

# **Digital Research Portal Implementation in Libraries, Archives, and Museums: An Annotated Bibliography**

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## **Introduction and Scope**

The following bibliography is a survey of the key issues that should be addressed when considering the implementation of a research portal. These articles illustrate benefits of online discovery tools and thoughts related to their implementation. The articles in this bibliography discuss digital resource structure, data protection policies, user needs, and implementation practices. The articles are scholarly English journal articles available through LIS databases. They were published from 2000 to 2014.

## **Description**

Library, archives, and museums should consider research portals in order to reap the benefits of today's technology, engage with the public in the digital realm, and foster new scholarship. Digital research portals are a single point of access for digitized materials. They may be related to a subject or be representative of a physical collection within a library, archive, or museum. Research portals have the power to create connections between diverse collections in separate information repositories. Successful research portals can bring authentic information out from the "deep" Web and into the forefront of search engine queries. Digitized collections support new interpretations of information through digital scholarship which harnesses the power of metadata.

## **Summary of Findings**

The ability to create digital research portals is a relatively new challenge that results increased Web capabilities of institutions and expectations users. Consequently,

the literature has emerged in recent years. Much of the available research in this area are qualitative research: interviews, evaluations of existing portals, case studies, and literature reviews.

One of the great benefits of digital research portals is that they allow users to access to information without the need to travel. Not only do digital research portals bring people closer to collections without the need of travel. They also have the power to bring together collections from multiple institutions. A deeper understanding of works can be reached when collections from library, archives, and museums are brought together in one portal. Although the convergence of collections creates complications for information professionals, they have a great capacity to enhance and promote scholarship quickly. The resources consulted in this bibliography address issues of professional collaborations, finding a universal metadata, preserving intellectual property rights, portal design, and user satisfaction.

One of the complications created by a convergence of library, archives, and museum (sometimes referred to as LAM) collections is need to coordinate staff from different disciplines. Libraries tend to have more experience sharing information management systems amongst each other while many museums have practices that are specific to them alone. Melding together the practices of LAM professionals to create one information tool requires significant consideration to knowledge management practices. Institutions are motivated to take on an “atransversal curatorial approach, that is, one that unites the different professional activities of the institution toward becoming more cohesive and research-oriented” (Duff, Cherry, MacNeil, & Howarth, 2013, p. 11). Digital portals allow curatorial, library, and archives staff to enhance understanding

through research support. Still, the move towards convergence requires a shift in perceived differences amongst professions. In order to prepare for a LAM convergence, professionals may wish to consult an article by King and Hedstrom for a brief history of each LAM discipline.

A 2014 study by J. J. Otto illustrates some of the technical difficulties of convergence through a study of metadata practices amongst institutional repositories. Otto notes that the “overlap and gaps between the related standards make them difficult to implement within any repository system” (Otto, 2014). Ya-Ning and Hao-Ren advocate the use of FRBRoo (or “FRBR-object oriented”) rather than Dublin Core in order to preserve relationships amongst library and museum materials. In a case study by Ya-ning and Chen at the National Palace Museum of Taipei, FRBR was implemented in conjunction with a content management system which proved to be capable of preserving important collection metadata.

Since the digitization makes international collaborative convergences more likely, readers may look to Diekema’s review of literature about multilingual information retrieval in digital libraries.

Rights management is a critical issue for many information repositories undergoing digitization. A discussion of this issue can be found in Cloonan’s three-part study of digital collections, which benefits from the many experts and archivists included in the interview process. Hedstrom & King’s article discusses the changing atmosphere in copyright restrictions and intellectual property in the digital age. Hedstrom & King suggests that the digital age is bringing about an “proptertization” of knowledge so that information treated as a commodity rather than a gift (Hedstrom & King, 2002, p.30).

In order to uphold the rights of intellectual property holders, an information management tools may be used to grant varying levels of access to users. N. R. Adam describes a content-based authorization model in a project undertaken by the Law Library of Congress. Friere's paper on The European Library outlines a plan for determining the rights status of works automatically.

