently, the positive response rate was 28.6 percent. Five participants responded to the e-mail but stated that they were unable to take part for different reasons.

Participants were made aware of the study's aims through the e-mail invitation and a introductory sheet which was given to participants at the beginning of the interview. This sheet also included a glossary of terms. In endorsement to the above, a verbal explanation of the project was given to the participant as each interview commenced. They were informed that their comments would not be ascribed to them personally and that the information recorded would be written up and sent to them to examine before it was entered into any reports.

The interviews varied in length from 30 minutes to 90 minutes, with the average interview lasting for 45 minutes. Each participant was asked if they would be willing to be observed when creating their teaching material, in case of further investigation.

3. Interview Outcomes

3.1 Introduction

Each interview was written up (see appendix B) and checked by the participant for errors and misinterpretations.

3.2 Question 1: The creation of teaching material

Talk me through the process of how you create your digital teaching materials. Could you go through this step-by-step, say exactly what you do and don't assume that we know anything?

A number of different scenarios were produced as a result of the above question.

Scenario 1

When creating material from scratch it was common that the following would take place;

1. Identify need or idea for new teaching material
2. Create a plan of sessions either in own head or on paper
3. Create a document (or a number of documents) per session. The same document could be created in a variety of formats
4. Make the material available on VLE (before/after the session or start of semester/year)

Scenario 2

When editing material using existing materials previously created by themselves then the first decision is to decide whether major or minor changes are to be made.

If major changes are needed, then the following steps would be most common;

1. Obtain a copy of the material
2. Review materials in relation to new developments and current affairs. Depending on the subject, the material may not change much.
3. Carry out some research or reading around the topic (if necessary – might have done this throughout the year) or collaborate with others.
4. Make the appropriate changes to the material, so that it is ready for the forthcoming session.
5. Make the material available on VLE (before/after the session or start of semester/year)

If minor changes are needed then the following would be most common;

1. Obtain a copy of the material
2. Make the appropriate changes to the material
3. Upload the material to the VLE (before/after the session or start of semester/year)

. The material may also be changed (in a major or minor way) for other reasons listed below;

1. Changes to module specifications mean that a part is dropped from a module and either covered in a different module or forgotten altogether
2. Students provide feedback through module feedback forms or personal communications with the lecturer about incorporating/dropping material.
3. The lecturer wants to refresh the look and feel of the material so that they do not get bored with seeing the same material from year to year.
4. To incorporate more interactive elements into the material, meaning that the existing material has become somewhat redundant

Scenario 3

When creating material using the material that was created for a module by someone else, one of two things can happen;

1. The material is disregarded and new material is then created from scratch as described in scenario 1
2. The material is adapted like in scenario 2

However, it was mentioned that in the unlikely event of material being passed on, it would be even more unlikely for the person receiving it to use the exact same material.

3.3 Question 2: File types and formats of teaching material

In the main what types of files do you create? E.g. text documents, image files, sound files, movie files and what file formats do you use? E.g. .doc, .ppt, .pdf, jpeg, .bmp

The participants' used a variety of file types and formats when creating teaching material. Table 2 below, shows these files, including the number of participants who used them which is shown in brackets;

| | |
|---|---|
| <p>Text files</p> <p>Microsoft Word (9) PDF (4)</p> | <p>HTML files</p> <p>HTML (8)</p> |
| <p>Other Microsoft Office files</p> <p>Microsoft Access (1) Microsoft Excel (3) Microsoft PowerPoint (6)</p> | <p>Image files</p> <p>BMP (1) GIF (4) JPEG (2)</p> |
| <p>Video/Animation files</p> <p>Flash (1) QuickTime (1)</p> | <p>Other files</p> <p>CAD (1) FileMaker Database(1) Hot Potatoes (1) LaTeX (1)</p> |

Table 2: The different files used by the participants

Microsoft Office applications were very popular amongst participants. Two out of the nine people that use Microsoft Word, stated that they did so because they have been encouraged by senior management to use this format. On both occasions, participants mentioned that the practice at Loughborough was to use Microsoft Word for text files. This comment has significance, meaning that the majority of people use it because other peers are doing so. This shows that it is embedded into the culture of Loughborough University to use this particular application and that management and peer influence have an effect on which is used. One participant stated that they did not use Microsoft Word because it is poor when handling large files and therefore LaTeX is preferred which is better suited to large files.

Some applications were criticised as not being useful in relation to the subject being taught and it was mentioned frequently that particular applications were used because they best suit that subject. One participant criticised Microsoft PowerPoint as being an application that makes students go through the subject too quickly, giving students inadequate time to take in each slide before the lecturer would

move onto the next. The subject being taught was mentioned as being partly blamed in this instance, due to its mathematical nature, in which students take a longer time to grasp compared to other subjects. One participant argued that Microsoft PowerPoint was a professional way to display lecture material and was suitable for that particular subject being taught.

3.3.1 Multimedia files

The most common multimedia files were the use of images and diagrammatic files which the majority of participants used on a frequent basis. However, only two participants stated that they use files such as those of sound and video. Three participants stated that they would like to incorporate more interactive materials by using multimedia but have not done so and two participants had investigated more interactive types but had not used them. The general feeling was that multimedia files (such as video and sound) add value to teaching materials but the following problems outweighed the benefits;

- Copyright issues
- Complexity of producing multimedia files or transferring files to multimedia types was high.
- Not having the necessary skills to produce the files
- The time cost involved with producing materials and setting equipment up to present these files.
- Students can have problems, e.g. they cannot listen to sound and video on campus without headphones as this may disrupt the working of others.
- Equipment for creating/running multimedia materials not available,
- The files could have a negative effect on the student e.g. video files of a lecture could reduce attendance.

The last point could be argued so that video and sound could have a positive effect on students because it would allow students to take part in distance learning.

3.3.2 Assessments

Assessment teaching material in the form of coursework, exam questions and tests are produced by many of the participants. The following types were identified in table 3 below;

| |
|--|
| Applied Exam Questions (1) |
| Applied Coursework Questions (1) |
| Computer Aided Assessments (Multiple Choice) (5) |
| Case studies (1) |
| Hot potatoes class tests (1) |
| Optical Mark Reader tests (1) |

Table 3: Assessment types

Two participants mentioned that a repository would be useful for assessment material, which backs up the findings of the Rights and Rewards Survey, with many participants giving similar comments.

3.4 Question 3a: Refreshing and updating teaching material

How do you handle the process of refreshing or updating your material?

All participants stated that updating/refreshing material is fairly straightforward and that versioning had never been a problem. Difficulties are uncommon due to the following reasons;

1. Nothing ever gets deleted so can always access older versions if needed.
2. At the end of each year all material is copied onto a separate disk so that everything is backed up.
3. The most up to date version is the one on the VLE, so this version is used as a benchmark for being the most up to date copy.
4. Material is updated on a yearly basis and this version stays the same for the whole year, not needing a new version until next year.

One participant stated that in relation to jointly run modules, if material is not updated in tandem with the other people involved then it would be possible that the material that is made available is a mixture of old and new material, causing confusion for staff and students.

3.4.1 Question 3.b: How often do alterations and revisions take place?

When do you do this/ How often? Is this for minor alterations or major revisions?

With regards to minor changes, all participants would make these changes as and when they are required. A minor change could happen in the event of the following;

1. Spelling mistakes are noticed either by the participant or students
2. A new resource is discovered part way through a module
3. To add new current affairs to the material

Major changes are usually made during the summer months. It was mentioned by the majority of participants that material would not change much from one year to the next. However, it would be rare for the material to not change at all. There would be mostly a few changes, either to the context of the material or to a session topic so that it was slightly adapted to teach a different angle of the subject. At the very minimum, all materials were reviewed and some minor changes would occur. However, there were a number of factors that would signal major changes including;

1. Changes to a student programme meaning that a module may be needed to be written in a different context.
2. Student feedback.
3. Broader changes to the department's aims could mean that senior management want to change a module significantly.
4. Major developments in a particular field (some fields change quicker than others).
5. The lecturer was getting tired of teaching the same material.

With regards to those factors that have the most impact, changes to student programmes might be out of the lecturers' control, however, two participants mentioned that student feedback from module feedback forms and personal communications would have a significant impact on the changes made.

One participant stated that their materials would change pre and post lecture depending on the outcome(s) of the session which is less of a rigid approach to take. It makes sense to tailor the material around what happened in a particular session instead of having a fixed set of material that may not reflect the session's outcomes.

One participant mentioned that checking and updating links that were embedded into teaching material was a difficulty, to ensure that material did not present any broken links.

3.4.2 Question 3c: The length of time teaching material is available

What length of time are files made available for?

There was a clear difference between participants for the length of time files were available for (e.g. all year or all semester) and when the files were made available (e.g. before or after the lecture).

Figure 1 shows the different variations that the material could be made available for on the VLE;

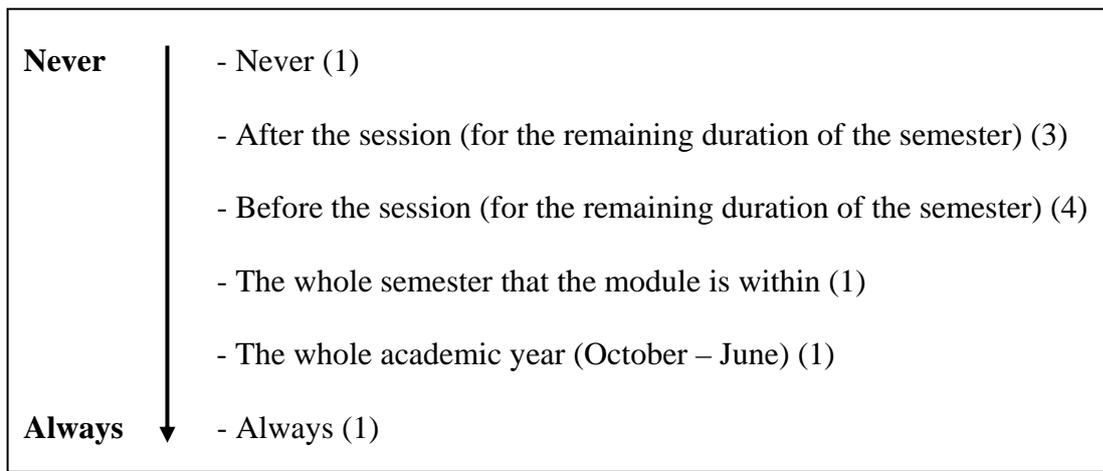


Figure 1: The different amount of time that material can be made available

Some academics would do more than one of the above with different types of material for example they might never put lecture slides onto the VLE but would upload a summary after the lecture. Also, they might put some material up before and some afterward. It is down to the personal preference of the academic and what they feel most comfortable doing. Some argue that making teaching material available via online systems will effect student attendance. Again, this may depend on the subject being taught, because in the School of Art and Design, pupils cannot pass the course without 100% attendance at sessions. Therefore the amount of material made available to students via online systems would be irrelevant in this case.

3.5 Question 4: Teaching material access problems

Have you had any problems with accessing files you have created in the past?

None of the participants had come across any access problems themselves but two reported that some students had problems accessing files before. This was due to material being available in formats that were not interoperable with multiple operating systems. It was also mentioned that a problem with PDF

files is that it requires users to have Adobe Acrobat installed on their PC, but due the software being free and easily available this problem can be quickly solved.

The lack of problems is usually due to the following;

1. The use of common applications (such as Microsoft Office applications) to create material, means that it would be very rare that themselves and others would have problems accessing it due to software becoming obsolete
2. In the main, the files created work on a variety of platforms and therefore are very interoperable.

