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綜論美國學術圖書館之學術傳播、研究資料管理與數位學術研究服務：麻州與密蘇里州五所大學圖書館實證研究^φ

An Overview of Scholarly Communication, Research Data Management and Digital Scholarship Services in American Academic Libraries: An Empirical Study from Five University Libraries in the States of Massachusetts and Missouri^ψ

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綜論美國學術圖書館之學術傳播、 研究資料管理與數位學術研究服務： 麻州與密蘇里州五所大學圖書館 實證研究^ψ

黃元鶴

摘要

學術圖書館館員之核心任務為支援學術研究服務，美國學術圖書館設有專屬館員負責學術傳播、研究資料管理，以及數位學術研究等服務。台灣的大學圖書館少有深入的數位學術服務實務工作，藉由美國學術圖書館之具體實務來增進經驗知識，本研究採用質性研究訪談方法，受訪對象包含美國學術圖書館四位學術傳播館員、三位研究資料管理館員、二位數位學術研究館員。訪談結果分述於重點工作項目、協調溝通等多元技能與挑戰、良好館員個人特徵與工作熱誠來源、數位時代館員角色與任務等。本文提出為未來推展相關業務之優先序、為挑戰性高的事務來規劃因應措施、彈性調整組織結構與強化館員職能等建議，提供台灣的大學圖書館推展數位學術研究服務工作之參考資訊。

關鍵詞：學術圖書館，大學圖書館，學術傳播館員，研究資料管理館員，數位學術研究館員，核心技能

前言

學術圖書館館員之核心工作是支援學術研究服務，近年數位學術活動樣態日漸複雜，美國學術圖書館設有專屬館員負責學術傳播 (scholarly communication)、

^ψ 本文初稿以「美國學術圖書館館員工作實務：以學術傳播、研究資料管理與數位學術研究館員為例」為題，發表於「數位學術之開放與分享：《教育資料與圖書館學》創刊 50週年研討會」。

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研究資料管理 (research data management)¹，以及數位學術研究 (digital scholarship) 等工作任務。美國大學與研究圖書館學會 (Association of College and Research Libraries, 簡稱 ACRL) 於 2005 年即提供學術傳播工具包 (Scholarly Communication Toolkit)²，以作為大學圖書館員提供學術傳播服務的指南，可見美國大學圖書館在 21 世紀初即提倡學術傳播服務。以本研究受訪者任職機構屬性來觀察，規模較小的學術圖書館亦設有學術傳播館員，而規模較大的學術圖書館才設置專屬「研究資料管理」與「數位學術研究」館員。

廣義的學術傳播服務項目包含研究資料管理服務 (Association of College and Research Libraries [ACRL], 2020; Calarco et al., 2016)，但因近年開放存取 (open access, 簡稱 OA) 學術資源朝向研究資料開放議題，因此規模較大的學術圖書館另為研究資料管理服務業務設置專屬館員。美國大學與研究圖書館學會提供圖書館服務指南，分別以字母順序、興趣小組、主題、類型等不同層面呈現，其中在主題層面，包含「Digital Scholarship」與「Scholarly Communication」等七項主題³，學術傳播工具包亦列在 Digital Scholarship⁴ 主題下，因此，本文以數位學術服務來統稱學術傳播、研究資料管理與數位學術研究等服務。

台灣圖書資訊學界早已關注國外的發展趨勢並介紹前述服務於學術圖書館的重要性，若干研究主要關於資料皮用 (data curation) 服務於圖書館，包含僅由研究人員之認知與其研究成果來探索研究資料管理議題 (林奇秀、賴璟毅，2017, 2018；秦韻涵，2012；陸怡靖、柯皓仁，2020)，或者分別由大學圖書館員與研究人員等兩種角色對於資料皮用的認知與態度 (李勇德，2015)，以及為圖書館提供數位學術服務提供營運模式建議 (陳雪華、陳光華，2012)。此外，柯皓仁 (無日期) 介紹數位化學術研究服務項目，所需工具以及館員技能的缺口。鄭瑋 (2019) 分析研究資料管理 (計畫)、服務與基礎建設等三層次，並介紹歐美各國的領航案例。

然而，台灣的學術圖書館通常由讀者服務組、參考服務組、知識服務組之館員提供廣泛的諮詢服務，並未設置專屬於前述三項任務之館員職稱，檢視各大專院校圖書館組織編制，唯有國立臺灣大學圖書館特設有研究支援組、學科