Digital research portals can grant researchers access to authoritative knowledge authentic information that would otherwise be obscured on the Web. "A great deal of the information in the Web is not accessible through the large search engines, and thus is not available to most Web users... All of the search engines combined are estimated to index less than half of the surface Web" (Hedstrom & King, 2002, p. 26-27). Digital research portals provide users with access to information they might not have otherwise realized existed. Research portals promotes scholarship and access to primary documents to a wider audience.

On a similar note, there is the question of design and user interface. If an institution is interested in working with novice researchers who will most likely access their site through search engines, they should consider their portal's internal structure. Thewall provides a discussion the impact of website design on information access and page ranking. In order to accommodate both the novice researcher and experienced scholar, E. J. Kelly provides explains how institutions might deploy a DAM approach that supports two interfaces through one depository.

Assessing the success of a portal is discussed in Heo's analysis of Korean cultural portals. This study proposes a method of measuring web portal user's satisfaction.

Results of these studies can help information organizations address some of the key issues and advantages of digital research portals. Although there is room for further investigations in this area, the amount of research on digital research portals is growing.

## Bibliography

Adam, N.R. (2002). A content-based authorization model for digital libraries. IEEE transactions on knowledge and data engineering, 14(2), 296-315.

**Abstract:** Digital Libraries (DLs) introduce several challenging requirements with respect to the formulation, specification, and enforcement of adequate data protection policies. Unlike conventional database environments, a DL environment typically is characterized by dynamic user population, often making accesses from remote locations, and by an extraordinarily large amount of multimedia information, stored in a variety of formats. Moreover, in a DL environment, access policies are often specified based on user qualifications and characteristics, rather than user identity (for example, a user can be given access to an R-rated video only if he/ she is older than 18 years). Another crucial requirement is the support for content-dependent authorizations on digital library objects (for example, all documents containing discussions on how to operate guns must be made available only to users who are 18 or older). Since traditional authorization models do not adequately meet access control requirements typical to DLs, in this paper, we propose a content-based authorization model suitable for a DL environment. Specifically, the most innovative features of our authorization model are: 1) flexible specification of authorizations based on the qualifications and characteristics of users (including positive and negative), 2) both content-dependent and content-independent access control to digital library objects, and 3) varying granularity of authorization objects ranging from sets of library objects to specific portions of objects.

**Annotation:** A single work may have many iterations as digital library objects. An examination of an access-control model is provided that takes into account audience credentials. This issue is of significant importance since many digital libraries grant access to global users. Although this article's outlook is limited by its early publication date, it sets the stage for further investigations in the areas of copyright and privacy in digital repository environments.

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Cloonan, M. V., & Sanett, S. (2005). The preservation of digital content. *Portal : Libraries and the Academy*, 5(2), 213-237. Retrieved from <http://search.proquest.com/docview/216169059?accountid=10559>

**Abstract:** The authors are conducting a three-part study to evaluate current trends in the preservation of digital content, with an emphasis on electronic records. The study emanated from the authors' work on the Preservation Task Force of the International Research on Permanent Authentic Records in Electronic Systems (InterPARES) project. This article incorporates the findings of both the survey and individual key-informant interviews that we conducted from August 2001 through February 2003, as round 2 of the study. Round 2 builds on the 2000-2001 round 1 survey that sought to identify and describe strategies for preserving electronic records. In this second round the authors found that progress has been made in some areas while it still lags in others.<sup>1</sup> The full study consists of three phases: round 1 identified and surveyed 13 institutions, projects, and programs in North America, Australia, and Europe. Round 2 surveyed eight of the 13 institutions again to follow up on their progress. Additionally, we interviewed 18 key informants, including archivists and librarians. In round 3 the authors will each conduct one case study drawn from the survey participants in rounds 1 and 2. By the end of the three rounds, the authors will have studied a continuum of activities (over a six-year period) that constitutes a range of digital preservation strategies. The study will have charted the change in technological developments over this period-developments that have occurred in our survey institutions to meet the requirements of their mandates to preserve digital content for as long as needed.