3.6 Question 5a: Resources to enrich teaching materials

Where do you look for resources to supplement or enrich your teaching materials (text, images, graphs, sound)?

Table 4 shows the different places that are visited and the types of material found;

| Subject-general services | Types of resources |
|---|---|
| BUBL Information Service (1) | Lists of resources (links) based around the Dewey Decimal Clarification System so a very subject-general service. |
| Cambridge Science Abstracts (CSA) (1) | Full text and bibliographic databases |
| Google (3) | General resources in multiple formats |
| Google Scholar (1) | Journal articles |
| Government Website | Statistical data |
| Meta Lib (1) | A subject general portal, similar to BUBL that gives links to e-journals, databases and WebPages. |
| World Wide Web Consortium (1) | A great number of publications and recommendations in a variety of formats and on a mass of topics. |
| Wikipedia (1) | Definitions, general information |
| Subject-specific services | Types of resources |
| British Plastics Federation | Subject specific service |
| Econ-Lit (1) | Powered by the American economic association and provides international resources on economics |
| Higher Education Academy Site (4) | Subject specific resources recommended by others in the field. |
| International Colour Consortium Website (1) | A range of resources for Art and graphics in PPT, PDF & HTML. |
| Organisation for Economic Co-operation and Development (OECD) (1) | Economics |

Table 4: Different services used by participants

3.6.1 Question 5b: Places visited to enrich teaching materials

If so, where do you get this material from, which places are visited?

Subject general websites, databases and electronic stores were most popular which was an opposite finding of the Rights and Rewards Survey, however, the survey represents a much larger and diverse sample of people. Subject specific services were less popular as shown in table 4, but it was significant that nearly half of participants stated that they would go to subject specific HEA sites. One of which criticised a HEA site for not doing enough to identify commonalities within the particular field.

Google was mentioned by three participants as being good for ‘broad searching’ a subject, and Google Scholar (2006) was mentioned as being good for finding new articles but did not cater for older articles. However, a reason for this, might be that Google Scholar is a relatively new service that only been around since November 2004 and is still in an early stage of operation.

Participants stated that finding new resources has been helped through the introduction of MetaLib, CSA and BUBL who provide links to a large number of resources in many fields. Only one participant mentioned that they would contact people who they have met through conferences, events, projects and meetings for items to enrich their teaching. A repository of teaching materials would give academics access to material in one, centralised place, and reduce the amount of time that is spent on visiting a mixture of all-subject and subject based services, such as the ones mentioned in Table 4. The general consensus was that academics would look for materials to enrich their teaching in the same places each time. Time limitations was mentioned by participants as being a barrier to searching for different resources and they would normally go ahead with the best resources found within these preferred services. This does not mean that academics would settle for anything when searching for a particular resource but instead find the most suitable resources from the ones that were available.

Only one participant mentioned that they look for material (other than content) to help them teach and they stated that ‘how to’ documents are important because “part of teaching and learning is the exposure to face-to-face contact, enthusiasm, inspiration and direction”.

Other places mentioned included, Loughborough University’s Professional Development training courses, personal research, departmental meetings and a variety of text books and websites related to a particular subject area.

3.7 Question 6: Third party materials

What types of third party resources e.g. images, diagrams do you incorporate into your teaching?

Diagrams were the most common third party resources that were incorporated into teaching materials. Two participants said that if they could not get copyright clearance on the diagrams then they would re-draw them. One participant said that they would like to be able to draw better diagrams by attending a course which would allow them to be taught how to create good looking diagrams very quickly.

Only one participant would use third party video files such as QuickTime or animations such as Flash. None of the participants used sound (other than that in video files) and when asked about different multimedia types three participants admitted that they would like to use video, sound and images more widely but have never done so. The main reason for not doing so was due to time constraints.

All participants said that any material used which was not their own would be cited so that students could then access the original resource if they wished to.

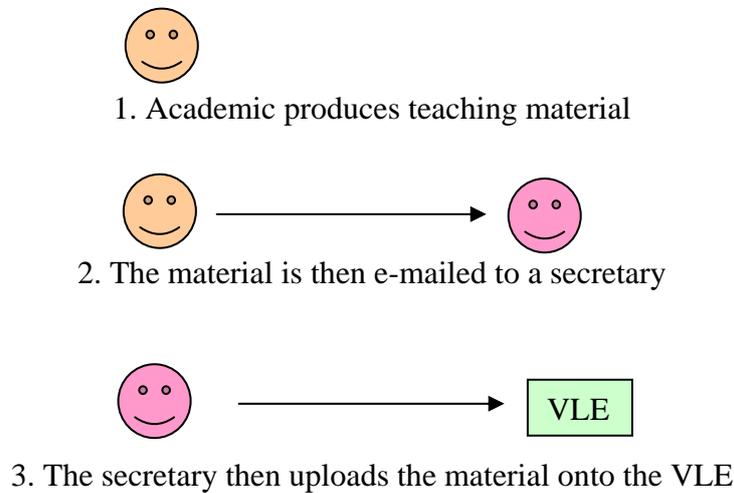
Three participants stated that they did not use any third party materials in their teaching.

3.8 Question 7: Making teaching materials available

Talk me through the processes of where and how you share or make materials available to students?

All participants make their materials available on the Loughborough Learn VLE and two one participant stated that they shared materials in other stores, being websites. Two participants do not put all of their materials on the VLE but do at least have some available. It was clear that participants were getting confused as to the differences between VLE's and a repository. Two participants said that they were happy for all of their materials on the VLE to be harvested into the repository. A couple of participants stated that they make their materials available upon request, to a variety of people both internally and externally. This was done on an ad hoc basis and usually with people that they know.

One participant mentioned that a secretary assists them, when making their teaching materials available. This participant stated that the following process happens;



It was mentioned that one secretary would cater for around four academics. It was unknown whether this was common practice, but the opportunity to use the secretary for uploading materials was available, if wanted.

3.9 Question 8a: Assistance from others

Q8a. Do others assist you in the process of creating and making materials available? For example:

a. From within your faculty e.g. teaching help at a faculty level.

Two participants stated that they had been given help by the faculty's Online Learning Development Officer (OLDO).

b From within your department: mentors, peers, colleagues, administration team or IT staff

Five participants were able to answer this question and they highlighted the following;

1. IT support - within department (2)
2. Learning and Teaching Co-coordinator (2)
3. Personal Secretary (1)
4. Technical Tutor (1)

The learning and teaching co-coordinator was recognised by two participants as being a champion in introducing new ideas to academics within the department. One participant stated that they would be

able to get IT support within their department. It was acknowledged that not all departments would have a similar individuals/groups that could advise department members on IT issues. One participants said that most academics within their department get to know people that can help them with a range of things, even if their job is not specifically designed to deal with these requests for help. Some individuals have talents that some people know about and others are unaware of.

Two participants had taken a period of secondment to research into different software packages and investigation into what other lecturers needed help with. This was beneficial in that the participants were able to discuss these issues with others who had similar teaching interests.

c. From within your subject area: professional groups;

HEAs were mentioned by two participants as being useful to ask professionals and peers within the subject area for advice on a number of issues.

Two participants stated that they might ask for support or guidance from professionals that were met at a number of events and throughout their careers.

Other support mentioned was;

- External examiners – providing feedback
- Links with industry – making students more employable
- Academic scholarships, journals and conferences

d. Areas outside your field: University support staff, University Library, IT support, Professional Development, teaching specialists or Learning Technologists.

Three participants had received support from Professional Development on Computer Aided Assessment (CAA). This was thought to be valuable assistance with setting up tests and questions. However, a common problem amongst academics is finding new questions from one year to the next and one participant stated that coming up with three wrong answers that were feasible was very difficult. A repository with a question bank was mentioned by three participants as being extremely useful to them to find new questions including those questions in a multiple choice format.

Professional Development training courses were monitored by two participants who were interested in attending new courses that were relevant to their teaching.

Two participants said that the library support staff had helped them on a number of occasions including creating online reading lists, recruiting a 'brought in' speaker for a lecture and by making suggested material available.

3.9.1 Question 8b: Types of assistance

If so, what assistance do they give?

All participants mentioned that they could get help if they wanted to and knew of the support available to them. However, the time taken in getting others involved with a problem can be costly. Most participants were content on working alone in the way that they best know, although some participants admitted that it was not always the efficient way of completing a task.

3.10 Question 9: Collaboration during the creation of teaching materials

Q9. Are there any colleagues or groups that you work together with to create teaching material? If so who and how?

Two participants stated that they worked with other people to create material.. Eight participants worked alone to create teaching materials and even in the event of joint modules, topics were split up so that different people would create their own material separately. When asked, none of the other participants knew of any peers that created materials with other people and on the whole, working in teams or groups was quite rare.

However, there were six participants that would collaborate with others on ideas either formally (i.e. in a meeting) or informally (i.e. in ad hoc conversations) with colleagues but not actually sit down with them to create material.

3.10.1 Formal collaboration practices at Loughborough University

From the interview results, formal practices of collaboration are minimal compared to more informal methods. However, one participant stated that they have meetings in their department to discuss teaching as well as having informal discussions with others. Also a core seminar is held where all lecturers agree to the teaching materials for the department. This is not the case for the majority of academics, who, rely on more casual ways of collaborating.

3.10.2 Informal collaboration practices at Loughborough University

One participant mentioned that they take every opportunity to share their resources with others and have created an “informal web” of people who share ideas with each other. Colleagues were also consulted with ideas and were an easy way of sharing teaching and research ideas. There are many people that an academic will have conversations or meetings with to collaborate informally. Usually on an ad hoc basis, these people include IT specialists, learning technologists, departmental peers and professional development personnel, to name a few. In terms of gathering ideas for teaching and research, a simple facility such as a mailing list could provide an academic with an informal way of sharing ideas with others. Many participants gave the impression that informal collaboration was important and that they would like to have the opportunity to collaborate on a more regular basis.

3.11 Question 10: Aids, guides and templates

Do you use any aids, such as guides or templates, to help you create teaching material? If so which ones?

One participant stated that their department is very focused customizing all teaching material so that it looks the same and is consistent. Not all departments are so particular about this as three participants said that they create their own templates for their documents. This makes sense because the majority of materials are created alone and the academics are therefore less likely to collaborate on the layout and design of their materials. Five participants stated that they did not use any templates for their materials and one stated that they use the standard templates that accompany each application.

Only one participant said that they use “how to” guides that help them with their teaching, and using these was rare amongst the majority. No other aids were mentioned.

3.12 Question 11: Reviewing teaching materials

Are your teaching materials reviewed internally or externally?

From the comments it is clear that teaching materials are reviewed internally in a number of ways, but this is not necessarily the same for all departments, these are shown below;

1. As part of the probationary period of a lecturer
2. Head of Teaching and Learning
3. Students
4. Peers

Only one of the participants stated that their materials are reviewed externally. It was mentioned that because student coursework is reviewed externally then lecturers have to be teaching the right things. Students are reviewed to measure how well they are performing compared to previous students. In

terms of actual teaching quality (and not content), Professional Development review teaching practice and the delivery of material.

3.13 Question 12: Repository use

Have you placed any of your research output into the Loughborough Institutional Repository?

Three Participants stated that they had contributed to the repository. Three participants said that they were unaware of its existence but mentioned that it was something that would interest them. Four participants were aware of the repository, three of whom had not the time to contribute their materials and one was waiting to see what happens when it gets properly launched. One participant stated that themselves and their colleagues would like more information on the repository. All of those participants that HAD contributed, wanted to contribute more articles in the near future. One of which also stated that they encourage others to contribute.

