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# ascilite Report 1 for the Carrick Exchange Project: Literature Review

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# ascilite Report 1 for the Carrick Exchange Project: Literature Review

## **Abstract**

To inform the design and development of the Carrick Exchange, the Carrick Institute for Learning and Teaching in Higher Education required research into the prospective user needs, contexts of use and policies necessary to facilitate engagement of the higher education sector with the Carrick Exchange. The data collection and analysis for this research included an extensive literature review, the substance of which forms this report. This document provides an overview of the significant literature relevant to the research conducted by ascilite and should be read in conjunction with the final report. Additional literature can be found in Appendix A: Additional resources, and within the attached bibliography.

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***ascilite Report 1 for the Carrick Exchange Project:  
Literature Review***

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Prepared by:  
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# Introduction

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To inform the design and development of the Carrick Exchange, the Carrick Institute for Learning and Teaching in Higher Education required research into the prospective user needs, contexts of use and policies necessary to facilitate engagement of the higher education sector with the Carrick Exchange. The data collection and analysis for this research included an extensive literature review, the substance of which forms this report. This document provides an overview of the significant literature relevant to the research conducted by *ascilite* and should be read in conjunction with the final report. Additional literature can be found in Appendix A: Additional resources, and within the attached bibliography.

## Background

An extensive review of the literature on digital repositories, learning objects and communities of users of such resources has revealed many themes, issues and concerns that are common across institutional and international contexts. The idea of having access to high quality, up-to-date learning resources for reuse in a range of teaching and learning contexts and technical environments is one which generally appeals to the higher education sector in an increasingly competitive market (Woo, Gosper, Gibbs, Hand, Kerr & Rich, 2004). Given the time and input required in the creation of learning objects and learning resources, and adapting them for inclusion in well designed learning activities, the prospect of re-use is extremely appealing (South & Monson, 2000; Hatala & Nesbit, 2001; Hirwade & Hirwade, 2006).

Furthermore, learning object repositories are considered to have the potential to influence the manner in which education and training are carried out as far as distributing innovations and developments (Porter, Curry, Muirhead & Galan, 2002). This is a particular issue for managing change as revolutionary changes in knowledge and management of information now demand particular kinds of engagement from the sector (Friesen, 2004). Similarly, successful adoption of learning object repositories has been identified in the UK context as being dependent upon professional and organisational change (Casey, Proven & Dripps, 2006), specifically in terms of intellectual property management. The underlying issues with respect to digital repositories of change management, intellectual property and rights management are however, still in their infancy and the subject of continuing debate and search for solutions (Porter et al., 2002).

Sølvsberg (in Casey et al., 2006) proposes that just like traditional libraries and their collections, a digital collection should be permanent, managed and quality controlled. Hatala and Nesbit (2001) describe an evolutionary approach to the development of digital collections involving the three stages of seeding, evolutionary growth and reseeded. While these initiatives begin to discuss the questions of developing standards and metadata schemas, the more difficult questions of stimulating user engagement and supporting communities of educators by useful repositories are not so readily addressed. By mid-2006 more than half of Australian universities had established institutional repositories for their staff, according to Henty (2007) who reports from the perspective of housing works of research and scholarship. Among the ten major issues relating to repository management that were reported as important by a group of senior academic administrators, were the key issues of sustainability and engagement. Oliver (2000) goes on to list portability, scalability, flexibility and customisability as factors that will influence the potential for interchangeability and re-use of digital resources located in database driven environments. This is further echoed by Koohang and Harman (2007) who report that sustainability and scalability of

repositories should be informed through identification of communities of practice and their particular user needs. Clearly contexts of use are a major factor in implementation.

Existing repositories in the international sphere of higher education have been developed for the distribution of a range of resources including teaching and learning resources, learning designs, learning objects and learning activity sequences, to name a few. The existence of these repositories has been identified as having potential to impact on teaching and learning methods (Porter et al., 2002). However, little conclusive information is available to suggest the extent to which educators make use of repositories. Loddington, Gadd, Oppenheim & Manuel, (2006) indicate that there are few studies to be found that have investigated teaching materials in digital repositories, suggesting that this reflects the few repositories that are dedicated to learning and teaching. Caws, Friesen and Beaudoin (2006) further suggest that the extent of decontextualisation involved when submitting an object to a repository for re-use, limits its educational value. Unless aspects of pedagogical design, context of use and learner control can be incorporated into the cataloguing, storing and retrieving of learning objects, and such objects themselves can be aggregated, then simply depositing into a repository is seen as merely a developmental exercise and of little benefit to students or staff (Cleveland-Innes et al., 2005; MacLeod, 2005). Some authors advocate that it is incumbent on learners and beneficial to their independent and life-long learning skills to be given access to repositories and to choose the most relevant and appropriate learning object to their current needs – be it a module, lesson or course (Paquette, 2004; Cleveland-Innes et al., 2005). This may be more likely to succeed when learners themselves have a stake in the evolution of the system (Hatala & Nesbit, 2001). Given that the Carrick Exchange will not be directly accessed by learners, the catalogue descriptors for each resource will need to inform academics of their potential for re-use and instructional utility, not only for their own use but also the potential for use by students.

In some ways there is more known about discipline-based or subject specific repositories with the suggestion that a level of relevance to the user is inherent in these (Richards , McGreal, Hatala & Friesen, 2002; Bates, Loddington, Manuel & Oppenheim, 2006; Shea, McCall & Ozdogru, 2006). A national initiative would need to access, share and exchange information about learning objects as well as having the functionality to grant access to the objects across institutional boundaries throughout the sector (Richards, McGreal, Hatala & Friesen, 2002). As such, the Carrick Exchange will need to explore the possibilities and challenges inherent in this notion.

Additionally, integration of social networking software as a component of the Carrick Exchange holds potential for intensifying engagement in a less formal manner than has been previously possible. As noted by Wiley (2003), if we set aside the issues of intellectual property and educational competitiveness, a range of social networking features can enable a new and valid way of utilising learning objects for enhancement of learning. As with all new ideas, in order to promote the diffusion of innovation, easy to use guidelines and instructional resources that prompt staff to engage and explore are needed (Conole & Fill, 2005).

# Engagement

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To promote knowledge sharing in the domain of learning and teaching, and engage the Australian higher education community within the Carrick Exchange, it is important to facilitate engagement through connecting people as well as resources. It is not sufficient to build a repository of resources, nor merely to provide social networking software and spaces for collaboration and community building. The literature increasingly documents a general lack of user engagement with repositories and online services (e.g. Gunn, Woodgate & O'Grady, 2005; Hummel, Tattersall, Brugos, Brouns, Kurvers & Koper 2005; Littlejohn, 2003; Phillips, Aspin, Hull, & Oxley, 2004).

The willingness to engage with the systems and populate them with useful resources are key components in the success of any repository (Woo et al., 2004). Foster and Gibbons (2005) emphasise that "Whatever the particular focus of the university IR [institutional repository], to be successful it must be filled with scholarly work of enduring value that is searched and cited" (p.1).

Casey et al., (2006) point out that the focus until recently has been on "building infrastructures, creating content, and developing technical standards and architectures etc., in the assumption that the 'soft issues will take care of themselves'" (p.2 of 8). Brosnan (2005) supports this, claiming that the reason many attempts to introduce learning technology innovations fail is not because the hard technologies are inadequate or deficient but because too little attention is given to the soft technologies within which the hard technologies are enmeshed.