**Annotation:** In comparison to a similar study by Neal Beagrie, this study is focused on practices and procedures. References and comparisons to Beagrie's study in this paper's conclusions. Shows a maturation of digital archives practices. Interviews conducted with "key informants" who are experienced in their fields and have transitioned from analog to digital practices. Respondents were from Australia, Canada, the United States, and Europe. The key-informant interviews resulted in an unexpected influx of recommended reading, which is included in appendix 5. Issues of intellectual property law with respect to primary documents are discussed in appendix 2.

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Diekema, A. R. (2012). Multilinguality in the digital library. *The Electronic Library*, 30(2), 165-181. doi:<http://dx.doi.org/10.1108/02640471211221313>

**Abstract:** Purpose - Together, increasing globalization and the internet created fertile grounds for the establishment of multilingual digital libraries. Providing cross-lingual access to materials is of particular interest to political entities such as the European Union, which currently has 23 official languages, but also to multinational companies and countries that have different languages represented among their citizens. The main objective of this paper is to review the literature on multilingual digital libraries and provide an overview of this area. Design/methodology/approach - Based on a thorough literature search in four different databases, a core set of literature on multilingual digital libraries was retrieved. Literature on various aspects of this topic was reviewed. The paper is organized based on emerging themes directly drawn from the literature. Where warranted additional literature is brought in to provide necessary background information or clarification. Findings - Creating a multilingual digital library is a highly complex undertaking and typically requires a collaborative effort between different organizations and people with different areas of expertise. Enabling users to search across languages requires translation resources to cross the language barrier, which can be challenging depending on the language and resource availability. Additional challenges were found to be in data management (localization and language processing), representation (dealing with different fonts and character codes), development (creating international software, cross-cultural collaboration), and interoperability (system architecture and data sharing). Research in multilingual digital libraries was mostly system based involving experimental systems or system prototypes. Research limitations/implications - Most likely the literature review does not include all possible journal articles on multilingual digital libraries even though the literature searches done to obtain these articles were thorough and deliberate. Journal articles without the descriptors used in this search and those articles not indexed in the four different databases used in the search will not be included here. The review excludes cross-language information retrieval research unless it is directly related to existing multilingual digital libraries, or a connection to digital libraries in general is made in the paper itself. Originality/value - This paper provides the first literature review on the topic of multilingual digital libraries and provides a concise overview of relevant aspects in this area. The number of multilingual digital libraries is growing, as is the interest from the research community in these libraries to apply their research findings from cross-language information retrieval. This review article provides a valuable entry point to the field of multilingual digital libraries for researchers, practitioners, and other interested parties.

**Annotation:** This review of multi-language digital libraries and the challenges they face.

Creating a multilingual, multicultural interface with interoperability offers many challenges for information professionals. A recommendation is made for translating meta-data in the case of non-textual materials. This study would be appropriate for



those interested in a multi-lingual LAM convergence. The study concludes that there is a need for further research on multilingual digital libraries and their users.

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Duff, W. M., Carter, J., Cherry, J. M., MacNeil, H., & Howarth, L. C. (2013). From coexistence to convergence: studying partnerships and collaboration among libraries, archives and museums. *Information Research: An International Electronic Journal*, 18(3).

**Abstract:** Introduction: The convergence of libraries, archives and museums is an evolving phenomenon that has garnered increased attention in the literature and professional practice over the past decade. To date, little research exists documenting the experiences of these institutions as they engage in different forms of collaboration and convergence. Method: Using a series of on-site, semi-structured interviews of professionals conducted in 2010 and 2011, the study examined initiatives involving different forms of collaboration and convergence, and different stages of the process in two institutions in Canada and three in New Zealand. Analysis: The interviews were audio recorded and a descriptive summary of each interview was prepared. We examined the summaries and identified themes within and across the institutions. Results: Findings suggest the motivations that led to the various projects reflected the discourse, beliefs, and values of the professions at the time the projects took place, and occasionally, administrative expediency. Aspects that emerged from the interviews correlate broadly to six themes: to serve users better; to support scholarly activity; to take advantage of technological developments; to take into account the need for budgetary and administrative efficiencies; to adapt to an evolving understanding of digital surrogates as objects; and to obtain a holistic view of collections. Benefits have accrued in terms of new perspectives on collections and on ways of seeing the institution, its users and services, in enhanced staff learning, in finding different methods for accomplishing work activities, and in the pragmatic efficiencies of budget reallocation and cost-savings. Conclusion: We conclude with an overview that summarizes the salient findings.