¹ 關於 research data management 的中譯名詞，本研究採用「研究資料管理」而非「研究數據管理」，因為本文之研究資料包含科學、社會科學、人文科學等不同領域之原始研究資料，因此不僅僅數據型資料，亦包含法庭資料、DNA 序列資料等多元類型的資料型態。

² 美國大學與研究圖書館學會提供之學術傳播工具包 (Scholarly Communication Toolkit) <https://acrl.libguides.com/scholcomm/toolkit>。

³ 美國大學與研究圖書館學會之圖書館服務指南 (LibGuides) 之七項主題，請見 <https://acrl.libguides.com/?b=s>。

⁴ 美國大學與研究圖書館學會之圖書館服務指南 (LibGuides) 之「Digital Scholarship」主題，請見 <https://acrl.libguides.com/subject/digitalscholarship>。

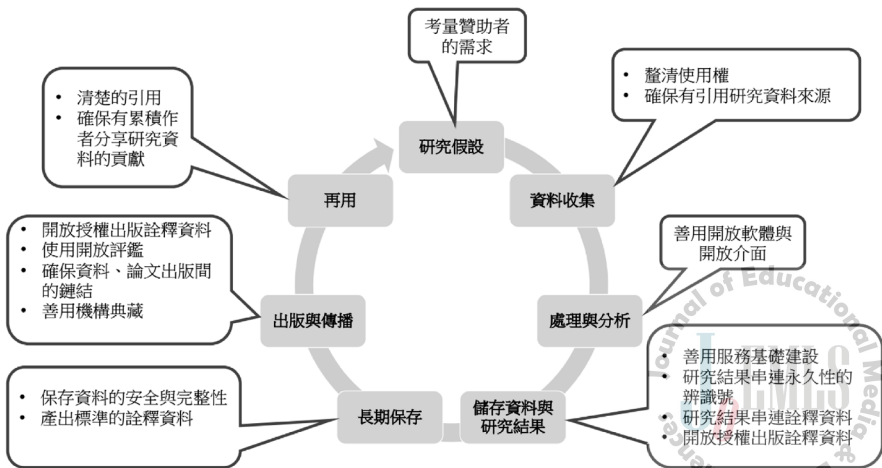
服務組，較能提供深入的學術研究相關服務。柯皓仁(2021)於2019年調查台灣的大學圖書館參考諮詢或學科館員，關於學術傳播、研究資料管理等面向之專業知能的重要程度與具備程度的差異分析，呈現顯著差異的研究結果，顯示台灣的學術圖書館館員支援數位化學術研究之重要性認知與個人技能有其顯著的缺口。

由於台灣的圖書館少有深入數位學術服務之相關實務工作，本文彙整美國學術圖書館於學術傳播、研究資料管理與數位學術研究等三種類型服務，除了綜整國外文獻關於前三項服務之角色任務與知識技能之外，更藉由訪談美國學術圖書館館員以獲取實務工作經驗知識，由實務案例來探索其工作項目與重點任務、相互關連與支援的職務內容、需具備的知識技能與態度、推動業務的挑戰與困難等，以提供台灣的大學圖書館規劃數位學術研究服務之參考資訊。

二、文獻探討

數位時代的學術資源相較於傳統以紙本型式之學術出版品，其學術傳播樣態變化甚大，學術期刊往往是學術傳播相當重要的媒體資源，在學術圖書館管理期刊資源的館員，必須轉換心態，採用數位時代的學術傳播觀念來翻轉傳統的期刊管理工作流程，由於開放取用學術資源議題興起，開放科學(open science)時代來臨，涉及層面範圍漸廣，在不同的研究階段推展開放(openness)的相關事項如圖1，學術圖書館館員需瞭解研究假設、資料收集、處理與分析、儲存資料與研究結果、長期保存、出版與傳播、再用等不同階段的相關工作細節，包含研究資料使用權、研究資料的詮釋資料