The importance of end-user and stakeholder involvement in the development of these systems should not be underestimated. Bates et al., (2006) assert that since users will have such diverse needs, it is the intended purpose of the repository that will largely determine whether people will use it. The propensity to adopt hinges not just on usability, but is influenced by the diverse characteristics of the end users and contributors, in terms of cultural, interdisciplinary and organisational and/or institutional differences. Even though a wide diversity in user communities are taken into account in the development of repositories, specific issues of support, trust, and simplicity were found to be paramount within one such community of users, i.e. the Intute community, UK (Williams, 2006).

Additionally, it is also noted in the UK context, that it is the utility of the repository and associated features, not its technological sophistication that ensures engagement by users (Margaryan, Milligan and Douglas, 2007). The way in which repositories are used usually depends partly on the dimensions of repositories, and also on key characteristics of the communities using them. For example disciplinary dimensions are likely to drive user decisions (Margaryan & Littlejohn, 2007). According to Margaryan and Littlejohn (2007), disciplinary differences including user prerequisite skills and their relative literacies can vary across disciplines. This will therefore affect the types of resources being stored for reuse, and how these resources will be used. They comment, "Some disciplines may favour complex, interactive resources, while others prefer text-based materials. Clearly, repositories aimed at single disciplines can be more focussed in terms of the resource types within their collection." (Margaryan & Littlejohn, 2007, p.5). Allen (2005) supports the opinion that the attitudes and behaviours of academics from different disciplines towards depositing their work deserves considered attention. His research revealed a far lower number of humanities deposits and a low awareness of Open Access as compared to academics from the scientific, technical and medical disciplines. His survey found that two thirds of respondents would deposit their work in institutional repositories, despite having several concerns, for example the potential for plagiarism. His research concluded that an understanding of the attitudes of academics from different disciplines is crucial.



It is not always possible for designers to consider all the possible ways in which a system will be used (Hatala & Nesbit, 2001) However, Woo et al (2004) caution that,

*“...lack of uptake is commonly experienced and it can be partly attributed to the neglect of user concerns. The end users of these systems have rarely been identified, and seldom given a chance to speak about their needs and concerns.”(p1)*

To prevent this, end users need to be identified and consulted about their needs and concerns for the system. It is acknowledged that effort should be directed towards the process of engaging the target audience, familiarising groups with the affordances of the Carrick Exchange and its potential to support user needs, and proactively facilitating the development of networks and communities of practice engaged in sharing and developing high quality resources.

The potential benefits of repositories are generally well documented. The following list, generated by combining Deakin University institutional repository information, (Monahan & Owies, 2005, pp.1-2) and the Jorum national repository information from the UK (Jorum, 2007), indicates significant advantages.

- Participation in the advancement and sustainability of e-learning at a national level;
- Conservation of time and effort through reuse and sharing of knowledge and resources;
- Facilitation of communities of practice and online professional networks at a national level;
- Project dissemination as a requirement of funding obligations;
- Archival functionality for publicly funded project output;
- Seamlessly integrated knowledge management systems;
- Easy cost effective searching and retrieval of resources;
- Improved sharing and storage systems;
- Improvements to the quality and currency of courseware and methodologies in units of study;
- Automated review notifications for content expiry;
- Workflow visibility and effectiveness - documented processes for contribution and reuse;
- Authenticated and secure access;
- Automated tracking and control over the reuse of materials;
- Legal security for contributors through a robust tagging and licensing system;
- Management and protection of copyright; and
- Metadata and cataloguing conforming to accepted standards, enabling easy search and retrieval.

However, realising these advantages is a complex task. Ignoring the sociocultural issues relating to learning object repositories is to run the risk of creating an under utilised service. It cannot be assumed that reuse will follow existence of the repository (Margaryan & Littlejohn, 2007; Philip, 2007). Margaryan and Littlejohn (2007) point to the effect various cultural dimensions (organisational, professional, disciplinary and national) may have on the impact, uptake and usage of the system. These factors are further influenced by community size, member proximity to the resource, the roles of stakeholders and types of tasks for which the resources in the repository are intended and used. In addition, barriers to uptake will cluster around socio-cultural, pedagogic, organisational and informational management, and technological issues (Margaryan, Currier, Littlejohn, & Nicol, 2006). Margaryan et al. (2006) offer the following general solutions to each of these areas (pp.4-5):

#### *Solutions to socio-cultural issues*

- *Design of the LORs (learning object repositories) should be based on understanding of cultural norms and expectations of the user communities.*

#### *Solutions to pedagogic issues*

- *Emphasis on pedagogy pull vs. technology push.*
- *Development of LORs by multidisciplinary teams (including teaching practitioners as well as learning technologists and librarians).*
- *Provision of examples of successful use of LORs related specifically to teaching and learning.*
- *Development of LOR models involving co-construction of resources by the students.*
- *Demonstration of impact for learning and added value for individual users.*
- *User development and support in information literacy.*

#### *Solutions to organisational and information management issues*

- *Incentives and rewards linked to community needs and goals.*
- *LORs linked to organisational strategy and objectives.*

#### *Solutions to technological issues*

- *Facilitating ease of use, engagement, efficiency and pedagogic effectiveness.*
- *Conceptualisation of LORs as a context rather than isolated tools.*
- *Effective policies and practices for metadata creation.*

For the Carrick Exchange to become integrated into the everyday work practices of the Australian higher education sector, the literature suggests that change management issues should be addressed early (Casey et al., 2006). Shea et al., (2006) further note that new ideas that are at variance with existing values and norms are unlikely to be quickly adopted. People will not necessarily change their practices in response to external forces upon them; they will only change if there is a good reason to do so, such as a benefit to their learning or teaching or promotion (Bates et al., 2006).

Barriers to change are not easy to implement as the VET sector has found with the Australian Flexible Learning Framework (Phillips et al., 2004). The Carrick Exchange will be initiating not only technical change, but educational and cultural change.

The change management processes required to assist in a shift towards increased sharing amongst academics may be significant. The literature confirms that to effect major educational change commitment at the highest organisational level will be required (e.g. Ely, 1999; Kenny, 2002, in Kenny 2003; McKenzie, Alexander, Harper & Anderson, 2005). Support championed and led from the top, with “bottom up” support for innovators, and provision of well supported resource development for those in the middle is the best model (Nicol et al., 2004 in Weedon, Bricheno & Chidwick, 2004). Scott (1999, p.10) notes that one of the reasons why many “intrinsically worthwhile” innovations founder in educational settings is that administrative and support personnel are not sufficiently apprised of key information and integrated well enough into change processes. The study by Ehrmann, Gilbert and McMartin (2007) into the impact of *icampus*<sup>1</sup> in five American universities noted that “the ‘market’ for higher education responds weakly, if at all, to changes in educational effectiveness” and that “widespread dissemination of such activities is very difficult” (p.2). Also:

*External forces and internal dynamics both tend to create a short institutional attention span for educational reform. . . It can easily take 8-12 years or more to create a visible, rewarded change in the outcomes of a degree program or a university education. (p.3).*

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<sup>1</sup> *iCampus* is an initiative between Microsoft Research and MIT. The consortium aimed to build and research technologies that could make a significant difference in university teaching and learning. Because of the failure of a number of large-scale projects which had not moved beyond the pilot phase, Ehrmann et al and *iCampus* decided to evaluate five successful projects.