**Annotation:** This study provides qualitative research of the benefits and issues of LAM convergence. On-site semi-structured interviews were conducted at five institutions regarding their collaboration or convergence. These five institutions represent various stages in the process of convergence and several varieties of convergence - amongst libraries and museum, libraries and archives, and several museums. This study asked interviewees to explain the motivation, implementation, and outcomes of their

institution's convergence process. In many cases, convergence was initiated for the sake of a holistic view of the collections through a digital medium. Case studies demonstrated similarities in planning process and received benefits. Differences and similarities amongst these five institutions are demonstrated with tables. It appeared that the largest challenge was a shift in perceived differences amongst professions. A literature review of convergence provided. Possible limitations to this study include sample size, sample bias, and self-censorship by interviewees who have been identified by institution and name.

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Freire, N. (2013). Facilitating access and reuse of research materials: The case of the European library. *Information Services & use*, 33(2), 173-181. Retrieved from <http://search.proquest.com/docview/1504414519?accountid=10559>

**Abstract:** The European Library provides access to research materials from the collections of Europe's national and research libraries, representing members from 46 countries. This paper presents the current status, on-going work, and future plans of the resource dissemination services provided by The European Library, covering resources such as national bibliographies, digital collections, full text collections, its access portal and API, open linked data publication, and integration in digital humanities infrastructures. In the coming years, The European Library will work to provide the means and tools for digital humanities researchers to easily use research materials from libraries in their research activities. (Adapted from the source document.)

**Annotation:** The library aggregation model for Europeana was established with the founding of the European Library. This paper examines the choices and practices taken in this creation. Topics include intellectual property rights, portal infrastructures, and configurations with third party applications. Provides an example for automated rights clearance for books and quickly identifying intellectual property rights through record clustering.

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Hedstrom, M.L. & King, J.L. (2002). On the LAM: library, archive, and museum collections in the creation and maintenance of knowledge communities. Paris: *Organization for Economic Cooperation and Development*. Retrieved from <http://www.oecd.org/dataoecd/59/63/32126054.pdf>

**Abstract:** While ‘convergence’ has been a topic of much discussion in the museum, archive and library communities, the emerging similarities between these three types of cultural heritage institutions – most apparent in their on-line activities – are not yet evident in the education of professionals who work in them. Curriculum models still support traditional definitions of the roles, functions and audiences of archives, libraries and museums. Professional practice can evolve in the context provided by digital heritage and digital curation, and to respond in a manner that supports common goals across institution types. New interdisciplinary foci for professional training can provide skills needed across the sector, while respecting the distinct histories, cultural roles and responsibilities of libraries, archives and museums.

**Annotation:** This article focuses heavily on the history and evolution of each LAM discipline. It would be useful for professionals to read in preparation for LAM

convergence since it would allow them to better understand each other’s areas.

Advocates that library, archives, and museums continue to provide their knowledge management expertise in the new information age. Could use further discussion and support of current digital age and future practices.

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Heo, M., Song, J., & Seol, M. (2013). User needs of digital service web portals: A case study. *Journal of Educational Research*, 106(6), 469-477. Retrieved from <http://search.proquest.com/docview/1651833304?accountid=10559>

**Abstract:** The authors examined the needs of digital information service web portal users. More specifically, the needs of Korean cultural portal users were examined as a case study. The conceptual framework of a web-based portal is that it is a complex, web-based service application with characteristics of information systems and service agents. In addition, the users’ reactions to the technology can impact the service quality. As such, a model that specifically measured cultural portal user needs was created by implementing data quality, service quality and technology adoption models. Through confirmatory factor analyses and model respecifications, the authors suggest a measurement model consisting of 5 first-level latent variables, with 19 observed variables. The measurement model confirmed the research hypothesis that data quality, service quality, and technology adoption models complement each other in assessing the needs of cultural portal users.