圖1 各研究階段推展開放的相關事項



資料來源：翻譯自 Bueno-de-la-Fuente (2016, 圖1)。

(metadata)⁵、鏈結資料、研究資料引用、機構典藏等項目。不僅關注於學術論文出版資源的組織整理與利用，更重視研究過程的產出資料，如研究資料的管理與利用。

因此，當前的學術傳播環境，已非僅期刊管理館員涵蓋的業務，多篇研究關於數位時代學術傳播下之學術圖書館員新技能的相關研究(Bonn, 2014; Brantley et al., 2017; Calarco et al., 2016; Cross, 2011; Genoni et al., 2006; Pontika, 2019)，而逐漸形成「學術傳播館員」的職稱。由北美期刊興趣小組轉型成立的North American Serials Interest Group, Inc.(簡稱NASIG)組織(<https://www.nasig.org/>)提供學術傳播館員的核心能力手冊(North American Serials Interest Group [NASIG], 2017)，除了必備之背景知識、技術能力、教學推廣、團隊建立等項目之外，包含五大項重點領域：機構典藏管理(institutional repository management)、出版服務(publishing services)、著作權服務(copyright services)、研究資料管理服務(data management services)、評估與影響服務(assessment and impact metrics)。該手冊廣泛而簡明地呈現學術傳播館員核心能力要素，且持續於2020年更新內容。

儘管NASIG(2017)已將研究資料管理納入學術傳播館員的業務，近年由於開放取用議題朝向研究資料之開放與再用，因此，亦有多篇研究關於研究資料管理館員的核心技能與任務(Eclevia et al., 2019; Faniel & Connaway, 2018; Schmidt & Shearer, 2016; Semeler et al., 2017; Tenopir et al., 2012, 2014)，顯示歐美學術圖書館之研究資料應用已可朝向設置專屬館員來管理其業務的規模。

此外，數位人文研究熱潮，人文背景領域學者應用現代科技而促使人文領域研究產生另一新風貌，各種樣態的人文資源需以數位型式展現，於是產生一新興館員職稱：數位學術研究館員。M. King(2018)、Mackenzie與Martin(2016)、Wong(2016)等若干研究曾探討數位學術研究館員所需技能及其任務。數位學術研究技能是指有能力參與新興學術與專業研究於數位系統之各項應用與實務工作，包含以下項目：教學、研究相關的數位資源與開放資源內容之應用、虛擬學習與研究環境之應用、使用新興科技於研究相關事務，開放出版資源及其相關的議題，如內容發現、權威、可靠度、出處、授權限制、採用/再用與資源的評估(Jisc, 2011，轉引自Mackenzie & Martin, 2016)。而Calarco等(2016)則將「Digital Scholarship Services Librarian」視為學術傳播館員之相關職稱。

綜整學術傳播、研究資料管理與數位學術研究館員之角色任務、知識技能於表1，顯示其工作任務有各自強調的重點，也有其重疊的項目。學術傳播館

⁵ metadata之其他譯文包含後設資料、元資料等，本文使用國家教育研究院雙語詞彙、學術名詞暨辭書資訊網中的圖書館學與資訊科學大辭典之譯文<https://terms.naer.edu.tw/detail/1679224/?index=6>。

表 1 學術傳播、研究資料管理與數位學術研究館員之角色任務、知識技能

職稱	角色任務	知識技能
學術傳播館員 相關職稱：metadata and scholarly publishing librarian, digital repository librarian, digital scholarship services librarian, copyright librarian, assessment librarian 合作伙伴：subject or liaison librarian, digital initiatives librarian, digital humanities librarian, data librarian, technical services librarian	<ol style="list-style-type: none"> 學術出版服務 (scholarly publishing services) 開放取用典藏服務 (open access repository services) 著作權與開放取用議題諮詢 (copyright and open access advice) 學術資源評估 (Assessment of scholarly resources) 	<ol style="list-style-type: none"> 瞭解商用與開放取用平台與其運作模式，知曉各項標準，如Digital Object Identifiers (DOI)、各種詮釋資料標準與探索工作等。有能力管理OA出版軟體、開放期刊系統、開放圖書出版等平台。 瞭解OA政策與需求，知曉資料格式、資料庫設計、資料管理工具。有能力管理典藏平台，協助研究人員將其研究成果存入典藏庫，聯絡出版商關於典藏政策與文獻處理費事宜，以及資料度用相關實務。 瞭解當代OA與學術傳播趨勢，知曉學術論文之著作權相關議題。倡導師生關於OA議題之正確認知，提供著作權相關諮詢。 瞭解學術評鑑相關指標，知曉書目計量與替代計量相關理論與實務，支援師生評估學術資源。
研究資料管理館員 相關職稱：data librarian, data support officer, data management planning consultant 合作伙伴：data creator, data scientist, data curator, digital preservation librarian, subject librarian, research ethics advisor	<ol style="list-style-type: none"> 提供取用研究資料之管道與機制 (providing access to data) 倡導研究資料管理之意識與支援 (awareness and support for managing data) 管理研究資料館藏 (managing a data collection) 	<ol style="list-style-type: none"> 瞭解研究資料中心、典藏庫，及資料探索機制。知曉研究資料管理與分析技巧與工具。瞭解資料授權與智慧財產權等議題。 瞭解資料政策與規範，知曉各式資料結構、格式、語彙、語意網與詮釋資料，建立研究資料管理計畫與平台工具。瞭解資料分享與資料再用的效益、資料引用實務，及稽核與評估工具之應用。 瞭解詮釋資料的標準與架構、資料格式與領域知識結構、資料串連與整合的技巧運用，及資料儲存平台之應用。有能力掌控資料度用的完整程序。
數位學術研究館員	<ol style="list-style-type: none"> 研究資料生命週期管理與詮釋資料知識。 數位圖書館之軟技能 (soft skill)，如協調溝通能力。 	<ol style="list-style-type: none"> 由支援研究者的典範轉向為數位人文研究人員與館員的協同研究模式。 知曉如何應用數位學術相關的科技工具。 人際溝通與協同研究能力。 瞭解數位生態系統 (開放取用平台、數位檔案、資料庫等)、大數據、數位人文資料、程式編寫、網站管理、建置資料庫、社群媒體散播管道、著作權議題等。