Ehrmann et al., (2007) emphasise the need for rewards to “feed” the demand for adoption of new ideas (p.iii); and importantly suggested that cross-institutional and intra-institutional links should be “nurtured” amongst central services that offer educational and professional development support (p.iii).

Subramani (2004) conducted research with 1000 contributors of reviews on Amazon.com and examined the questions of pro-social behaviour to consider motivations for contribution such as altruism, and other motivations arising from intangible benefits such as reputation and name recognition as well as psychosocial rewards such as positive feelings from a sense of belonging to a community. Subramani’s research suggested that in spite of the somewhat impersonal nature of the process, contributors to repositories perceived their actions as being a social act. Altruistic motives with no expectation of returns of any kind, are significant in influencing contribution as is the need for social affiliation and the need for professional self-expression as well. Extrinsic rewards such as reviewer ranking also appears to play an important role, though this was seen as contrary to the idea that social capital is engendered largely by interpersonal interaction in face-to-face situations. In this case there was evidence that social capital in the form of obligations, trust and identification with the community play an important role in stimulating contributions.

The use of social networking software to facilitate communication, networking, collaboration and sharing amongst users will be an important aspect of the Carrick Exchange. Social networking tools, part of the Web2.0 technologies, are a recent development, allowing a user to create and maintain a network of close friends or business associates for social and/or professional reasons. (O’Murcu, Breslin and Decker, 2004). Their use revolves around principles of networking and sharing and as Bryant (2006) observes, social software tools can support students and staff beyond the classroom, reaching around the world for learning and communication. Brosnan (2005) reports success relies significantly on the social dynamics of the networks, the barriers that exist, and the incentives that can be found to overcome these barriers. The potential is there through the growth of social capital, for learning-object exchange to function as a mechanism for supporting and sustaining communities of practice.

In general, social software supports collaborative online spaces such as blogs and wikis; sharing of and commentary on photo, audio and video files; digital storytelling; 3D virtual worlds (such as Second Life, <http://secondlife.com/>); and social spaces such as Facebook (<http://www.facebook.com/>). Technology usage by individuals is undergoing a change from consumption of content to user-centric creation of content and collaboration via networks. However, there is often an unchallenged assumption that the software on its own promotes communities. The critical elements for successful use of social software are identified in the Australian Flexible Learning Framework report for the VET sector (Evans 2007, p.13) as:

- “Authenticity” – there is a real and established need to use the software;
- “Relevancy” - its use is “relevant to the need, and appropriate for the client”; and
- “Support” - there is support for the software within an “enabling culture”.

Furthermore, Evans (2007) indicates that the best strategies to help staff learn how to use social software tools are action learning, just-in-time mentoring, coaching and work-based learning. The tools considered to be most useful in assisting staff to learn how to use social software are virtual conferencing and online forums. The best professional development strategies were reportedly blended ones using a variety of opportunities and strategies. The importance of modelling as an enabler as well as a professional development strategy was emphasised. Digital storytelling through the use of multimedia case studies was considered very effective, along with “learning by stealth”, i.e. blending usage into everyday practices and inviting managers to ‘see, hear and feel what happens’ (p.22).

The Carrick Exchange may well support fully formed communities of practice plus other looser and more brittle networks. Wenger, McDermott and Snyder (2002), in defining communities of practice, support the notion that a website on its own is not a community of practice. Communities of practice are “groups of people who share a concern, a set of

problems, or a passion about a topic, and who deepen their knowledge and expertise... by interacting on an ongoing basis" (p.4). Development of the necessary domain of knowledge, the community and shared practice over time (through sharing of stories, experiences and methodologies) will present ongoing challenges to the community. Wenger et al., (2002) suggest that domain, community and practice are not only defining terms for a community of practice, but that they represent "different aspects of participation that motivate people to join a community" (p.44). Some members will join because they are interested in the domain, the specific area of knowledge; some will join because it is the community aspect they seek; others will be seeking to learn about practice, the standards, the tools and the lessons learned by experts in the field.

McDonald and Star (2006) point to five key challenges in the formation of a community of practice: the need for financial support; issues of academic time poverty; the need for well-placed institutional champions; the difficulty of identifying and quantifying outcomes from communities of practice; and the question of sustainability and ongoing support.

In addition, policies should be stated clearly "and not form unwanted obstacles" for communities to develop and the threshold for entry into the system should not be unnecessarily complicated or high (Hummel et al., 2005, p.66). There must be sufficient room for the community to self organise its own structure and facilities. Hummel et al. also suggest that the system should begin with a minimal set of activities and forums and, when more participation is required, this might be better promoted through synchronous collaboration rather than through asynchronous means. "Clear policies, usability and reward systems are of importance when facilitating a learning network" according to Hummel et al. (2005, p.55). The importance of systems of reward and recognition for effort in teaching, and activities such as contribution to the development, sharing and reuse of resources is gradually being recognised within the higher education sector. Some institutions are beginning to take action which recognises the important role of teaching: for example, the University of Queensland, in an internal review (University of Queensland, 2007), has recognised that different staff roles demand varying amounts of emphasis on teaching and research, which should be acknowledged. The argument is that both are of value and worthy of recognition and reward. In addition exemplary repositories and exchanges such as MERLOT and CLOE, and the Carrick Institute itself have systems of reward in place that provide models for recognising and rewarding members through awards and conferences. The collaborative RUBRIC project for regional universities also has in place recommended methods for tying contribution to their repository with promotion and career advancement processes. The issue of rewards and recognition is not dealt with in depth in this report as it is to be researched further in another study; however, the *ascilite* research recognises its central importance in the development and sustainability of the Carrick Exchange.

Contributions of teaching and learning resources to online repositories have received significant attention with several research reports revealing common barriers.

Foster and Gibbons (2005) found that while wanting to embrace the benefits of sharing research and ideas potential contributors were concerned about overwork and resisted any additional activity that might erode their available time for research and writing. A survey conducted by Bates et al., (2006) revealed supporting attitudes where they found that the main reason [for not contributing] was personal factors, including: lack of time; lack of knowledge/awareness of the issues; lack of confidence in own materials and not realising that other people would want them. One participant in the survey stated that "without adequate time, resources, appropriate skills, recognition, and backup support it is virtually impossible for academic staff to produce reusable learning objects to the required standard themselves. A key point is that this requires the development of new approaches to assessment, learning and teaching that is recognised in deployment, reward and promotion" (Bates et al., 2006, p.25 ). The same study revealed the biggest single reason for not contributing was a lack of awareness regarding any repositories, and this highlights the need to increase awareness surrounding repositories. The lack of awareness was not only related to the actual existence of the repository, but also to understanding the purpose of a repository, "how they work and the benefits that they bring to an institution or a subject area"

(Bates, Loddington, Manuel & Oppenheim, 2007, p.78-9). Another reason cited by the study included a general lack of time to prepare and contribute materials by academics.