**Annotation:** This article examines the cultural context of information needs in relation to the usefulness of portals. Parasuraman's SERVQUAL model is adapted to measure customer perceptions at Korean cultural web portals. The study takes the perspective of cultural portals as jointly an information system and service, therefore the method of measuring success should be based on customer perceptions. Many of the users in the study were first time web portals users under 30. The study investigates if cultural portals can have a positive effect on Korea's low score on OECD index of lifelong learners. One of the possible setbacks to the usefulness of this study is that information seeking habits are particular to Korean users, since they tend to use Korean web portals over international ones.

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Kelly, E. J. (2014) [Assessment of Digitized Library and Archives Materials: A Literature Review](#). *Journal of Web Librarianship*, 8(4), 384-403.

**Abstract:** Many organizations have evolved since their early attempts to mount digital exhibits on the Web and are experimenting with ways to increase the scale of their digitized collections by utilizing archival finding aid description rather than resource-intensive collections and exhibits. This article examines usability research to predict how such systems might effectively be used and highlights a digital library and finding aid system that utilizes a single repository of digitized objects to fuel two types of user-discovery systems: a typical digital collections interface with item-level access and a finding aid that incorporates digitized items at the aggregate level.

**Annotation:** This article demonstrates the refinement in the digitization process in order to expedite the process and decrease backlog. The effect of methods of access on usage is discussed as is user groups and their research habits. The digitization needs of experienced researchers and archives differs from the needs of inexperienced researchers who benefit from digital exhibits. This article promotes a digital repository that would meet the needs of divergent user-groups where users can navigate between

digitized records and finding aids and by doing so reap the benefits of both descriptive practices. Also discussed a DAM model with partially automated encoding. The benefit of a DAM XML database is shown to be its adaptability to divergent user interfaces which can then be linked together. Creating one digital object for both an item-based platform and finding-aid style interface allows for a broad scope of users with minimal maintenance from staff.

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Otto, J. J. (2014, January). Administrative metadata for long-term preservation and management of resources: a survey of current practices in ARL libraries. *Library Resources & Technical Services*, 58(1), 4+.

**Abstract:** An institutional repository is, among other things, a means to preserve an organization's scholarly output or resources in a variety of digital media and across disciplines. Administrative metadata are critical to the preservation of these digital resources. This study, which surveyed fifty-four Association of Research Libraries (ARL) institutional repositories about their administrative metadata, was designed to create a snapshot of current metadata practices. It revealed no true consensus of administrative metadata accommodated and collected by the repositories. Moreover, responses throughout the survey indicate that in general, organizations are neither accommodating nor recording administrative metadata to any significant extent. If research libraries are to provide permanent, organized, and secure repositories for institutional scholarship and special collections, they must identify core metadata in the context of repository objectives, explore barriers to collection of administrative metadata, and strategize as to how those barriers might be mitigated or overcome.

**Annotation:** This study of 54 institutional repositories examines metadata practices at research libraries is especially useful because as it is pointed out in the study, the recording of these metadata practices is irregular amongst institutions. Since recording metadata is expensive for institutions, it is important to create standard practices so that common elements may be shared amongst repositories.

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Thelwall, M. (2002). Subject Gateway Sites and Search Engine Ranking. *Online Information Review*, 26(2), 101-7.

**Abstract:** The spread of subject gateway sites can have an impact on the other major Web information retrieval tool: the commercial search engine. This is because gateway sites perturb the link structure of the Web, something used to rank matches in search engine results pages. The success of Google means that its PageRank algorithm for ranking the importance of Web pages is an object of particular interest, and it is one of the few published ranking algorithms. Although highly mathematical, PageRank admits a simple underlying explanation that allows an analysis of its impact on Web spaces. It is shown that under certain stated assumptions gateway sites can actually decrease the PageRank of their targets. Suggestions are made for gateway site designers and other Web authors to minimise this.