One participant stated that it would be good practice for department administrators to automate submission of research material to the Loughborough IR because they have to deal with all submissions to journals.

3.14 Question 13: Persistent stumbling blocks

Are there any persistent stumbling blocks that you encounter when creating and sharing your teaching materials? These could be:

- a. *Subjects that you struggle to find resources for;*
- b. *Support you require to achieve a particular step in the process;*
- c. *Professional/technical assistance or advice that you would use to expand on your teaching.*

Three participants stated that they did not struggle to find resources but might have limited time available to search for them. The lack of time available to find resources was mentioned by six participants. The time involved in taking part in training courses was considered costly in some cases, yet this is the only way to receive the support that is needed. The method of training courses was criticised by some, and in some circumstances brainstorm sessions and onsite support would be more appropriate delivery methods.

It was mentioned by one participant that it can be easy to get stuck into a mind set and just look in the same few places for materials each time. It was mentioned that it can sometimes be difficult to get hold of commercial materials. Two participants stated that the introduction of simple web system would help when searching for new materials.

Only two participants stated that they would like support in enhancing materials, and other participants commented that because they create material alone, support in creating the materials is very rarely sought. One participant mentioned promotion and recognition as a motivational stumbling block to creating teaching material.

None of the participants mentioned any areas at Loughborough University which they felt lacked support, which shows that the support system currently in place is working to a satisfactory level, in the academics' mindset. However, it was mentioned that not knowing where the expertise is and how to get help, sometimes can be a problem.

3.15 Question 14: Additional comments

Do you have any questions of additional comments or observations to make?

A number of additional comments were mentioned involving the following topics;

Repositories

A good idea for a repository would be to develop one where students could put things and work together on different subjects. This collaboration would help students to learn and contribute to the whole Loughborough experience. Two participants stated that a repository of teaching materials would be one that would be of interest and would help the discovery of new resources to be used in their teaching.

It was commented that the activity of telling others about teaching takes the time away from carrying out teaching.

Loughborough's academic culture

One participant gave a good comparison of different teaching cultures at Loughborough University and Sheffield University. Microsoft Word files are created by most academics and seems to be the practice at Loughborough. At Sheffield, PDF files are the most commonly created files. The culture of the University is one that people just won't get on and work with new ideas. There is a lot of resistance amongst academics to 'changing their ways'. The culture at Loughborough University was regarded by

some participants as one which reflects the culture of many UK universities. The balance between research and teaching was regarded as uneven with more time being devoted to the former. It was regarded that this was common amongst many institutions as was the lack of promotion via the teaching route.

In terms of changing academic culture at Loughborough and throughout the UK, it was argued that sometimes lecturers have good reasons for resisting change, especially when the uptake and use of new technology is involved.

Good practice

The Online Learning Development Officer's (OLDO's) are regarded as useful people to provide support with digital material, to encourage academics to get material in digital formats and make material available to students in a digital form. An example of good practice for a teaching material repository would be to have one or two OLDO's per department (depending on the size) so that they can learn about a particular subject area and further help academics to produce material and make them available via the repository. An example of good practice for a research output repository could be that administrators that receive research material from academics then automate a submission of the material to the repository. This would involve little time and effort on the academics part, which seems to be a barrier at present.

3.16 Question 15: Observation

Would you be willing to allow us to observe you in the process of creating/making your teaching materials?

Six participants agreed to be observed during the creation of teaching materials, though, four of them stressed that they would not be creating material for some time.

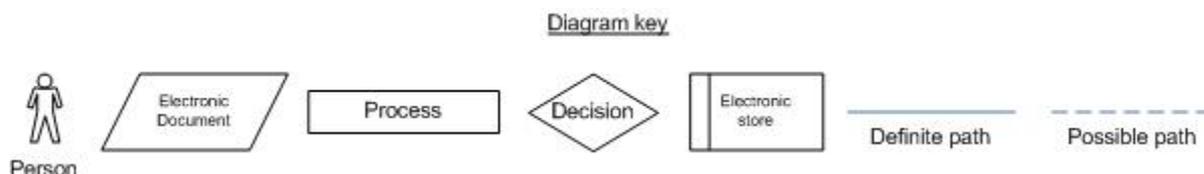
4. Teaching material and research output workflow mapping

4.1 Introduction

Firstly, this section documents research output workflow including a case study of a deposit to DSpace following a live demonstration, in which the steps for the submission of a research paper were recorded. The RepoMMan Project team have carried out extensive work on research output workflows through a survey and a number of interviews, similar to those carried out by this project with regards to teaching material. The two types of material have been evaluated from the two studies in relation to each process in the material lifecycle. The commonalities and differences of the people who may support these stages are stated.

From the interviews and other research carried out, teaching material data flow diagrams have been created to show the processes and people involved with creating and sharing teaching material. The diagrams which have been created using Microsoft Visio, show the different stages in the producing, editing and sharing of teaching material. Also, potential functional stakeholders are highlighted at the different stages in these processes.

The key for the teaching material diagrams are as follows;



4.2 Existing Practice - Research output workflow

4.2.1 A deposit to a research output repository using DSpace

A demonstration of a live submission of research output to the pilot DSpace research output repository at Loughborough University was given to project staff by the Repository Manager.

The repository, which is still in its pilot stage, is due to be fully launched in June 2006 and has currently over 900 submitted items which is very respectable considering its short life period to date.

Logging into the repository is the first process of submitting a new item. New users need to register if they have not already got a username and password.

If the document(s) that are being submitted are not in a PDF format then they need to be converted using Adobe Acrobat Professional. The Loughborough University Logo is added to the document if the document is not already in a PDF format.

When logged in, the following steps are carried out;

1. Click on **Start new submission**
2. Choose the **collection** that you want your item to be deposited
3. Go to the Sherpa/Romeo List (SHERPA, 2006) to check if the publisher will allow the item to be put into the repository. If unsure, it is advised that the publisher should be contacted before it is submitted to the repository. Any other parties should be contacted so that the item is copyright cleared.
4. Click **next** and **describe the item**. Fields to complete are title, authors, abstract, publisher, date of issue, citation, language publication type and description amongst others.
5. The **description** field is used to give details regarding the items original publication. For example, the original journal name, volume & issue number that it was published in originally should be stated.
6. The item is then **uploaded**
7. The submission is **verified**, which means the submitter checks the information that has been inputted and examines the submission for errors.
8. Once verified, the **licence** page appears and the submitter accepts the licence terms. The licence is a small paragraph of information, but there is a link to the full licence if wanted.
9. The **submission is completed** and the item arrives in the **task pool**.
10. The task pool can only be viewed by manager and administrators. With the idea being that the submissions can be finally checked before going into the repository. Fields are checked for errors and if it was someone other than an administrator that submitted it, then copyright clearance can be double checked.
11. The task pool has the following options
 - Accept task
 - Reject
 - Return to task pool
 - Do later
12. The resource is then **committed** to the archive

13. **Confirmation** is sent to the relevant parties explaining that the item has been accepted. A screen displaying a thank you message and the unique resource identifier is shown.

It is considered good practice to go into the ‘view accepted submissions’ section and find the submitted record to ensure that it is displayed correctly and that it exists in the repository. Once submitted, further metadata and descriptions can be added to make the item more searchable.

Although this seems a long process on paper, the time taken to deposit an item is around 5-10 minutes. Once a person has deposited several times, it is then easier to submit materials in a shorter space of time.

4.2.2 Loughborough University’s pilot research output repository

At present, the Repository Manager is responsible for dealing with all submissions to the Loughborough research output pilot repository, but in the future, contributors will be able to submit their own material. The diagram, on page 29, explains the current and future processes of this repository.

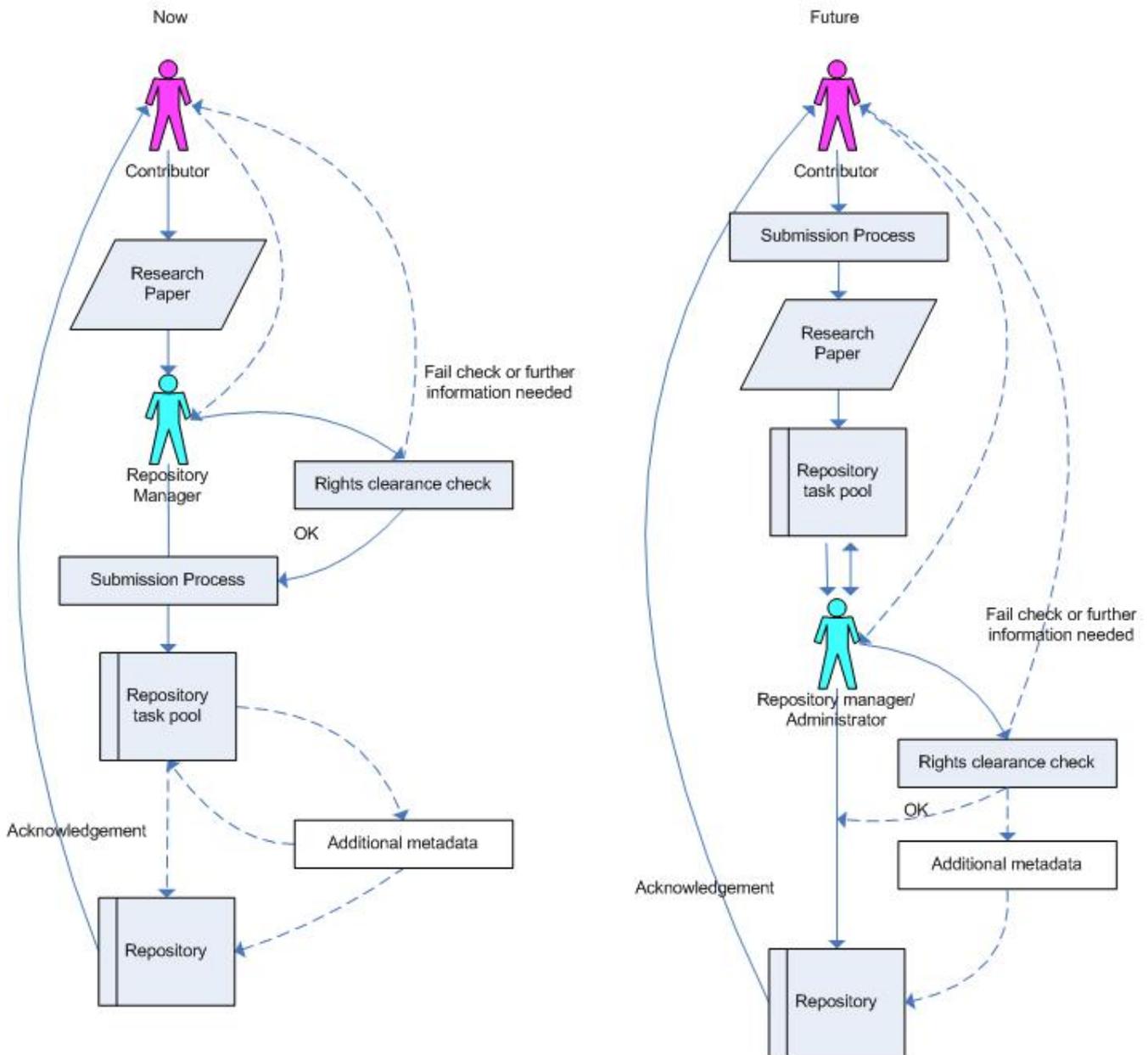


Figure 2: The Loughborough repository at present and in the future

As shown in figure 2 the repository manager is responsible for completing the submission process as well as other important tasks such as checking for copyright clearance and adding any additional metadata. In the future contributors will submit their own materials which will be then dealt with by either the repository manager or an administrator who will finalise the process ensuring everything is correct including any licences and metadata that have been declared. It is apparent that the assistance of the repository manager significantly reduces the amount of work that the contributor needs to do. Because the repository is still in its pilot stage it is important to recruit as much content as possible because “an empty institutional repository is analogous to a library with empty bookshelves” (Jones,

Andrew & MacColl, 2006 p. 111). In the future, the repository manager's interests might be directed more towards enhancing and increasing the functionality of the repository and marketing it to different communities.