## Resource identification and contribution

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As well as the communities, networks and workspaces expected to establish around the Carrick Exchange, there will be a repository of quality learning and teaching materials either deposited on the site or linked from websites and databases elsewhere. In a review of repository development in the UK (the CD-LOR Report), the authors warn all repository managers to clearly establish the *need* for any collection (Margaryan et al., 2007; Margaryan & Littlejohn, 2007). This view is shared by findings from the research of Gosper, Woo, Gibbs, Hand, Kerr and Rich (2005), and Ringan, Corley and Campbell (2005). Communicating the purpose of the repository and its community will be important to the success of the Carrick Exchange. The Australian Partnership for Sustainable Repositories (APSR) investigation into the ten major issues facing repository service providers, relating to research output in Australia (Henty, 2007), noted that *defining the collection* was an essential communication task in the process of repository development and user engagement. In addition, the APSR research uncovered similar issues of lack of engagement to those noted in the CD-LOR report. Senior academics responsible for repository services and data management were interviewed for the APSR research. It was noted that open access repositories have not been taken up with great enthusiasm: an exception was the Cornell University Physics eprint archive (<http://www.arxiv.org>). An interesting finding was that in the research context, mandating article deposit resulted in high levels of contribution, as illustrated by the Queensland University of Technology experience. However the high cost and effort required to deposit articles in the system was seen as a barrier by some senior managers.

This lack of contribution to repositories has been reported elsewhere (Margaryan et al., 2007; Wenger et al., 2002). While studies such as Najjar, Ternier and Duval (2004) may document usage patterns from the logs of repositories, they do not reveal the broader picture of contribution. Some studies of repositories (Bradley & Boyle, 2004; Littlejohn, 2003; Hand, Gosper, Woo, Gibbs, Kerr & Rich, 2004) list incentives for use put forward by target users, but resource contribution still remains relatively low. Repository managers catering to more diverse users, e.g. around national rather than discipline-based repositories, are likely to face greater problems in this area (Margaryan & Littlejohn, 2007). Furthermore, the way repositories are used depends not only on the “dimensions of repositories” (purpose, scope, target audience etc.), but also on “key characteristics” of the communities (p.4336).

In their study of the needs of academics in the research domain, Foster and Gibbons (2005) noted that academics characteristically require the following:

*[To be able to] work with co-authors; keep track of different versions of the same document; work from different computers and locations, both Mac and PC; make their own work available to others; have easy access to other people's work; keep up in their fields; organize their materials according to their own scheme; control ownership, security, and access; ensure that documents are persistently viewable or usable; have someone else take responsibility for servers and digital tools; be sure not to violate copyright issues; keep everything related to computers easy and flawless; reduce chaos or at least not add to it; and not be any busier. (p.3-4 of 10)*

This suggests that collaborative workspaces offered through the Carrick Exchange, where resources can be shared and contributed may well meet a need within the higher educational community. The research of Breslin, Nicol, Grierson, Wodehouse, Juster and Ion (2007) within the discipline of Engineering in the DIDET project at Strathclyde University also indicates the value of such shared workspaces for teachers and students to share and manage resources. Further, the need for a critical mass of resources within the repository is reported as critical for a viable implementation (Foster & Gibbons, 2005; Breslin et al., 2007). Breslin et al. also suggest that it may take two to three years for a cross-institutional repository project to become established and be able to offer benefits to others beyond the core implementation group.

One of the design aims of the Carrick Exchange is to promote processes characterised by Stuckey and Arkell (2006, p.7) as “connection” not just “collection”. Therefore, diverse communities and database or repository models are being explored to determine the elements that contribute to success. Examples as varied as amazon.com (which markets books, DVDs etc.), domain.com.au (real estate), Wikipedia.org (a collaborative encyclopaedia), Youtube.com (video sharing), Edna (edna.edu.au) and MERLOT (merlot.org) (educational exchange) were reviewed. Their strategies for resource contribution and networking, using Web 2.0 technologies, may inform the development of personal and group workspaces on the Carrick Exchange. On amazon.com, for example, registered users are greeted by name and have delivered to them recommendations and updates about available products. The user can collate chosen resources from the site, and develop their own profile of recommendations, ratings and preferences. The system monitors users’ preferences, locates resources based on previous searches and feeds back information that connects users with other like-minded members. A mix of these features may be of value to the Carrick Exchange.

MERLOT (<http://www.merlot.org>) uses similar techniques to support its educational community. Of particular relevance to the Carrick Exchange is the emphasis placed in MERLOT on establishing a repository of high quality items that are organised according to disciplinary communities. Many of the items submitted have been recognised as exemplary in their field (LeLoup and Ponterio, 2002). The Australian study by Woo et al., (2004, p.3 of 9) questions motivations to share even when disciplinary domains are set-up as filters:

*The assumption that sharing will happen automatically because of technological advances assumes teachers are intrinsically motivated to share, but a brief survey of the literature shows that this is often not the case.*

Allen (2005) supports the opinion that the attitudes and behaviours of academics from different disciplines towards depositing their work deserves considered attention. His research revealed a far lower number of humanities deposits and a low awareness of Open Access as compared to academics from the scientific, technical and medical disciplines. His survey found that two thirds of respondents would deposit their work in institutional repositories, despite having several concerns, for example the potential for plagiarism. His research concluded that an understanding of the attitudes of academics from different disciplines is crucial.

In contrast, a study conducted in the UK by Bates et al., (2006) found that respondents would prefer to contribute to a national repository with over two thirds (67.2%) of participants choosing this option over other kinds of repositories listed. The key reasons given for contribution were to:

- increase access to resources for students,
- improve teaching, and
- increase student motivation.

An Australian study by Woo et al., (2004) found that the criteria teachers used to select learning objects for their teaching were the same as those they used when selecting traditional resources. Furthermore, teachers in this study were primarily concerned with the object’s potential to enhance pedagogical efficacy and improve work efficiency. Therefore, it was seen as vital for learning object systems to provide high quality, relevant objects that could be accessed and acquired in a time efficient manner.

# Peer Review and Commentary

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The quality and currency of resources added to a repository is critical to ensure user needs are met. Furthermore Ruiz, Mintzer and Leipzig (2006) suggest that in the case of e-learning, peer review requires additional considerations, beyond just the quality of the content. Elements such as ease of navigation, interactivity, appropriate level of challenge, the need for special skills, hardware or software etc., all place new demands on reviewers engaged in the process of evaluating e-learning resources.

In terms of standard peer review of publications, Starbuck (2003) raises the question of the value in peer review, saying that “authors need to view reviewers’ comments not as judgments about the value of their work, but as good data about potential readers of their articles.” (p.344). He identifies the editorial review process as problematic insofar as reviewers make decisions about acceptance when actually reviewers and authors should be peers. These kind of standard review processes have been shown empirically to incorporate elements of bias and randomness, so the design of peer review for repository systems needs to include both formal peer review processes that follow the benchmark standard lines as well as allowing for an informal element in terms of commentary. Van Rooyen, Godlee, Evans, Black and Smith, (1999) reports on the arguments in favour of open peer review which include “increased accountability, fairness, and transparency”. (p.44).

Research conducted by Taylor and Richardson (2001) on a national system for peer review of ICT based teaching and learning resources indicated a strong preference by Australian academics for the opportunity to have teaching related resource development acknowledged in the same way that research received recognition. A national repository is well-placed to implement a formal peer review system. However, peer review as a quality assurance mechanism could simply include an assessment of the currency, educational design and construction of resources; compliance with copyright, intellectual property and digital rights management policies; and technical accuracy and reliability. Formal peer review on the other hand, is a lengthier and more demanding review process, and might replicate the scholarly peer review process that leads to publication in the higher education sector.