資料來源：「學術傳播館員」參考自Calarco等(2016)；

「研究資料管理館員」參考自Schmidt與Shearer(2016)；

「數位學術研究館員」參考自M. King(2018)。

員之角色任務範疇很完整，包含研究週期的各項環節。研究資料管理館員則著重於研究資料本身的收集、管理與利用的議題。數位學術研究館員角色則強調以新興科技協助研究人員應用於其研究，聚焦於與研究人員的協同合作，廣泛應用各項資訊技術融入服務。

表1廣列三種類型館員的各項角色任務，然而，各機構於其任務需求的程度不同。Pontika(2019)分析學術傳播館員於徵才廣告各項技能需求頻率，Mackenzie(2016)則依據數位學術研究服務之深淺區分為四項層次的角色。

Pontika (2019) 曾收集英國關於學術傳播館員徵才廣告資訊加以分析，經常出現的工作敘述如下：與所有研究相關人員聯絡、提供研究人員諮詢與建議、為符合開放取用政策之相關資訊製作統計報告、瞭解著作權、授權以及智慧財產權相關知識。關於開放取用工作所要求的能力敘述中，前三項經常出現的內容分別是開放取用政策執行與監督、管理文章處理費 (article processing charges, 簡稱 APC) 與預算、製作開放取用推廣文宣等項目。在機構典藏系統管理議題中，前三項經常出現的內容分別是保證資料的正確與品質、管理與維護典藏庫、監管典藏資源與向研究人員推廣利用。此外，研究資料管理技能也出現在徵才廣告敘述中，包含研究資料管理專家、確保符合研究贊助者的政策、為研究資料管理提供實務諮詢、確保資料應用、應用數位保存標準等。

Mackenzie (2016) 將圖書館提供數位學術研究服務區分為四種層次的角色。(一) 擁有者/使用者 (owner/user)，如提供掃描服務的儀器設備、多媒體應用服務等。(二) 夥伴 (partner)，如機構典藏系統之應用是由大學研發處、資訊中心與圖書館之間合作的夥伴關係，著作權等出版諮詢是學校法務室與圖書館間合作的夥伴關係等。(三) 顧問 (consultant)，圖書館提供創意發想或新科技發展的育成空間，如創客空間等。(四) 專家 (expert)，圖書館發展實驗性的數位學術研究，與校園不同研究人員合作發展新專案，如使用手持式拉曼光譜儀到其他機構，為該館收藏的中世紀手稿文獻提供光譜分析服務。其他案例如與數位人文學者合作，以資料探勘或文字分析等方法分析特藏資源。