4.2.3 RepoMMan research

As mentioned earlier, the RepoMMan project have investigated workflows with regards to research output. The project undertook a user requirements survey and a number of interviews to identify the current practice of creating research output at the University of Hull. The interviews were very similar to the ones which this project undertook, with the difference being that the RepoMMan project was investigating research output and this project was focusing on teaching material.

Figure 3, below, shows the steps that an academic takes when creating research output

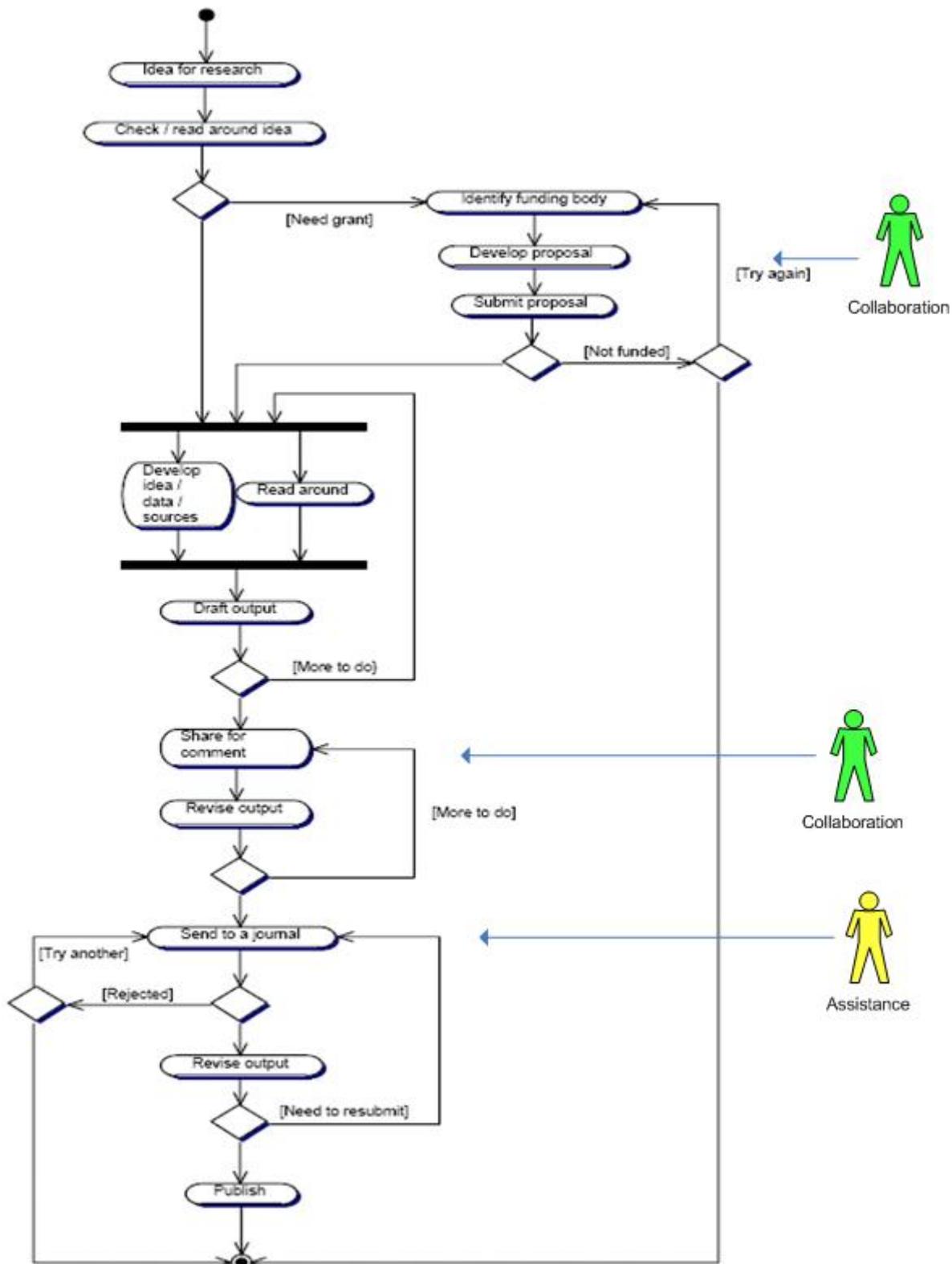


Figure 3: Research output workflow (Green. R. RepoMMan Project, 2006)

As shown in Figure 3, assistance and collaboration have been added at different stages that they could occur. Similar drawings have been created in the forthcoming section but this time in relation to teaching material.

4.3 Existing practice - Teaching material workflow

In section 3.2 we created a number of scenarios in respect to the comments made during the interviews. The following diagrams have been produced as examples of existing practice with regards to the creation of teaching material.

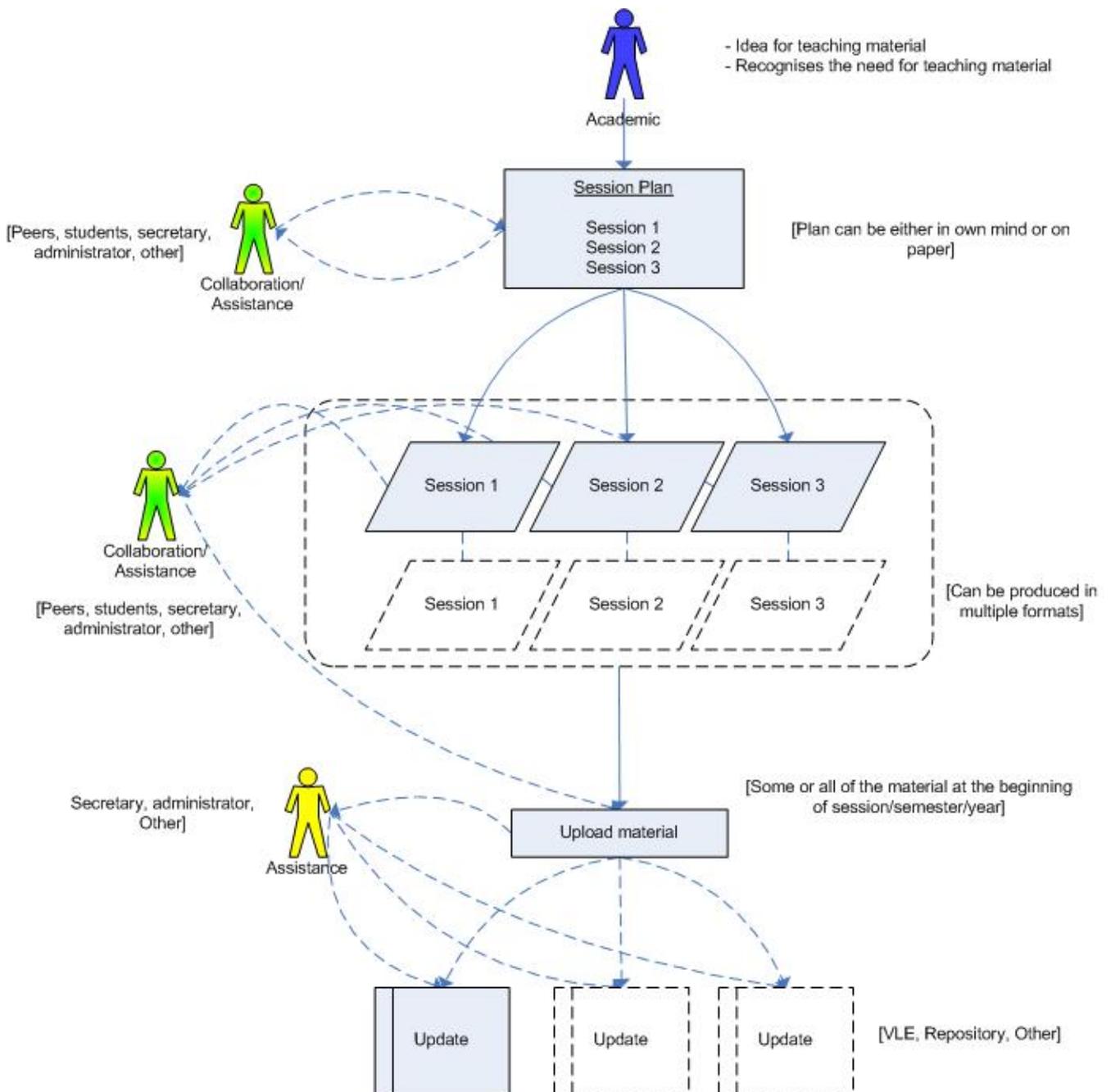


Figure 4: Existing practice of creating teaching material

As shown above, collaboration and assistance from functional stakeholders can be sought on a frequent basis at a number of stages in the process of creating and making teaching material available. Whether the academic uses this assistance depends on the availability of and access to this support. In the future, repositories might dominate in terms of the system used to store materials, but according to the survey results and interview findings, an institutions VLE is most commonly used at present.

Figure 5, on page 34 shows another example of existing practice but this time it shows the questions that an academic may ask during the production and sharing stages. It aims to put the thinking behind the actions of the contributor, for example it asks who can assist at this point or who can I collaborate with here. These types of questions may not be relevant to all academics, especially to those who enjoy working without any collaboration or assistance.