Peer review may also be an informal process whereby members of the community voluntarily respond to others’ contributed resources, or resources stored elsewhere but linked to via the Carrick Exchange. These resources might be finalised products that the authors publish and share widely or to a narrower select group of colleagues, or resources “under development”. This informal sharing of ideas could be an important element of the Carrick Exchange and the basis for various communities of practice through a mechanism of commentary.

One of the best models of formal peer review for educational resources is that of the MERLOT system in the USA (McMartin, 2004; Nesbit, Belfer & Vargo, 2002). This system is based on the academic peer review practices for scholarship and publication in higher education, an “expertise-orientated” approach (Worthen, Sanders & Fitzpatrick, 1997). Peer review is recorded for formal recognition of contributors, and usage pattern updates are sent to contributors each year. Building on the MERLOT model, Nesbit et al. (2002) have created a convergent participation model for evaluation of learning objects where resources undergo a two cycle process: two individual experts assess the resource, then a combined group assessment is made, amalgamating the feedback from both assessments. Students are included on the panel of reviewers. The Australian ACELL project, Advancing Chemistry by Enhancing Learning in the Laboratory (<http://acell.chem.usyd.edu.au/>), is an example of a discipline-based repository which also makes use of learner feedback in the evaluation process. Other repositories which implement peer review are Intute in the United Kingdom (<http://www.intute.ac.uk/policy.html>), and Educause in the USA (<http://www.educause.edu>). The Jorum national repository in the UK (<http://www.jorum.ac.uk/>) is currently investigating peer review processes.



Though peer review is seen as a value adding process, realisation of peer review processes is problematic. The Taylor and Richardson report on *Validating Scholarship in University Teaching* (2001) concluded that at the time of publication, there was a “window of opportunity” to establish a peer review scheme to assess information and communication technologies in Australian universities (p.87). The project set out to develop conceptual and procedural bases for a national scheme. Reviewers would be editors of journal and conference proceedings and it would be the responsibility of these editors to advertise the scheme. A supporting professional development strategy was to be developed and resourced. The project generated a number of options for the peer review process.

Taylor and Richardson (2001, p.7) offer four reasons for peer review:

- Need for the evaluation of quality in ICT-based resources;
- Need for recognition for the developer of ICT-based resources;
- Need for the collaboration and dissemination of resources and knowledge relating to the design and construction of these resources; and
- Need for this quality assurance, recognition and collaboration to be grounded in the concept of scholarship.

Taylor and Richardson stress that it is the focus on scholarship that is central to the “value-adding” work of academics (p.7). Peer review is seen as a means of validating and recognising that scholarship, and this is essential if effort around teaching is to receive parity with scholarly research endeavours in higher education. They claim,

*“that activities of teaching and learning are now claimed as public territory. They are more easily accessed, and access/lurking is unlikely to impact on the educational process. Our position is that the benefits of peer review still outweigh a situation where ‘anything goes’, whether in the field of research or teaching.”* (p.53)

Despite the positive outcomes of the project, the scheme has not been adopted nationally.

Recent changes to academic publishing have seen some journals try a move towards a more “open” approach to publishing that may be of interest to those conducting peer reviews of educational resources. One of the arguments against traditional blind peer review is that the reviews produced and the research accepted favour tradition and not innovation (Rogers, 2006). The peer review system evolved when dissemination was difficult and expensive. There is an argument that open publication may allow innovation to be disseminated more speedily.

Anderson (2007) argues that the Web may become the first place of publication in the future, and only the very best and most enduring works will be published in paper. In their report to Ithaca University, Brown, Griffiths and Rascoff (2007) have also extended their definition of publishing to take account of the broadest sense in this digital age, to reconceptualise the university’s role and revitalise its capacities in this respect. Descriptions of future discipline-based portals are suggested and the interactive nature of reviewed materials could include:

- “traditional peer-reviewed published material (monographs, journals, reference works)
- multimedia projects;
- raw primary source material (data sets, gray literature);
- primary source material designed with the interpretative and conceptual insights of scholars;
- conference proceedings and other non-peer-reviewed output from universities;
- pre-print workspaces that allow scholars to collaborate in advance of publication (working paper repositories);
- post-print conversation spaces that encourage scholarly communication (message boards, author sites, newsletters, blogs );
- dissertation repositories; and
- subject matter repositories” (Brown, Griffiths and Rascoff, 2007, p.3)

Cornell University's open access Library e-print site, arXiv<sup>2</sup> ("archive"), has allowed pre-publication of papers in the sciences since 1991, and for these papers to be open for comment. The prestigious science journal *Nature*<sup>3</sup>, began trialling a more open peer review process (Rogers, 2006) in June 2006. Authors can choose a 'pre-print' option. This pilot is now out of the beta stage and is called *Nature Precedings* (Nature, 2007). Once a research article has passed an initial quality check, the author posts their paper on the journal's website, and anyone, provided they give their name and email address, can comment on the research; the traditional blind peer-review process continues in the background. The traditional method of review is lengthy, and can take between four and twelve months, after two or three reviewers have made their assessment, the editor has compiled and reviewed the reports, amendments are requested from the author and finally the work is published. The open approach where a pre-print is out in the public domain immediately the research article is completed allows for much quicker access. This could become a model for repositories like the Carrick Exchange which undertake peer review, where currency of resources is a considerable issue. *Nature* warns readers to treat the findings in any of the research published in *Nature Precedings* with caution as results may be preliminary or speculative, but all documents are citable (have a DOI), and are archived under a creative commons license where derivatives are allowed (Nature, 2007).

Whilst the open review process speeds publication, the process of soliciting informal peer review comments was less than successful. Reaction to the trial from authors and scientists was mixed. While there was considerable traffic on the site where the pre-prints were posted during the four month trial, and the concept was well received, few readers commented on the papers. Survey results and analysis of the comments (Nature 2006) indicated that: obtaining comments was difficult; attempts to solicit comments produced only limited success; competition in the field may have been a reason for lack of input; potential commenters thought that open peer review was a good concept but still did not provide feedback; and editors' analysis of the comments indicated that generally comments were low level and did not add to the review process. This reluctance to provide substantive comment in general on other sites was noted by some participants in the *ascilite* research. Nonetheless, the argument for early publication and dissemination provided in the *Nature* example probably overshadows the counter argument that informal peer review is likely to be minimal and of little real value for development.