**Annotation:** This article explains considerations for site structure when creating a research portal. Relates the search habits of users (linear or berry-picking models) to portal structure. Considering the prevalence of search that is done through search engines, the portal structure is understood with relation to Google's PageRank system. This article finds that the use of gateways can reduce the visibility of target sites. Portal designers should consider if they would want their gateway page to have a higher PageRank than individual contents pages.

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Ya-ning, C., & Chen, S. (2004). A metadata practice of the IFLA FRBR model: A case study for the National Palace Museum in Taipei. *Journal of Documentation*, 60(2), 128-143.

**Abstract:** In 1998, the Functional Requirements for Bibliographic Records (FRBR) model which is composed of four entities (work, expression, manifestation and item) and their associative relationships (primary, responsibility and subject), was proposed by the International Federation of Library Associations and Institutions (IFLA). The FRBR model can be deployed as a logical framework for proceeding metadata analysis and developing metadata format. This paper presents a case study of the National Palace Museum (NPM) in Taipei to examine the feasibility of the FRBR model. Based on the examination of case study at the NPM, the FRBR model is proven to be a useful and fundamental framework for metadata analysis and implementation. Findings show that the FRBR model is helpful in identifying proper metadata elements organization and their distribution over the FRBR entities. The model is more suitable for media-centric and association-rich contents. However, in order to refine the FRBR model as a common framework for metadata, it would also require supportive mechanisms for

management responsibility relationships for the workflow consideration and refine the distinction between work and expression entity.

**Annotation:** This case study presents the feasibility of using FRBR as a conceptual framework for metadata in a museum setting. The FRBR metadata model is useful for LAM convergence because it records the relationships between art, representations, and related information sources. In conjunction with a content management system (CMS) the FRBR model is able to preserve rights information with regard to digital surrogates of materials.

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Ya-Ning, C., & Hao-Ren, K. (2013). FRBRoo-based approach to heterogeneous metadata integration. *Journal of Documentation*, 69(5), 623-637.

**Abstract:** Purpose - This paper seeks to adopt FRBRoo as an ontological approach to integrate heterogeneous metadata, and transform human-understandable format into machine-understandable format for semantic query. Design/methodology/approach - Two cases of use with museum artefacts and literary works were exploited to illustrate how FRBRoo can be used to re-contextualize the semantics of elements and the semantic relationships embedded in those elements. The shared ontology was then RDFized and examples were explored to examine the feasibility of the proposed approach. Findings - FRBRoo can play a role as inter lingua aligning museum and library metadata to achieve heterogeneous metadata integration and semantic query without changing either of the original approaches to fit the other. Research limitations/implications - Exploration of more diverse use cases is required to further align the different approaches of museums and libraries using FRBRoo and make revisions. Practical implications - Solid evidence is provided for the use of FRBRoo in heterogeneous metadata integration and semantic query. Originality/value - This is the first study to elaborate how FRBRoo can play a role as a shared ontology to integrate the heterogeneous metadata generated by museums and libraries. This paper also shows how the proposed approach is distinct from the Dublin Core format crosswalk in re-contextualizing semantic meanings and their relationships, and further provides four new sub-types for mapping description language.

**Annotation:** A model for using FRBRoo to integrate metadata standards for museum and library materials in one information management system. Discusses ways to build a cross-walk between heterogenous metadata formats and elements through a shared

ontology across disciplines. Sample queries performed for the sake of studying success of integration. Explanation of possible mapping-paths. As noted this case study, draws conclusions from only two samples; it would benefit from an expansion of sample size.

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## Personal Statement

The results of these studies show the many issues and advantages that come with implementing a digital research portal. Although there is room for further explorations on the subject these resources provide a condensation of some of issues at hand.

A common thread throughout the reading, is the need for standardized knowledge management practices across disciplines and international borders. This standardization would be a pivotal breakthrough in the world of digitization. The issue has come up in regards to LAM convergence, metadata structure, multilingual information retrieval, intellectual property rights, and user interfaces.

Through these readings we begin to understand that the metadata structure is the backbone of digital research portals. In order to let them reach their full potential and to alleviate the costs of implementing them, standardized metadata practices should be established. Although there may not be one single metadata structure that will work for all research portals, there is a significant need for one that will work in most cases, across most disciplines.