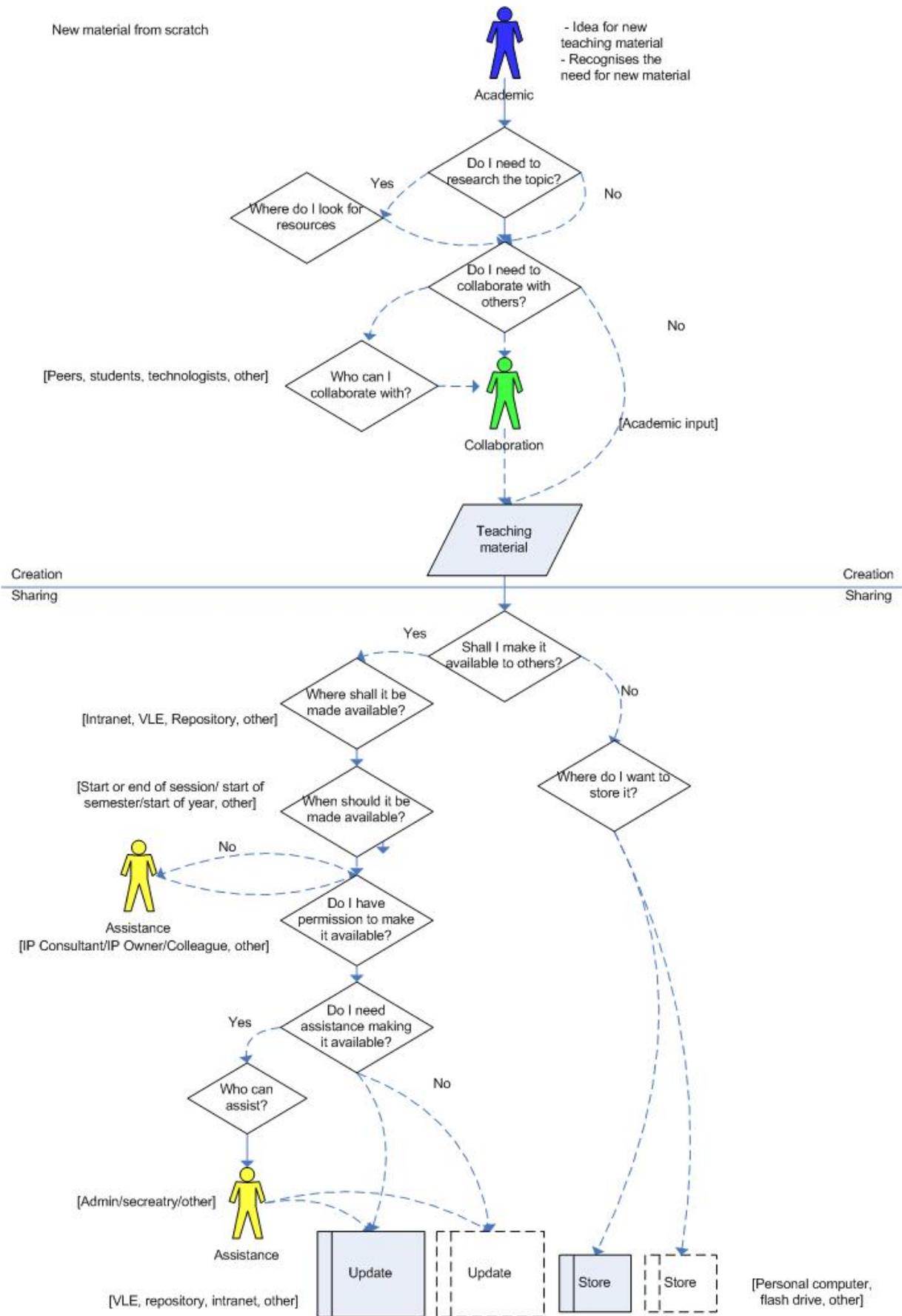


Figure 5: Another example of existing practice

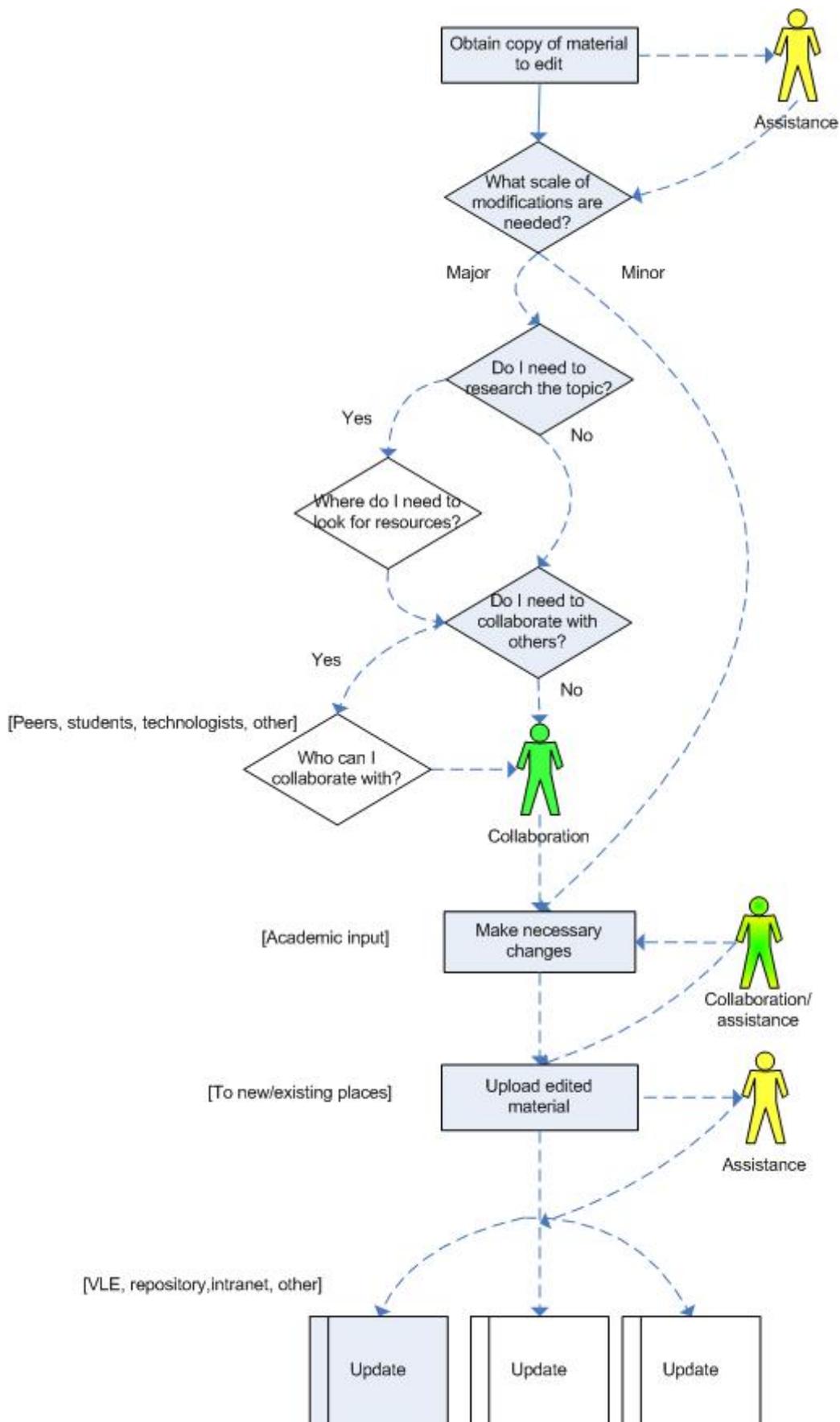


Figure 6: The process of editing/updating material

Figure 6 (on page 35) shows the different stages involved with editing and updating material.

Interestingly, academics might not have a copy of the material that needs editing and might call upon some assistance to obtain a copy of the material. They will need to decide whether major or minor changes are needed which in turn affects the requirement for assistance and collaboration. It is important that all existing copies get updated to reduce versioning problems.

4.4 Commonalities and differences between research and teaching processes

Table 5 below, compares the two types of material in relation to a number of stages in a documents lifecycle.

| Stage | Research output | Teaching material |
|------------------------------|---|--|
| Idea/need for material | Research ideas are more likely to change more frequently than compared to teaching material yet once the material is published it will stay the same. Even if new papers get submitted which update the original research findings, then the original research will still be available. More likely to involve collaboration compared to teaching material. | Unlikely to involve any formal collaboration and no need for assistance at this early stage. Ideas for teaching material will stem from the academic's own style of teaching as this will influence what is produced. |
| Creating | A lot of research output is created by two or more authors unlike teaching material which is normally created alone. Collaboration with peers and colleagues is likely when producing a research output. | The majority of teaching material is created alone but might have informal discussions with others when gathering ideas for creating material. Similar to research a number of other sources may be used including books, articles etc. |
| Sharing and making available | Likely to be stored in journals, electronic journals, personal websites, publications database, reading lists, databases, research output repositories. Assistance is less likely to be needed for making research output available than teaching materials. | Likely to be placed or stored in a database, VLE, Intranet, personal PC. Majority of material is not peer reviewed. More likely that assistance is required due to the larger number of documents that need to be made available. |
| Editing and updating | Not likely to be edited or updated once published. An article might be created at a later date updating the original paper, but the original article would be still kept. | More likely to be edited/updated frequently. Some academics update on a day to day basis where others will update them yearly. Older versions are not likely to be kept. |
| Deletion or archiving | Likely to be archived in a database or website and personal copies kept of articles at various stages (pre print – post print). Normally referred to in an institutions publications database (but not held). It is unlikely that different versions are deleted and are often kept on personal PC's or databases. | Less likely to be archived than research output. Results show most academics keep copies on a separate disk from year to year but mainly as a 'dump' of items produced for that year. More likely that teaching material is deleted compared to research output. |

Table 5: Commonalities and differences in document lifecycle

| Assistance | Research output | Teaching material |
|-----------------------------|--|--|
| Departmental Administrators | A department's research output is logged by these administrators. They often keep the University's publications database up to date by entering records for new items. | Can assist creators of teaching material to upload material onto a system such as a VLE. To assist the academic wherever possible. |
| Repository Manager | Involved in making sure all items display correctly and have enough appropriate metadata. Takes care of the general day to day running of the repository and ensuring any targets are achieved. Keeps the repository administrator(s) busy by marketing the repository across the institution so that content recruitment is maximised. | |
| Repository Administrator | Takes charge of all submitted items (of both research output and teaching material). Carries out a number of checks to ensure that the material is suitable and as described by the contributor. Ensures that licences are completed correctly and that any rights are not violated. Attempts to look after all stakeholders associated with material such as authors, co-authors, content owners, publishers etc. | |
| Secretaries | Not as involved with an academics research output compared to teaching material. They might liaise with journals on an academic's behalf. | Similar to administrators, a secretary might upload material to system on an academic's behalf to save them time. Might photocopy material ready for a session or be involved in printing out lecture notes/slides. |
| Other assistance | Publishers assist in the process of getting material published by offering advice and suggestions to revise material before it is published. | Learning and teaching co-ordinators might assist and advise academics on teaching matters. Faculty IT co-ordinators might advise on IT issues relating to teaching. Any other people that are known from an academics personal network may also assist in the developing ideas, creating and sharing of teaching material. |

Table 6: Commonalities and differences in assistance

Table 6 shows the commonalities and differences in the types of assistance that academics may rely or call upon when working on the two types of material. It is clear that assistance is more likely to be needed when creating and sharing teaching material compared to research output. However, it is apparent that academics like assistance to be available when making both types of materials available in repositories. Unlike VLE's, repositories require certain degree of metadata to be attached to deposited items which adds to an academics busy schedule. Therefore where the lack of time is a barrier to contributing, assistance is crucial.

| Collaboration | Research output | Teaching material |
|----------------------|---|---|
| Internal Colleagues | It is more likely for formal collaboration to take place when creating research output than teaching material. Likely to create research output with a colleague who is interested in similar subject disciplines. | Although formal collaboration between academics does happen, the majority choose more informal methods of collaboration when working on teaching materials. |
| External Peers | It is common that an academic will formally collaborate with others from different institutions that have an interest in the research area. | Unlikely to formally consult external peers about teaching material |
| Students | Students are less likely to be consulted when creating research output than creating teaching material. In fact, formal collaboration with students would be quite rare unless they were involved in carrying out the research. | As students are the primary audience of teaching material, they have an impact on it. Feedback through formal methods including meeting and module feedback forms are a good way of collaborating with students to improve teaching material. |
| Other collaboration | Anyone with an interest in the research topic could be called upon for collaboration. | Online Learning Development Officers or people in similar roles might assist in the creation of material or putting material into different formats or systems across campus. Any other people that are known from a personal network may also be asked to formally collaborate in the process of creating teaching material, although from the interview findings, this can be rare. |

Table 7: Formal collaboration

Table 7 above, and table 8 on page 39, evaluate the formal and informal collaboration involved between two types of material. It is clear that formal collaboration is more likely to be sought when working on research output, and with regards to teaching materials, informal methods are more probable.

| Collaboration | Research output | Teaching material |
|----------------------|---|---|
| Internal Colleagues | More likely to collaborate formally with internal colleagues on research output or ideas that are gained by informal methods through others might cause conflict. | It is more likely that academics use informal collaboration methods than formal practices. The majority of academics like to work alone to create the material but informally collaborate at the ideas stage. |
| External Peers | External colleagues must have an interest in the research area to be of use. | Unlikely to consult external peers about teaching material, but informal discussions at conferences and events might introduce new ideas for teaching material. |
| Students | Informal collaboration between students would be unlikely when producing research output. | As students are the primary audience of teaching material, they have an impact on it. Feedback either informally through informal conversations or discussions is very common. |
| Other collaboration | Anyone that is known to the researcher could be called upon for informal collaboration when creating research output. Mailing lists are a good way of informally collaborating with a large amount of people in many diverse communities. | This could a range of people including IT specialists, learning technologists, librarians, professional development personnel etc. |

Table 8: Informal collaboration

5. Commercial workflows

5.1 Introduction

Attempts to gather information about workflow, for the creation of digital items, from industry has proved difficult. However, some specific and generic examples of the process of creation and deposit into databases have been located. Workflow in industry, by its very nature, needs to be effective and efficient. It may be possible to incorporate some of these workflows into repository systems.