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<sup>2</sup> <http://arxiv.org/>

<sup>3</sup> <http://www.nature.com/nature/index.html>

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## Appendix A: Additional resources

Author/s	Key words	Description and context	Research methodology	Key findings	Area	Implications for the Carrick Project
Allen, 2005	Repository, Open access, peer review, humanities	Comparison of academic views to contributing to repositories – Provides detailed overview of possibilities for Open Access publication and the “continuum of peer review”	Attitudinal survey, humanities practitioner interviews and analysis of contents of 25 UK based repositories. Data compared to scientific, technical and medical (STM) disciplinary studies.	Humanities academics willing to share but many lacked knowledge about purpose of repositories. Disadvantages of sharing perceived as “potential for plagiarism, the apprehension of interfering with publishing their work elsewhere, and the fragility of online means of dissemination.” P4 Benefits perceived as more for those accessing rather than for authors.”	Resource contribution	Clarify purpose of repository and promote to wide disciplinary range
Australian National Training Authority, 2003	Overview of learning objects, metadata, granularity, instructional design	Descriptive study of LORs for the Australian VET sector	Focus on the demystification of learning objects and how they can be used within the VET sector	Raising teacher awareness may only be feasible once an infrastructure is in place at an organisational level	Repository	Clarification of terms
Barton and Waters, 2004	Institutional repositories, planning and design, LEADIRS, service model, legal and regulatory environment	Provides advice on how to establish an institutional repository Where possible, includes links and references to universities that have already designed or built institutional repositories Provides a number of case studies to serve as examples	Case study	Establishment of an institutional repository is a large task – this book builds on the work of a number of universities who have established repositories and provides very practical advice for those getting started.	Engagement	Chapter 2 provides a good overview for setting up an institutional repository. Sample Job Description: User Support Manager P46 Marketing: Lessons Learned P59; Policy, MOU, cost modelling (p132)

Author/s	Key words	Description and context	Research methodology	Key findings	Area	Implications for the Carrick Project
Bates, Loddington, Manuel and Oppenheim, 2006	Rights and Rewards, repositories, learning objects, survey, data analysis	Comprehensive academic survey for Rights and Rewards in Blended Institutional Repositories project "need to align technology with existing practice in order to facilitate this change and not hope that the technology will change existing practice" p25	430 valid responses were recorded to questionnaire focussed on motivation and understanding of repositories	Over half of all participants placing their teaching materials into VLE Respondents indicated that future contributions would be 'much more likely' or 'likely' if a specialist panel reviewed material to guarantee quality	Peer review	Peer review processes are valued by academics and a rigorous process on par with research should be established
Brosnan, 2005	Learning objects, digital repositories, sharing, social capital theory, social dilemmas, communities of practice	Examines learning objects as public goods and the provision of an object repository as a "commons"	Explores learning objects as "social capital" Empirical analysis of Jorum	Rational behaviour at the individual level can lead to disastrous results at the group level	Resource contribution	
Casey, Proven and Dripps, 2006	Professional and organisational change, change management, intellectual property rights, learning objects,	Maps Digital rights management issues and examines cultural change needed to share resources	Discusses the importance of understanding the context of application for LORs	Issue of permanence is an important one for the e-learning community	Resource contribution	DRM issues need to be addressed
Caws, Friesen and Beaudoin, 2006	Learning objects, repositories, language learning, French, research design, higher education	Development of learning object repository for learning French as second language	Focuses on the issues associated with the development of an online collection of resources for teaching and learning, including pedagogy	Evaluation process for examining FLORE important to ensure end users needs are met.	Resource contribution	Value of peer review process and evaluation of use

Author/s	Key words	Description and context	Research methodology	Key findings	Area	Implications for the Carrick Project
Chang, 2004	Reusable learning object (RLO), instructional components, reusable e-learning materials (REM)	Short paper on how to encourage educators to create and share reusable eLearning materials	Brief overview of reusable learning objects and reusable e-learning materials	Maximising learners' engagement and motivation in the process of learning is critical towards learning outcomes	Resource contribution	Motivation for reuse of contributed resources
Christiansen and Anderson, 2004	Learning objects, development implications, pedagogy, course development	Examines the implications of a learning object approach to the design and production of online courses	Three case studies- Nursing, Business and English writing	Issues relating to repositories constrain the learning object economy and the free sharing of resources	Resource contribution	Application model for reuse of contributed resources
Cleveland-Innes, McGreal, Anderson et al, 2005	Metadata, EduSource, learning object repositories (LORs), standards for learning objects, adaptation of content, pedagogical approaches, learning objects	Analysis of implementation of EduSource as part of Athabasca University putting all courses online	Descriptive study of implementation process and issues involved with EduSource at AU	Considered the adaptation of content and related applications, pedagogical approaches and the use of learning objects by instructional designers, faculty and the learners themselves	Repository	Offers recommendations for other higher education institutes developing LORs
Conole and Fill, 2005	Learning design, toolkits, teaching/learning strategies, e-learning, pedagogy	Article describes the background to the specification of a learning activities design toolkit	Describes a learning design toolkit which guides practitioners through the process of creating pedagogically informed learning activities	Teachers need support and guidance with respect to quality of resources and e-learning design, as well as methods for understanding, unpacking and repurposing existing offerings	Engagement	Support methods for reuse of contributed resources

Author/s	Key words	Description and context	Research methodology	Key findings	Area	Implications for the Carrick Project
Currier and Barton, 2003	Metadata creation, metadata management, learning object repositories (LORs), standards and specifications,	Surveys the growing body of evidence to scope the issue of metadata creation and to identify questions for further investigation	Analysis of the creation and usage of metadata in an LOR environment	Good quality metadata is a key component in the successful implementation of LORs	Resource contribution	Signals the importance of metadata for resource contribution
Downes, 2002	Learning objects, learning environment, accessibility, open standards	Aims to provide a comprehensive overview of learning objects and related topics for the non-technical reader	Divided into 4 sections: arguments, theoretical use, practical use, learning object economy as whole	An open learning marketplace supporting multiple standards is required	Resource contribution	Good background for non-technical reader
Gašević, Jovanović, Devedžić and Bošković, 2005	Learning object, ontologies, repositories, content structure, semantic web	Proposes a framework for building learning object (LO) content using ontologies	Approach based on using ontologies for annotating LO content, and thereby extending LO reusability	Attention should be paid on two ontologies: content structure and domain ontologies	Resource contribution	Useful framework for ontologies
Hatala and Nesbit, 2001	Internet-based educational systems, advanced technology in education, learning object repositories, learning objects metadata	Describes how the Technical University of British Columbia is addressing its need for a robust repository solution	The development model is based on the Seeding, Evolutionary growth, Reseeding (SER) model	To construct a requirements specification for a planned full-scale repository implementation	Resource contribution	Development model for building repository

Author/s	Key words	Description and context	Research methodology	Key findings	Area	Implications for the Carrick Project
Haughey and Muirhead, 2005	K-12 education, learning objects, pedagogical issues, student interface, accessibility, usability, evaluation instrument	Describes learning object assessment in the K-12 sector	Describes developments in the areas of learning object assessment, arguments around LO characteristics. Development of evaluation instrument	Teachers unfamiliar with LO use provided LOs as stand-alone unconnected activities or used them as a whiteboard activity. Teachers with greater experience with LOs embedded them in a sequence of activities that encouraged student-oriented individual and group learning.	Engagement	Model of use for contributed resources
Heery and Anderson, 2005	Digital repository, learning object repositories, gap analysis, user requirements	Seeks to identify useful areas of activity for the Joint Information Systems Committee (JISC) Digital Repositories Programme Reviews current implementations of digital repositories 37 page report with recommendations for JISC	A number of approaches including selective review of current activity, stakeholder interviews, focus group, e-mail questionnaire for selected repository software developers and gap analysis are used	Repository developments should demonstrably be set within the strategic aims of the host institutions or funding bodies and clearly relate to the strategic aims and objectives of the organisation bidding for funds – buy-in from institutional and other senior management must be assured for future sustainability	Resource contribution Engagement	Articulating purpose of repository
Henty, 2007	Institutional repositories, development, digital resources, data management	Article identifies 10 issues relating to repository management that are seen as important by a group of senior academic administrators	Thirty-three people from fourteen universities were interviewed Contains anonymous quotes from respondents relating to issues	Responsibility for the long-term management of research data is ill-defined in all of the universities surveyed At present in Australia, there is no course in repository management offered within the higher education or vocational education sectors	Peer review	Engagement and sustainability