國外文獻關於學術圖書館提供學術傳播、研究資料管理、數位學術研究等服務的內容相當豐富，然而提供前述服務時，具體實踐有哪些需注意的事項？除了專業工作之外，M. King (2018) 也提及軟技能的重要性。由於台灣的圖書館並未設置前述專屬職稱館員，本研究冀望由美國學術圖書館館員獲取實務工作經驗知識，研究問題如下：美國學術圖書館館員於學術傳播、研究資料管理與數位學術研究等面向之實務，(一) 其工作項目與重點任務為何？(二) 需具備哪些重要的知識技能與態度？(三) 推動業務的挑戰與困難為何？(四) 良好館員需具備哪些重要軟技能？(五) 對於學術圖書館的未來方向發展與館員的期許為何？

三、研究方法

本研究採用質性訪談研究方法，研究對象是美國學術圖書館之學術傳播、研究資料管理、數位學術研究等三種職稱館員。以筆者訪美期間所在之密蘇里州羅拉市與麻薩諸塞州波士頓地區之大學圖書館為範疇，在圖書館網站收集館員名錄資訊，以電子郵件寄發邀請信，本文納入研究分析之受訪對象包含四位學術傳播館員、三位研究資料管理館員、兩位數位學術研究館員，訪談時間在2019年8月下旬至10月間。受訪者任職機構之地理區域、學科分布與圖書館

規模請見表2，圖書館規模差異大，館員人數最少為十餘人，最多者為八百餘人。受訪圖書館員之工作屬性、教育背景與訪談時間請見表3，所有受訪館員均具備碩士學位以上學歷，大學主修包含人文學、社會科學與科學等不同學科領域，兩位數位學術研究館員則均具備博士學位。訪談大綱如下：(一)請敘述例行工作與特殊案例。(二)請分享開放取用議題之想法。(三)如何因應變化？如何學習新知？(四)工作中曾經面臨哪些困難？最大挑戰為何？(五)好館員應具備哪些特質與技能？(六)如何保有工作熱情？(七)數位時代圖書館員的角色為何？對於下一世代的館員有哪些期許？英文版訪談大綱請見附錄。

表2 受訪者任職機構之地理區域、學科分布與圖書館規模

機構代碼	地理區域	學科分布	圖書館規模
A	密蘇里州	理工為主，商管與人文為輔	總館一所，館員人數約十人。
B	麻薩諸塞州 波士頓地區	綜合學科	總館與各學科圖書館共約70餘所，館員合計約800至900人，各學科圖書館規模不太相同，醫學圖書館館員約30人，法學院圖書館館員近70人。
C	麻薩諸塞州 波士頓地區	理工為主，商管與人文為輔	總館與各學科圖書館共計約八所，館員人數近150人。
D	麻薩諸塞州 波士頓地區	人文、藝術、商管、護理、教育、神學	總館與各學科圖書館共計約九所，館員人數近130人。
E	麻薩諸塞州 波士頓地區	綜合學科	總館與各學科圖書館共約13所，館員近100人。另附加系所或資源中心等圖書室約六所。

表3 受訪圖書館員工作屬性、教育背景與訪談時間一覽表

館員職稱或 工作內容	館員 代碼	機構 代碼	性別	教育背景	訪談日期	訪談時間 (分鐘)
Scholarly Communication Librarian	SC1	A	男	學士：應用組織管理／電腦科學 碩士：圖書資訊學	2019/8/30	59
	SC2	B	男	學士：藝術史／音樂／電腦科學 碩士：圖書資訊學(法學研究 碩士班進修中)	2019/9/16	75
	SC3	C	女	學士：新聞學 碩士：圖書資訊學	2019/10/8	36
	SC4	D	男	學士：政治科學與歐洲研究 碩士：資訊科學與公共行政	2019/9/10	N/A
Data Management Services / Research Data Program Manager / Senior Research and Data Librarian	RDM1	C	女	學士：生物化學 碩士：資訊研究	2019/9/17	62
	RDM2	B	女	學士：人類學 碩士：圖書資訊學(圖書資訊學 博士班進修中)	2019/10/4	52
	RDM3	B	女	學士：英文與政治學 碩士：圖書資訊學 博士：法律(Juris Doctor, 簡稱JD)	2019/10/24	64
Digital Scholarship Librarian	DS1	D	女	學士：古典文學、希臘與拉丁文學 碩士：美國歷史與美國研究 博士：歷史	2019/9/23	48
	DS2	E	女	學士：義大利研究 碩士：義大利研究 博士：人文計算	2019/9/26	46