Within the education sector there are a number of systems to assist in the process of creation, maintenance and management of teaching materials and courses. The obvious example here is a Virtual Learning Environment (VLE). Academics may also be familiar with electronic peer-review systems and, increasingly, with repositories for deposit of research and teaching outputs. Some of these systems are discussed in greater detail in this section.

5.1.1 The Workflow Reference Model

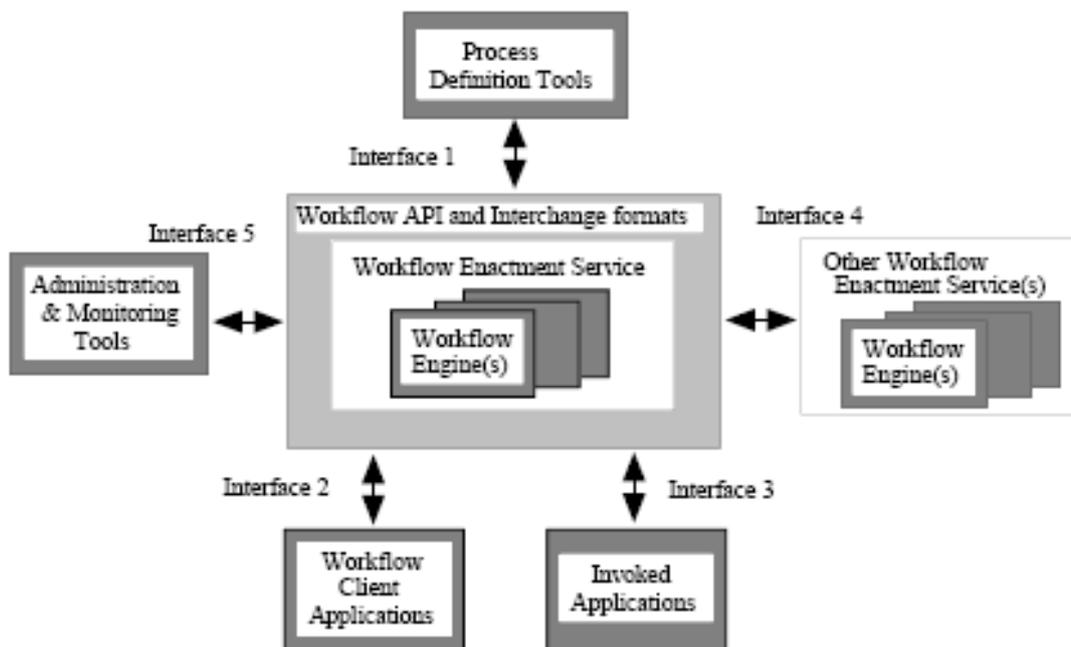


Figure 7: Workflow Reference Model – Components and Interfaces

In business most workflow is structured around IT systems and it is primarily concerned with the automation of procedures for the movement of documents between actors working to achieve a business goal (Hollingsworth 1995). Automation of the processes can be achieved through the use of

workflow management systems. Hollingsworth (1995) has described workflow management in the following way:

Its primary characteristic is the automation of processes involving combinations of human and machine-based activities, particularly those involving interaction with IT applications and tools.

The Workflow Reference Model (WfRM) forms a description of the underlying workflow systems architecture. It outlines three key aspects of industry workflow: a common vocabulary for describing the workflow and automation processes; a functional description of software components and their interaction; and the definition of standard information exchange via software components (Hollingsworth 2004, 295). Although the WfRM is now over 10 years old Hollingsworth (2004, 298) considers that it remains relevant as it describes the core business process without defining technologies and functionality.

5.2 Examples of commercial workflow

5.2.1 The AHDS

The Arts and Humanities Data Service (AHDS) provides an eight point list outlining the workflow for depositing digital resources with the them. Links to all the relevant contacts and documents required are provided; the steps involved can be summarised as follows:

1. Contact the AHDS via the Depositing Advice Team.
2. Produce copies of data and document files in suitable format for deposit with the AHDS.
3. Complete the Data and Documentation form.
4. Complete a Catalogue form.
5. Complete, and sign, a Licence form.
6. Send the data, documentation and forms to the AHDS.
7. An acknowledgment of receipt of items will be sent.
8. Confirmation of completed deposit will be given.

(How to deposit with the AHDS 2004)

The Visual Arts Data Service (VADS) carried out a digital capture pilot study with the Surrey Institute of Art and Design. Bremner (2003) has produced a case study which illustrates the workflow of images and metadata from capture to archive. This real-world example demonstrates the complexities involved in capturing and recording a single image for deposit into a database.

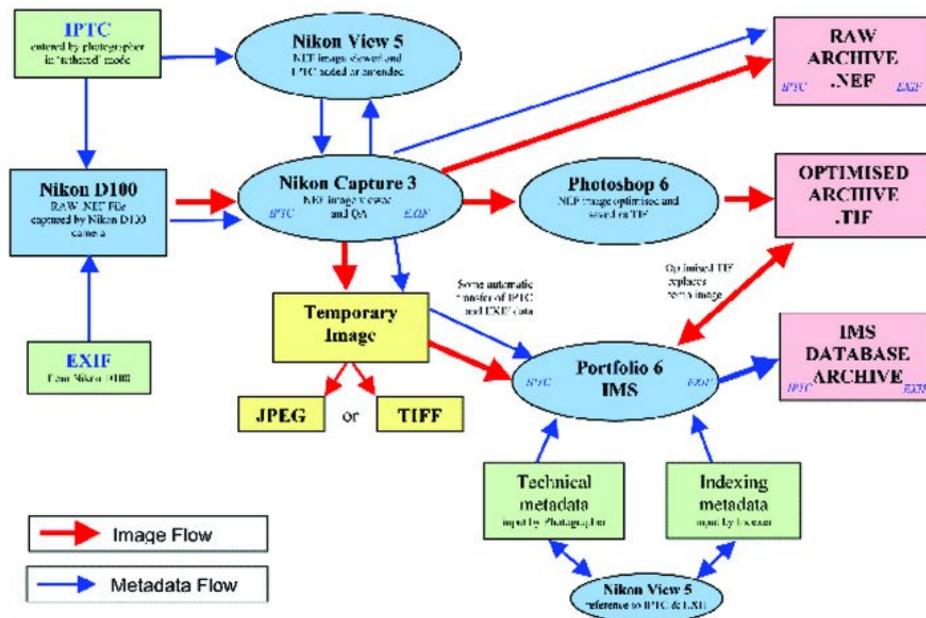


Figure 8: Flow of images and metadata from capture to archive(Bremner, 2003)

The same project also attempted to develop a standard workflow for image capture, but they discovered that this was impractical. In reality two workflows were necessary and their use depended on the artefact to be captured in digital format. The “Tethered mode workflow” was used for capturing images in a studio environment and the “Un-tethered mode workflow” was used for capturing images on location. Both workflows involved similar activities but the “Un-tethered mode workflow” for location image capture involved the following additional steps:

- Saving images to Compact Flash – before batch downloaded to laptop at suitable stages in the workflow.
- Lighting each artefact – this was not necessary for this project but it might be a consideration under different lighting conditions. The use of flashlights would inevitably slow the capture process.
- Importing images - into their chosen Image Management System (IMS) at the end of the day, metadata was collated at this time. (Bremner, 2003)

5.2.2 TASI

TASI is an excellent source of information for all aspects of the creation of digital resources. They provide a range of standard workflow procedures for individuals or projects to follow. These include: pre image capture, image capture, initial generic optimisation (TASI: Basic Guidelines for Image Capture and Optimisation N.D.), project and capture (TASI: Managing the workflow N.D.).

Their Capture Workflow, detailed below, highlights a variety of possible stakeholders involved at various stages in the process. Image owners need to be contacted for copyright clearance, individuals or admin staff are required to arrange delivery of works to imaging / photographic studios, studio staff, metadata creators, digital imaging staff, quality assurance checks, archive media creation, and finally admin / transport for return of materials are all necessary to complete the cycle. Beyond this, repositories might consider repository managers, library staff, computing staff, media services staff, university committees, teaching and learning specialists, and numerous other stakeholders. The capture workflow might include the steps set out below:

- Contacting the owners of the works (or images) and clearing copyright (if necessary).
- Locating, preparing and delivering works to the studio (this can sometimes include conservation work).
- Capturing the image with a scanner or digital camera.
- Creating metadata (including capture information, descriptive cataloguing and administrative metadata).
- Optimising the images (cropping, cleaning, colour balance) and creating surrogate images.
- Performing quality assurance checks on the images and metadata (and re-capturing if necessary).
- Archiving the digital master images - normally burning to DVD-R or CD-R.
- Returning all works to their original location. (TASI: Managing the workflow N.D.).