Author/s	Key words	Description and context	Research methodology	Key findings	Area	Implications for the Carrick Project
Hirwade and Hirwade, 2006	Quality enhancement, learning object repository(LOR), i-DLR, digital libraries, information communication technology	Discusses characteristics and benefits of LORs and challenges to be faced in developing such repositories  Focuses on i-DLR a LOR about Digital Libraries	Descriptive study of issues related to LOR with Indian context.	New technologies make it more practical that teaching materials are shared among faculty to save time for course development and content creation	Resource contribution	General discussion of benefits of LOR
Koohang and Harman, 2007	Open educational resources (OERs), sustainability, scalability, decentralisation, communities of practice	Paper discussing the concept of Open Educational Resources (OERs) and their sustainability	Special attention is given to sustainability; instructional design & presentation; cost of production and maintenance; support; and OER communities of practice as relate to scalability	OER communities of practice must be formed to help enhance scalability.  Communities of practice are analogous with decentralisation	Peer review	Strategies for engagement
Krull, 2004	Educational metadata standards, RU LOM Core metadata, IEEE standard, learning object, linguistic and cultural diversity, technological literacy	Investigates the development and adoption of educational metadata standards New application profile is proposed, RU LOM Core, for the South African higher education context	Discusses Learning objects, metadata, related IEEE standard and various application profiles 6 metadata standards are explored, 3 metadata editors are described	IEEE standard, developed largely within the northern hemisphere, can be adapted to work in the South African scenario RU LOM Core takes linguistic and cultural diversity and the low rate of technological literacy into consideration	Resource contribution	Strong analysis of metadata standards and possibilities of creating less technological literacy restricted access
Loddingon, Gadd, Oppenheim and Manuel, 2006	Rights and Rewards, repositories, learning objects, survey, digital rights management	Aims to investigate and deliver rights solutions for a teaching materials repository	Examines licences currently being used by repositories compared these to responses to its survey results	Just under a third of RoMEO respondents, and just over half of R&R respondents were not confident enough to state who they thought owned the rights in their materials	Peer review	Signals the importance of educating contributors on IP and DRM issues



Author/s	Key words	Description and context	Research methodology	Key findings	Area	Implications for the Carrick Project
MacLeod, 2005	Learning object repository (LOR) deployment and diffusion, environmental scan, international standards,	Review of LOR deployment and diffusion across Canada	Considers 8 LORs funded at least partially by CANARIE, compares to existing worldwide LORs	Using existing infrastructure to build a pan-Canadian and sustainable infrastructure of interconnected LORs	Resource contribution	Importance of partnerships and role of federated searches to share resources
Manuel and Oppenheim, 2006a	Rights and Rewards, repository, teaching materials, funding models	Examines the factors that influence design of reward schemes	Outlines the factors influencing the design of a scheme to reward staff within higher education institutions for depositing materials	Provision of awards can ensure the recognition that staff time is valuable, and that the additional efforts that individuals make to excel in their role are recognised and rewarded	Peer review	Identifies importance of rewards and incentives program
Manuel and Oppenheim, 2006b	Rights and Rewards, repository, pilot study, funding model	Report introducing Loughborough University's Reward and Award scheme	Presents recipients' views on the application process, the awards offered, as well as the personal and wider benefits of the scheme	Dissemination of project outlines and findings might help to generate greater interest in the scheme and in teaching and learning in general	Peer review	Identifies importance of rewards and incentives program
Margaryan, Milligan and Douglas, 2007	Learning Object Repositories, guidelines, development, key dimensions	Report articulating guidelines and questions involved in Learning Object Repository development	Outlines guidelines for setting up and/or evaluating Learning Object Repositories (LORs)	Based on the findings of the Community Dimensions of Learning Object Repositories (CDLOR) project	Engagement	Mapping CE process over the guidelines will ensure all aspects are addressed
Markey, Rieh, St Jean, Kim, and Yakel, 2007	Institutional repositories, survey, census, data analysis, digital scholarship	Survey of institutional repositories (IR) based in the United States	Separate questionnaires targeted 2,147 academic library directors and senior library administrators contacted, 446 participated in the census – 20.8% response rate.	236 (52.9%) respondents reported no IR planning; 92 (20.6%) respondents are planning for IRs; 70 (15.7%) respondents are planning and testing IRs; and 48 (10.8%) respondents are implementing an operational IR	Engagement	Comparison needed with Australian institutions – many more implementing research repositories so may be more accepted

Author/s	Key words	Description and context	Research methodology	Key findings	Area	Implications for the Carrick Project
McGreal, 2004	Learning objects, granularity, terminology, definition	Overview of various definitions of learning objects and surrounding terminology	Defines the terminology surrounding learning objects and various definitions of learning objects themselves	The usefulness of a LO can best be evaluated once it has been placed in at least one specific learning context	Resource contribution	Glossary of terms
McGreal, Anderson, Babin, Downes et al, 2004	EduSource, learning object repository, repository network, community building, CanCore	Overview of the EduSource network of interoperable learning object (LO) repositories	Describes organisational structure, working groups, principles adopted, infrastructure and community building processes	Represents a constructive collaboration among a diverse group of participants who have accepted common basic principles for the design and construction of an open network of learning repositories	Engagement	Development of networks
McMartin, Flora (2004)	Repository, partnerships, sustainability	MERLOT is an exemplary international repository which is sustained through institutional partnerships and clear strategic direction.	<a href="#">Case study</a>	Good background paper on MERLOT model, including overview of roles and responsibilities of partners.	Peer Review Engagement	Management model and peer review process provide excellent models for CE.
Nash, 2005	Learning objects, learning theories, repositories, online courses	Discusses cases of successful and unsuccessful uses of learning objects	Based on surveys of existing approaches, best practices, and hands on experience	Need standard taxonomy/classification scheme Best practices that take into learning theory and behavioural psychology have a higher likelihood of success	Resource contribution	Taxonomy of LO
Neven and Duval, 2002	Metadata, learning object metadata (LOM), learning object Repositories (LORs), reusable learning objects, digital libraries	Comparative analysis of features of 10 LORs	Broad overview of functionality and features of then-current LORs	Peer-reviewing can facilitate the task of evaluating the quality of a resource when it appears in the result page of a query A more advanced system could generate user profiles based on the user's download behaviour and point the user to appropriate materials	Resource contribution	Dated information, highlights areas of concern in implementation of LORs