註：SC4館員以電子郵件回覆訪談問題；RDM3館員先前是學術傳播館員，受訪當時是研究資料館員，受訪內容亦提及學術傳播館員之相關業務。

本研究主軸為探索美國學術圖書館之學術傳播、研究資料管理與數位學術服務，受限於訪美期間的地點限制，受訪者任職機構僅來自密蘇里州與麻州的大學。考量受邀來自台灣陌生學者的訪談意願不高，因此並未設限圖書館的規模與學科特性，可能因機構屬性不同而產生多元的服務樣態。本研究受訪者任職機構規模包含館員十多人、百餘人，以及約900人等三種規模大小，學科屬性則包含有綜合型、理工或人文為主等三種類型，台灣的圖書館可對應其機構近似的規模與學科屬性來參考該校館員的工作實務。

四、研究分析與討論

本研究將館員訪談工作實務內容，分別於重點工作內容與項目、協調溝通等多元技能與挑戰、良好館員之個人特徵與工作熱誠來源、數位時代之館員角色與任務等四項陳述相關內容。

(一) 重點工作內容與項目

此節參考NASIG(2017)於學術傳播館員之工作項目類別，並增加研究資料管理與數位學術研究館員的工作內容，由於受訪者並未提及評估與影響指標層面，因此本研究未納入該項內容，綜整如下主題，並適時摘要受訪館員之原文語錄，粗體之文字為原文語錄之重點提示。

1. 學術出版與開放取用學術資源政策與著作權倡導服務

美國哈佛大學於2008年成立學術傳播處(The Office for Scholarly Communication, 簡稱OSC), 宗旨是為促進開放、分享與保存學術⁶。哈佛大學之開放取用政策(open access policies)⁷是哈佛大學教職員生以非專屬授權校方以非營利方法公開並散播其學術論文, 哈佛大學開放學術傳播中心主任Peter Suber表示:「開放取用的原意很單純, 即是使學術文獻能在網路上取得, 而不需任何的價格與許可的障礙」。因此, 哈佛大學設置Digital Access to Scholarship at Harvard(簡稱DASH)⁸, 該校研究人員可上傳、典藏並公開其學術論著, 促進學術資源開放分享, 提升學術影響力。

學術傳播館員之例行業務即是協助研究人員符合研究計畫執行過程中關於贊助機構或校方之開放取用政策的要求, 其角色在學術機構中相當重要, 能輔助研究過程中的相關行政瑣事, 使研究人員專心於研究本身, 促進研究效能。若機構內研究人員對於研究計畫進行中的學術資源典藏相關問題, 即由學術傳播館員或指派學科聯絡館員(liaison librarians)提供協助。

⁶ 哈佛大學學術傳播處<https://osc.harvard.edu/about/>

⁷ 哈佛大學開放取用政策<https://osc.harvard.edu/policies/>

⁸ 哈佛大學DASH <https://dash.harvard.edu/>, 提供學者自我典藏並開放取用之學術資源系統。

My role is to help researchers here to **comply with the NIH (National Institutes Health) public access policy** – the primary requirement that require researchers to share their scholarship. (SC2)

My day-to-day job is to **oversee the implementation of OA policy**, we have a very hands on workflow for gathering paper, guide faculty that fit under the OA policy. ... We go department by department, look for papers by each faculty member and department, and **tries to find the right version to deposit into our repository**. If she cannot find it, **she created these emails, then we send to the liaison librarians to ask the faculty** to ask for the papers. That's whole workflow we do. (SC3)

美國雖有多所大學編列文章處理費預算補助教師發表於OA期刊，但畢竟並非每校都能如此做，因此SC1館員提及他所在的機構難以在OA政策的推動有較積極的做法，他就由教育層面著手，向讀者倡導OA的正確觀念。

學術傳播館員經常辦理工作坊課程，其內容包含著作權與合理使用、研究者與投稿者之永久性身分辨識號（Open Researcher and Contributor Identifier，簡稱ORCID）、開放取用政策與作者權利、開放型學術社群平台，如ResearchGate、Dspace等主題。教育讀者關於著作權法相關知識，內容如作者權利以及作者簽署之專屬與非專屬授權書的差異，也經常遇見學生隔日即需繳交碩論，但到圖書館詢問碩論中關於第三方資料的授權問題。此外，SC1館員提及到班授課的服務，針對數位藝術主修學生班級，講授在不侵害其他藝術家著作權的情況下，套用數位物件及軟體應用的相關知識。