TASI's Generic Image Workflow provides digitisation projects with recommendations for best practice within the imaging workflow. Their workflow model comprises six stages:

1. Capture
2. Master Raw Archive
3. Optimisation
4. Master Optimised Archive
5. Surrogate Creation
6. Delivery

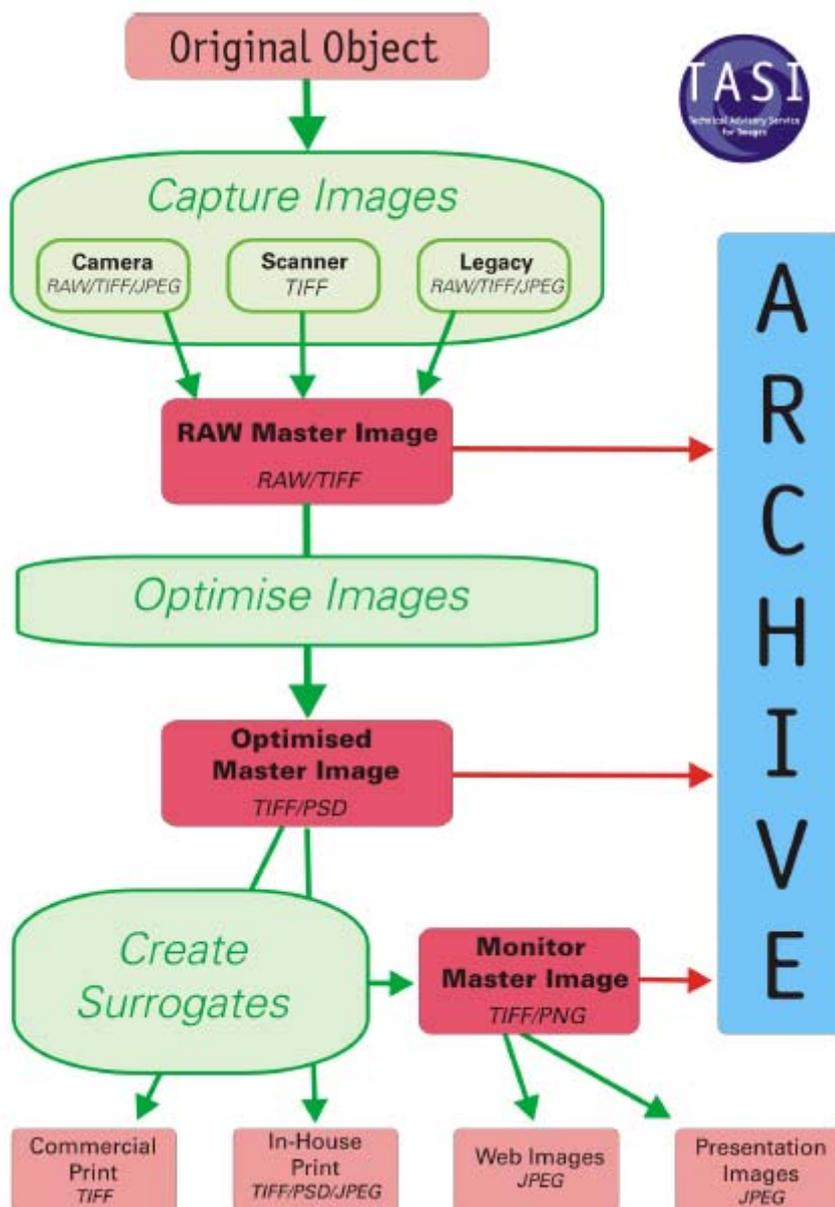


Figure 9: TASI: Generic workflow diagram (Generic Image Workflow: TASI Recommended Best Practice for Digitisation Projects, N.D.)

Their generic workflow diagram (Figure 9) illustrates these six stages. This workflow can be adapted to fit the requirements of individual projects and it should be tested at each stage to ensure that the workflow is optimised for best performance. TASI stress the importance of quality control measures and ensuring that ‘sign-off’ occurs throughout the workflow. Having ‘sign-off’ systems in place ensures that a file can be tracked by project staff at all stages in the workflow; IMS is TASI’s recommended recording system. Another aspect that warrants consideration is the creation of a procedural manual. This manual can be used for training new staff, ensuring consistency of approach to tasks and quality assurance, but it must be updated to reflect any changes in the workflow process. (Generic Image Workflow: TASI Recommended Best Practice for Digitisation Projects, N.D.).

5.2.3 VLE systems

Many VLE systems include digital workflow management activity functions. Blackboard allows tasks to be assigned to individuals and groups, these activities include Review, Approve and Grade. Priorities and deadlines can be assigned to each task and levels of permissions set. In this way task owners can be assigned Read, Write, Delete or Manage permissions. For example a lecturer might want to ask a colleague to review a new course outline, this would be achieved by:

- Upload the item to the VLE.
- Navigate to the Content Collection.
- Add a Workflow to the item.
- Fill in the Workflow Information – this includes the name of the person designated to undertake the task, any instruction for them, type of task, its priority and a deadline if this is required.
- Send workflow to user(s) – this task will appear in their Workflow Activities List. An email can also be generated to alert them to the new task assigned to them. (Blackboard: Quick tutorials N.D.)

This workflow could be adopted by repositories wanting to include quality control measures to ensure good content is deposited. This would operate as a peer-review system where selected individuals could review the technical and pedagogical, and subject content of learning material.

5.3 Metadata capture

Adobe's "eXtensible Metadata Platform (XMP) is a framework for adding machine-readable labels, or semantic content to application files, databases and content repositories" (Adobe: a manager's introduction to adobe eXtensible Metadata Platform, the adobe XML metadata framework, N.D.). Adobe believes that due to the large volume of unstructured data and metadata that business are expected to handle, an 'intelligent system' for managing data is required. XMP is being added to all Adobe software products and it gives creators of a digital items the opportunity to add their own metadata to files. Metadata can be recorded at all stages of the lifecycle of the file, from file capture onwards. The metadata provides information about the content of the file, its usage, author details, copyright data and other detailed information. XMP is freely available via an open source licence and it is standard compliant (Controlling the data chaos by adding intelligence to media 2004).

Metadata can be saved within individual files; it is preserved even if a file is altered or converted to a different format. More metadata can be added so that a record of changes can be made and retained. Because it is based on standards XMP can be customised and extended, it can also be integrated with file management systems (Controlling the data chaos by adding intelligence to media 2004).

One of the advantages of this system is that metadata templates can be created with pre-populated fields. Information that is common to a range of files can be added to a template and a standard template with the image creators name, company, copyright information and so on can be created (Adobe XMP for creative professionals 2005, p3).

Adobe outline the advantages of using XMP to manage workflow in a team setting. Metadata can be recorded and tracked as it travels around the team. All members of the team have access to the information, thus keeping them up-to-date with all modifications to a file. In their turn individuals can annotate the metadata to record their own input to a file (Adobe XMP for creative professionals 2005, p1). Metadata can be input via the File Information dialogue box or Adobe Bridge. This user-friendly 'navigational control centre' is available for use with any of their Creative Suite 2 software programs and provides some useful advanced features. Metadata can be edited; metadata templates can be accessed, edited, replaced or added to multiple files simultaneously; images can be rated and comment labels added; and searches on the metadata can be carried out for easy location of files. Camera raw data can also be accessed from within Adobe Bridge (Adobe XMP for creative professionals 2005, p3-6).

One of the problems associated with working in teams is that of version recording and tracking. Adobe have built Version Cue using XMP as the foundation. Version Cue manages changes to a file so that naming conventions are not necessary and all team members can manage versions, organise and access files shared by the project (Adobe XMP for creative professionals 2005, p7).

5.3.1 Adobe workflow examples

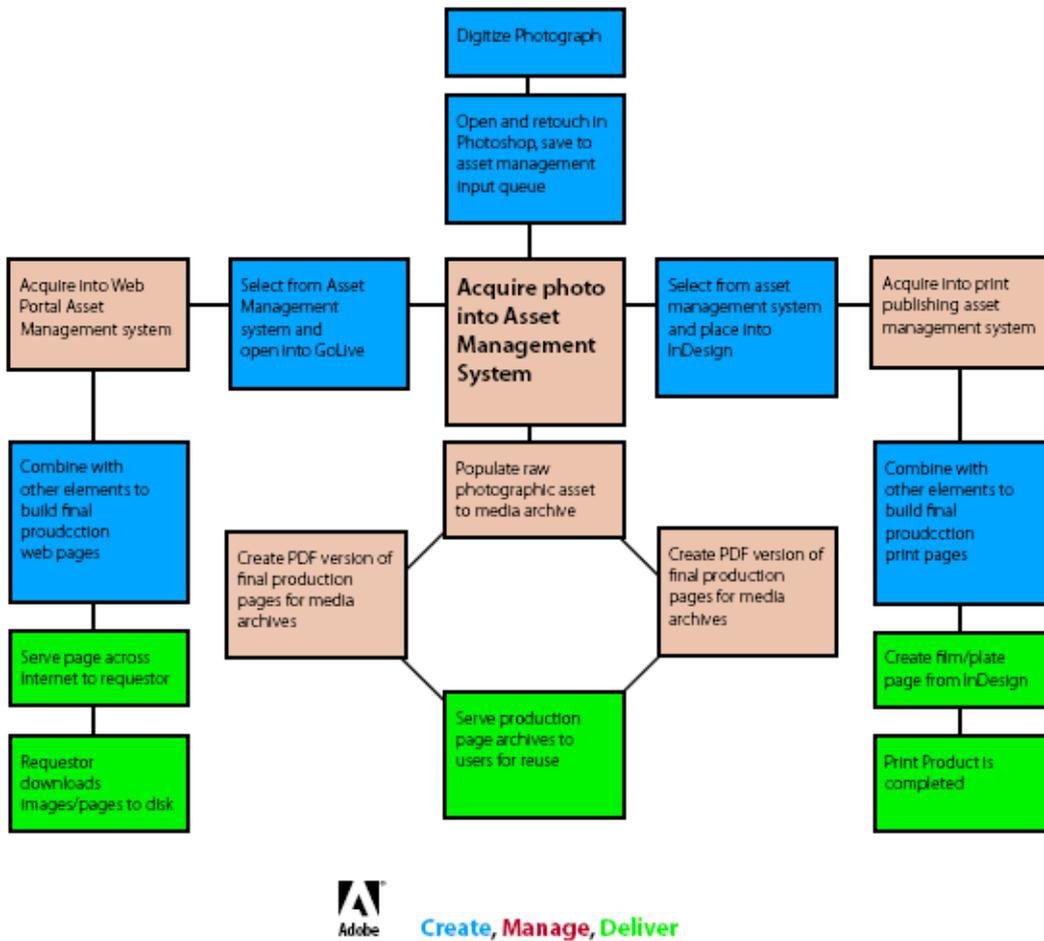


Figure 10: Sample workflow for a digital image (Adobe eXtensible Metadata Platform, N.D))

The workflow example in Figure 10 shows the path of a news photograph from its creation through to print publication, web display and retaining a copy in a newspaper archive (Adobe: a manager's introduction to Adobe eXtensible Metadata Platform, the adobe XML metadata framework, N.D.).

Creative professionals often need to use of a variety of software products in the process of creating finished artwork. One example to illustrate is shown in Table 9 below.

| Task | Software |
|------------------------------------|-------------|
| Create original artwork | Illustrator |
| Rasterize and modify | Photoshop |
| Insert artwork into print document | InDesign |
| Insert artwork into a web page | GoLive |

Table 9: Workflow illustrating the use of a range of software products

Metadata can be added at each stage of the process and this descriptive information can easily be accessed by the team (Adobe XMP for creative professionals 2005, p8-11).

5.4 Summary

Much can be learnt by exploring the workflow models used by industry. Some of the examples illustrated here are already familiar to academics and university staff. The strengths of Adobe's XMP are: its ease-of-use; integration with software packages that are currently in use; metadata can be added by the creator(s) of a file, it can also be edited and extended at different stages in the process of creation. This makes the creation of metadata relevant and useful to file creators thus making them much more likely to input data. By creating a range of metadata templates for projects, individuals, university or repository images can be tagged with standard information so reducing the time and effort needed to create metadata.

6. Stakeholder analysis and requirements for a demonstrator repository

6.1 Introduction

The requirements of a number of different stakeholders need to be explored when planning to set up a repository of any kind. From the survey and interview data, there were a variety of people that need to be catered for when the demonstrator repository is being designed. Some stakeholders are crucial to the repository's existence, for example, contributors are crucial to the repository because without them there would not be any material available to be uploaded into the repository. Some will be less important, but still need to be considered by the repository and at the very least, be conscious of their existence.

The importance of these stakeholders is made clear by Crow, (2002, p.20) who in relation to research output institutional repositories believes that;

“as digital publishing technologies continue to evolve, forcing a fundamental change in the structure of scholarly communication, everyone connected with the process will be affected: librarians, faculty, students and practitioners, research funding agencies, and commercial and non-commercial publishers”.

Therefore everyone involved in the creating, sharing, storing, description, discovery and ownership of teaching materials will be affected in relation to a repository of teaching materials.