Author/s	Key words	Description and context	Research methodology	Key findings	Area	Implications for the Carrick Project
Ockerbloom, 2007	Digital repository, intellectual content, open standards, DSpace architecture	Review of current DSpace architecture and proposals for next architecture	Conducted a survey of the DSpace maintainer and developer community	Developing DSpace 2 will require significant resources and community support	Repository	
Oliver, 2000	Upskilling, technology-based learning, higher education, learning tools	Paper describing possible strategies by which institutions can support, encourage and sustain technology uptake in university teaching and learning	Provides examples of case studies and initiatives in the use of the design and development of reusable tools and learning resources to support technology based learning settings	Design of Web resources needs to consider the important issues of portability, scalability, flexibility and customisability in order that the materials can truly be interchangeable	Engagement	Strategies that can be adapted for engagement
Paquette, 2004	Learning object repositories, educational modelling languages, instructional engineering, elearning standards	Describes a potential solution for creating responsive LOR content	Proposes a set of tools and Instructional Engineering principles to help use LOR to create learning/training designs that respond to pedagogical needs	Future solution of the major interoperability technical problems will shift the focus from media development to instructional engineering and pedagogical concern	Resource contribution	Design of resources and applicability for use
Payne, 2005	ARROW, institutional repository, best practice, interoperability	Paper describing the development of ARROW over the first year of the project	Focused on producing a generalised institutional repository solution	Multiple mechanisms under development to support discovery and retrieval of objects from the repositories	Resource contribution	Management of contributions

Author/s	Key words	Description and context	Research methodology	Key findings	Area	Implications for the Carrick Project
Porter, Curry, Muirhead and Galan, 2002	Learning resources, learning object repository (LOR) implementation, metadata tagging, national strategies, CANARIE,	Full review of LOR implementation across Canada	Descriptive study of issues related to LOR with pan-Canadian context	Utilisation of learning object repositories is still at the demonstration phase and the market for the exchange of learning objects in its infancy	Engagement	Early study of takeup in Canada with implications for takeup of CE.
Richards, McGreal, Hatala and Friesen, 2002	Learning objects, CANARIE, repositories, reusable learning objects, reusability	Article about design of POOL, a learning object repository scalable to the national level	Focuses on the architecture of POOL, the use of CanCore and the desired evolution of POOL, POND and SPLASH	Technology of learning objects and repositories is in an early phase of development and that significant evolution can be expected	Resource contribution	Management of contributions
Richardson, 2006	Open access repositories, survey, research management	Survey on Australian universities and integration of open access repositories with research management systems	34 Universities responded to survey on integration of open access repositories with research management systems	The majority of universities have implemented electronic collection of academics' publication details for the purpose of reporting to DEST	No	Where a need is created for external reporting, takeup is improved.
Sale, 2006	Institutional repositories, analysis, author support policies	Short article analysing the percentage of research entered into institutional repositories	Analyses 7 institutional repositories in Australia and the research output entered into their IRs	Requirement to deposit research output into a repository coupled with effective author support policies works in Australia and results in high deposit rates	Peer review	Where a need is created for external reporting, takeup is improved.

Author/s	Key words	Description and context	Research methodology	Key findings	Area	Implications for the Carrick Project
Shea, McCall and Ozdogru, 2006	MERLOT, learning object repository (LOR), conceptual approach, data analysis, faculty development, Multimedia Educational Resource for Learning and Online Teaching	Analysis higher education faculty adoption of MERLOT Large scale assessment of the project from the perspective of faculty adopters Data from three sources were collected and analysed. log files of SUNY users of MERLOT ; numerical/ narrative reports from online faculty surveys a ten part questionnaire	Case study of 710 online faculty teaching at 33 institutions in the State University of New York Literature of technology adoption and diffusion of innovation theory Viewed through Rogers' five stages of the innovation process	The most committed online faculty were significantly more likely to adopt MERLOT Stage approach common to technology adoption models is appropriate in understanding some aspects of the data Faculty who had taught more than one online course were more likely to report that MERLOT was useful in their teaching	Engagement	Those most familiar with technology use in their teaching and most likely to engage in adoption of additional innovations
Silva and Silva, 2007	Learning objects, metadata cooperation, stock exchange, learning object repository (LOR), credit based systems,	Analyses current LOR design and structure Introduction of a "stock exchange" based system for LOR information called LOB (Learning Object Board)	Kind of methodology followed in the area of IT engineering	Found out the most common and popular LOR features, as well the respective strengths and weaknesses A credit based system should creating user's interest to enter LOB everyday to check LOs values and promotions	Resource Contribution	Important information regarding possible designs of new LORs using credit based systems
South and Monson, 2000	learning objects, instructional technology, unified system, theoretical framework, granularity	Article about integrating learning objects into instructional technology infrastructure <a href="http://reusability.org/read/chapters/south.doc">http://reusability.org/read/chapters/south.doc</a>	Describes the theoretical framework used to conceptualise and work with learning objects, the core issues and principles, the solution that they are working toward, the role of learning objects in that solution, and the benefits anticipated	Many more faculty are interested in producing a few objects for their classes than are interested in a full-blown development project	Resource Contribution	Team development of teaching resources may be useful for creating quality resources

Author/s	Key words	Description and context	Research methodology	Key findings	Area	Implications for the Carrick Project
Su, Tseng, Wang et al., 2005	SCORM, learning object repository (LOR), LCMS, information management, content management learning object repository (LOR), e-learning, content management, XML	Propose a management approach, called the Level-wise Content Management Scheme (LCMS) for LORs	Meta-study of topic	(SCORM) has become the most popular international standard for e-learning systems  Very structured scientific analysis and proposal for LOR structure	Resource contribution	Ensure technology complies with standards
Wang, Dickens, Davis and Wills, 2007	Learning objects, community of practice, repurposing, Wiki, contextual metadata	Article describing development of tools for adaptation of learning objects	Describes a simple set of tools to enable practitioners to adapt the content of existing learning objects	Within UK language teaching community there is a willingness and intent to reuse materials but the practitioners have expressed their need for simple to use community tools	Engagement	Identifies the need for communication and collaboration tools for networking
Wiley, 2000	Learning object, instructional design, taxonomy, analysis	Article exploring the potential links between learning objects and instructional design	Attempts to connect learning objects to instructional design theory	Lack of a broadly applicable taxonomy significantly hinders the application of the learning object to existing instructional design theories	Resource contribution	Necessity for careful design of taxonomies
Wiley, 2003	Learning Objects, decontextualised learning, instructional design, educational object commons	Attempts to describe mainstream view of learning objects, and demonstrate an alternate way of thinking about learning objects	Examines implicit assumptions of SCORM, disparities between learning objects approaches and current research on learning, reusability paradox	The problem lies in the received view of what learning objects are and how they ought to be used	Resource Contribution	Implications for taxonomies and metatagging of items

Author/s	Key words	Description and context	Research methodology	Key findings	Area	Implications for the Carrick Project
Woo, Gosper, Gibbs et al, 2004	Learning objects, learning object systems, motivators and inhibitors, learning object exchanges	Invited teachers, educational developers and curriculum consultants from three educational sectors to comment on LOs	Analyses user concerns and most used features	For a learning object system to be adopted, it must be compatible with the workflow of its users	Resource Contribution	Analysis of workflow models
Zuccala, Thelwall, Oppenheim, Dhiensa, 2006	Webometric, repositories, digital library, link analysis,	Evaluates five different types of public repositories in the UK	Qualitative and quantitative research techniques Webometric analysis, interviews, online survey	A link analysis should be carried out regularly to examine international links; managers should communicate with users regularly to inform of usage.	Resource Contribution	Analysis of use models; LexiURL link analysis tool may be useful plug-in for CE.