I work with undergraduates, I do visit classes and give lectures on copyright, and publishing and all of the areas ... in this class students learn **how about digital art and how to create digital art using various software format**, etc. And I go in and talk to them specifically about the challenges they might face in **incorporating other digital objects into a digital artwork and how to correctly do that without violating another artist copyright** for example. (SC1)

除了前述倡導著作權等相關事宜之外，因應掠奪型出版猖獗，學術傳播館員工作往往需時常提醒讀者投稿注意事項，RDM3館員亦會協助學生選適合投稿的期刊，而SC1館員特別提及需為師生指引適宜發表的刊物，以防範研究人員誤將論文投稿於掠奪型期刊，目前是學術傳播館員的重要任務之一。

So from a scholarly communications perspective, what I do on the campus, is I work with of the faculty, **in educating them and providing support for various avenues of scholarly ... one of scholarly publishing, so I help them in understanding how to interpret and negotiate copyright transfer agreements. I help them in finding places to publish, if they're looking for some new journal to publishing**. (SC1)

Scholarly communication position was traditional like working on **dealing with open access policy, repository**, also helping people with publishing, like **deciding where to publish, publishing agreement**, and that kind of things. Sometimes I would work with students about how to decide where to submit to, **which journals would be appropriate to submit to, author agreements, ... advising them about sort of like thinking about keeping certain rights.** (RDM3)

2. 研究資料管理服務

美國的大學圖書館提供研究資料管理服務者，可能由學術傳播館員或研究資料管理館員來提供服務，同樣職稱的館員也會因為圖書館規模大小不同，其工作內容有所差異。如本研究受訪者SC2、RDM2與RDM3館員來自同一所大學，但不同學科圖書館，職稱雖不相同，皆提供研究資料管理服務，然而服務層次仍有其差異，SC2與RDM3館員的服務對象是該專業學科領域的讀者，RDM2主要任務則為協調與建置該校各分館之研究資料管理營運模式與服務全世界的讀者。此外，SC1與SC2之職稱都是學術傳播館員，但SC1任職圖書館規模小，目前他任職的圖書館並未提供研究資料管理服務，而SC2館員先前的職稱為「Digital Resources & Services Librarian」，但他負責的業務包含學術傳播與研究資料管理。

在職能分化較細的大學圖書館，除了學術傳播館員之外，亦設置研究資料管理館員，名稱不全相同，受訪人員的頭銜包含「研究資料專案經理」(Research Data Program Manager)、「研究與資料館員」(Research and Data Librarian)，或工作內容加註「資料管理服務」(data management services)。

RDM1館員提及她的工作可提升研究有效性的影響力，基於平等與社會正義的觀點，她深懷使命感並認為提供研究對話公平取用環境之工作相當重要。

... for me personally, another part of my motivation as well as the library motivation is **thinking about equitable access to the conversation of research, both contributing the conversation of research as well as benefiting from the conversation of research** ... the motivation for the whole team and for the entire library organization is **to increase that equitable access to research in itself ... expanding on that idea of thinking about how information interacts with societies and human experience and some of those ideas around equity and social justice.** (RDM1)

本節內容分別就研究資料管理的重要性、多元樣態的研究資料分享風氣，以及研究資料典藏庫與資料再用服務等三項加以說明。

(1) 研究資料管理的重要性

研究資料是研究過程中重要的一環，為落實管理機制，目前在研究計畫申請案中，往往需提供研究資料管理計畫，包含研究資料如何收集、維護及散播研究資料。當研究計畫執行完成後，研究資料需被妥善儲存於貯存庫，研究經費支援機構若將研究成果與研究資料管理列為必要項目，則有助於提升研究人員繳交研究資料於貯存庫的比例。

工作於醫學院圖書館的受訪者SC2館員表示，醫學研究是對於研究過程高度規範的學科領域，必須合乎美國國家衛生院（National Institutes of Health，簡稱NIH）的規定，上傳相關研究成果至NIH PubMed Central repository以符合開放取用政策，下一階段的研究經費才會撥款。雖然研究資料管理也列入研究控管的必要環節之一，研究計畫申請書中必定要載明研究資料管理計畫，但由於研究資料型態多元，以生醫領域而言，資料貯存處如National Center for Biotechnology Information(簡稱NCBI)，包含不同研究資料類型，如SRA(<https://www.ncbi.nlm.nih.gov/sra>)或GEO(<https://www.ncbi.nlm.nih.gov/geo/>)等不同的資料集，但與研究成果發表統一登載於NIH PubMed Central repository之單一系統狀況不同，所以他會接到讀者來電詢問如何在NIH PubMed Central repository登錄研究成果，以利取得下一階段研究計畫經費，但未曾接到讀者來電關於研究資料管理與研究經費的問題。當然也並非所有研究資料都能被開放利用，如涉及隱私或較具敏感的資料則難以對大眾開放。