Drake (2004) recognises that

“In simple terms, success in building a repository involves eight "C" words”:

- *Comprehension* - *Collaboration* - *Context* - *Change*
- *Caring* - *Commitment* - *Creativity* - *Competence*

Each one of the C's relies on the co-operation of different stakeholders from different communities in order for it to be successful. Therefore, a functional and non-functional stakeholder analysis has been carried out which looks at the requirements of each group for a demonstrator repository containing teaching material.

6.2 Functional stakeholders

6.2.1 Contributor requirements

It is obvious that contributors are crucial to the repository and it solely relies on them to allow items to be made available to others. However, the following requirements that have been identified which need to be considered by the repository;

- The survey and interview results show that legal issues are a concern to contributors therefore clear advice relating to legal aspects of the repository and the materials within it must be available to contributors to answer any questions that arise. Information regarding the licence(s) that may be available must be easy to access and understand. The repository should make the contributor feel confident about the legal issues relating to their submitted material.
- From the interview data it is clear that teaching material may be updated frequently, therefore contributors need to be provided with information in relation to versioning issues. This must be put into place to ensure that contributors know what the procedures are for updating material.
- Support and assistance must be freely and easily available to contributors who lack the time to carry out many of the tasks associated with depositing to a repository of research output and teaching materials including, submitting and adding metadata. The submission process usually requires the most support and it is crucial that contributors have this assistance.
- It is useful to obtain assistance and collaboration from different people that have some knowledge about the topic as well as the technology. It is often the case that colleagues will have a good understanding of the topic and that learning technologists have a good aptitude for technology but people with knowledge of both aspects is often preferred.
- More opportunities to informally exchange documents and ideas to make the process of creating teaching material easier.
- The repository must offer the contributor a number of unique functions or features that are not currently catered for in other systems within an institution as contributors might feel overloaded by the number of similar systems that exist. It is important to get contributors to think that they are using a repository 'service' rather than a 'system' and that the repository has a number of different purposes.
- The contributor must trust the repository in a variety of ways, such as taking the responsibility for preserving the content and protecting any rights associated with the material.

6.2.2 End user requirements

The end user requirements are going to be studied in more detail later on in the project, however the following have been identified;

- The system must be simple and easy to use
- The metadata added must be meaningful in order for end users to retrieve submitted items that are being searched for.
- Require tools to link institutional systems and services together. Thomas & Rothery (2005) believe, in relation to the users of a repository, “it would be far more efficient to search across a number of distributed repositories”. This is something that can happen on an institutional scale where one search facility can cross search a number of different systems e.g. repositories, VLEs and databases (amongst others) on behalf of users, providing them with a ‘service’.
- Like the contributor, the end user must trust the repository. “Users now rely on institutions to provide ongoing development of systems that support long-term access to the materials” and “over time, institutions will keep users’ trust so long as they sustain reliable access to information.” (Research Libraries Group, 2002, p.17)

6.2.3 IT Specialists

IT specialists must be involved in the decision as to which repository software(s) should be used or evaluated. At Loughborough University the Library’s Systems Manager and his team decided on the software to be used for the research output repository and therefore was very much involved in the process of selecting repository software. Once installed it must be easy for IT specialists to maintain, so that it can run alongside other systems that are currently being looked after. As well as those points mentioned above, IT specialists are useful in a variety of ways including the following;

- Assist with the installation of repository software process and any required upgrades.
- Need to consult them regarding the skills involved with the day to day running of the repository.
- Involved with monitoring the repository’s success, such as being able to create usage statistics for senior management and contributors.
- Ability to develop add-on tools e.g. a tool that packages materials in a suitable format for depositing.
- Assist in giving training sessions to contributors and users on how to use the repository software and tools

- Ability to answer technical queries from a number of stakeholders, including users, contributors and repository managers and administrators.

6.2.4 Librarians

Libraries play a very important role in the development of repositories. According to Phillips et. al. (2005) “librarians are positioned to facilitate and promote the institutional repository,” Therefore their needs have to be catered for when considering stakeholder requirements. However it has to be recognised that “institutional repositories significantly extend the role of a library”(Cervone, 2005, p.45) and that in relation to research output repositories “even new professionals in the field did not expect to become scholarly publishing change agents” (Phillips et. al., 2005). This highlights that librarians roles are changing due the emergence of such repositories. As with other important stakeholders, it is important to ensure that the requirements of libraries and librarians are reviewed on a frequent basis as the repository goes through different life stages.

A number of requirements can be identified;

- The library may already be involved with other systems or repositories that provide users with electronic information and therefore the repository must sit amongst these systems and be able to be managed along side these to ensure that staff have enough time to manage the additional system.
- The introduction of the repository must mean that additional skills need to be learnt by librarians are minimal and within reason. As mentioned above by Phillips et. al. this does not always seem to be the case. A more suitable alternative solution should be considered if any are available.
- The repository must be able to generate statistics showing the amount of material available and the amount of access given to materials. This is important to libraries who host repositories to show that the repository is worth while and having a positive impact on different communities.

6.2.5 Support staff

These assisting staff are crucial to the repository so that both research output and teaching material can successfully reach the repository. Without them content will still reach the repository however, from both the survey and interviews it is significant that lack of time is a clear barrier to contributing to repositories. Assistance in the form of secretaries admin staff or similar, which is freely and easily available can remove or reduce this.

6.2.6 Online Learning Development Officers (OLDOs)

The OLDOs help assist academics when it comes to actually creating and making the teaching material available and therefore need to be considered when designing a repository of teaching materials. They need to be involved with the design and implementation of the repository as they have experience in working very closely with academics to provide support for them. The OLDOs require the repository processes to be quick and easy which is a similar requirement to administrators and secretaries because they may have to deal with submitting large amounts of material to the repository as well as having a number of other tasks to complete.

6.2.7 Technical authors/tutors

These stakeholders were mentioned by one participants and like any stakeholder, the repository needs to recognise their existence and role in the process of making material available. Their needs will be similar to those of the technologists, although technical authors and tutors may have a closer relationship with fewer academics. They are normally department based, technical authors and tutors are specialists within a specific field as well as having an aptitude for technology in that area. They could help academics engage with the repository by removing the barrier between the contributor and the repository. However, they will have their own agenda's and work to carry out therefore they require the submission process to be as short as possible.

6.3 Non-functional stakeholders

6.3.1 Senior Management

It is necessary to keep senior management aware of the developments of the repository and carefully introduce ideas that have an effect on any policies or areas that they are involved with. These stakeholders may not play an 'active' part in the process but they might manage the time of others involved in the process and therefore it is very important to keep them informed and in favour of the repository, wherever possible. One of the drawbacks of institutional repositories according to Yeates (2003, p.98) is that they "may need quick wins to sustain institutional support" and therefore can have difficulty in functioning without this backing.

Management of relevant systems and services at the institution where the repository will sit will also have to be informed of the repository's aims and objectives. This is so that the repository is not seen to be competing with existing initiatives within the institution. It is also important to know of these systems and services so that the unique qualities of the repository can be expelld to the internal and external community.

6.3.2 Institutional requirements

This will be investigated further within the subsequent stages of the project. However, were a number of institutional requirements that have already been identified from the work that has already been carried out, including;

- The repository must not break any institutional policies during its operation. Intellectual Property (IP) laws should not be broken and best efforts should be made to ensure that the repository conforms to all existing policies. Also, the repository should not promote any unlawful activity and should make this clear to different user groups.
- The repository should display research examples and teaching examples of a standard which reflects the research and teaching ability of members of the institution.
- The repository should make its aims clear from the outset and not disrupt existing practice amongst academics. Therefore the repository processes should blend into what already takes place at the institution.

6.3.3 External stakeholders

This could be anyone with an interest in the subject area or that comes across the repository and wishes to use or contact it. This depends on the context of the repository, because if it is Open Access (OA) then anyone within a number varied of communities could use the repository. Therefore these people need to be made aware of the repository's acceptable use policies and should be given easy access to these documents. Also, any external co-authors of material should be kept updated with any changes to any legal policies or licences and their rights must be protected as much as those contributors from within the institution. Other external stakeholders could be someone who is involved in one of the many processes related to the repository, even down to the creation of content that goes within it.

7. Conclusion

7.1 Existing practice

The participants did not share the same views with regards to research or teaching repositories. There were three types of people identified from the interviews in relation to teaching material creation and sharing;

1. Those who enjoyed creating material on their own and keeping to their own ways of doing things
2. Those people who would like to enhance their material and use different technologies that interact with students better but do not have the skills or time to do so.
3. Those people who enjoy creating interactive materials using a variety of technologies and systems to do so.

Many participants fell into the second category and there was a definite willingness to make materials available to other people, which was similar to those results from the survey. Therefore, suitable collaboration and assistance is the key to getting these academics into the third category and helping repositories to succeed.

7.1.1 Collaboration

Key points;

- Teaching material relies on more informal collaboration techniques than compared to research output which is more likely that academics will adopt a more formal approach.
- It is more likely that academics will collaborate externally when creating research output compared to teaching material which is more likely to rely on internal collaboration.
- Academics are less likely to collaborate with others when creating teaching material compared to research output.

7.1.2 Assistance

Key points;

- Assistance is important when submitting both research output and teaching materials into repositories. Higher amounts of assistance are needed for teaching material due to the large number of files and documents that are produced.
- Assistance is required for the additional tasks associated with submitting to a repository instead of a VLE, including filling out a submission form and adding metadata to items.

- Training and delivering new skills coupled with suitable assistance can help academics with creating and sharing teaching material.
- Assistance by someone who has knowledge of the subject is important.

7.2 Functional and non-functional stakeholders

Functional stakeholders play a crucial role in the processes within and surrounding a repository. Examples include, contributors, end users, secretaries, admin staff, librarians, technical tutors and IT staff.

Non-functional stakeholders can consist of senior managers, the host institution, external parties and institutions and others who may be interested in the repositories existence, such as industry and commercial representatives.

Key points – for both stakeholder groups

- Both functional and non-functional stakeholders are crucial to the repositories existence.
- The repository must meet the expectations of all stakeholders and maintain a worthwhile status.
- The stakeholders must see the unique features of the repository and see the benefits of having such a repository.

Key points – functional stakeholders;

- Functional stakeholders are crucial to a repositories existence and success as they play an active part in repository related processes.
- This group will be able to offer the collaboration and assistance mentioned above.
- The repository must create a trusting relationship with functional stakeholders.

Key points – non-functional stakeholders;

- It is important to keep this group informed with the repository developments.
- Aspects of the repository that are specifically relevant to a stakeholder group should be discussed and the stakeholders should be consulted. For example, reward and award issues should be discussed with Human Resources to inform them about the aims of the repository and to get their opinion on the potential success of offering incentives to functional stakeholders.
- This group will play a significant part in the support and promotion of the repository and need to be kept on side.

- They are a very broad group of stakeholders that may hold different views in relation to a repository of teaching materials. However, the repository should aim to sit within the agenda of these different stakeholders.

There may be other stakeholders that need considering when thinking about designing and developing a repository of teaching materials that are unique to other HE institutions. Also, those stakeholders listed may have different characteristics depending on their exact roles and goals within other institutions. There may also be other ‘silent’ functional and non-functional stakeholders that have not been highlighted in this investigation.

7.3 Future aims

This workflow study, coupled with the survey findings, will inform the design of a demonstrator repository of teaching materials. A reward scheme which investigates the possibility of rewarding these functional stakeholders will be proposed and piloted within the repository. Also, a rights solution will aim to reduce the lack of rights awareness of both functional and non functional stakeholders and protect the copyright of the related parties. The repository will be designed with the IBM user engineering method in mind, in order to deliver a system around the different user groups.

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