They have **research data management plans with the grant proposal**, the research data management plan will **indicate to the funding agency**, that might be **highly sensitive, or protective data that have to keep secure**, so **might not be the case that make every single piece of data freely available because of the privacy**, rights and roles, but they **must indicate what they're going to do**, somebody asked questions **how to access the data**, there will be the **protocol of asking how you can get this data**, all this things would come into **research data management plan**. (SC2)

Yes, there are **requirements**, and **some cases are required to the repository**, where they want **research data to be placed**, The **NCBI (National Center for Biotechnology Information)** has many **different data repository**, where it make sense for the researcher to add their data, **So the SRA dataset, the GEO**, there are many different data repository, (SC2)

簡言之，美國的生醫領域學者，其研究經費來源若來自美國國家衛生院，相關研究成果必須上傳至NIH PubMed Central Repository以接受贊助單位的檢核，達成研究成果開放取用的目的。然而，原始研究資料管理雖被要求說明於計畫書中，但由於研究資料類型多元，目前學者上傳其原始研究資料的系統，並無統一的系統與資料規範，NCBI是生醫領域學者較常利用的研究資料貯存系統。

除了前述關於在美國的醫學領域研究計畫經費撥款進度是與研究各階段是否依規定要求上傳研究成果之外，其他如政治科學等學術期刊會要求作者同時亦需上傳研究原始資料於研究資料貯存網站，這已是許多學術期刊之同儕審查的必要環節。

... a hundred number of journals that require as part of peer review for you to submit your data. There is certain journal in political science or academic journals that asked for you to deposit your data also when you along with your publication ... it's like around 75 Journals are use Harvard dataverse to support peer review and replication and so forth. (RDM2)

RDM1 館員提及研究機構角色的重要性，若學者隸屬研究機構將研究資料管理等流程納入於升等或終身職評量機制，或相關獎勵機制，則學者即會注意研究資料分享議題。

... there is influence of the institution, then also the institution has a role as well and considering things like promotion and tenure. That reward promotion and tenure and what is it that you get rewarded for ... you know, systems as I think a great influence on what researcher are going to pay attention to. (RDM1)

當然，圖書館的角色即是促使研究過程中相關利害關係人對話的進行，以協助研究社群互惠互利，加速研究發展以利建構更美好的社會。

(2) 多元樣態的研究資料分享風氣

每個學科領域之研究資料分享風氣差異大，RDM1 館員觀察是地球與太空科學領域很早即建立研究資料分享的慣例。

... disciplines that have a stronger history of sharing data, so if you get into Earth and Atmospheric environmental, they of course have a natural affinity to share data, because they have to share data in order to understand the environment ... if you are in Astronomy science, they built in the blood about sharing data because they have that impetus from the large instrument, the telescope instrument So there's some disciplines that have that ecos of sharing data to it. (RDM1)

有些研究因若干機密因素而無法使資料對大眾公開，RDM2 館員仍呼籲可上傳至研究資料管理系統，設定資料可分享的對象與範圍，提供有限的分享。

Maybe it's sensitive or something like that you may still share it, but you may require that it's only shared with safe people who are in this field. Or only share people who had IRB You know that they're going to treat the data with the respect that is required of a human subject data. So you know sharing doesn't necessarily mean open all the time but we do

advocate you when you can, to make it open, ... still share but make it clear what kinds of conditions are around sharing. (RDM2)

由於並非每學科存在研究資料分享慣例，如RDM3館員提及社會科學領域學者往往不太分享研究資料，對於他們推展研究資料管理業務是一大挑戰。

In terms of data management, it's been hard for us to have, we tried to explore with faculty depositing their data, we have not had as much as uptake on that, people taking us on their offer, cause **in the social sciences, compared to other disciplines, people are a little more shy about sharing their data**, it's not fully populated, because of that, the issue of trying get integrated into people's mindset and workflow. (RDM3)

此外，RDM3館員亦提及若某教師尚未取得終身職，他們總是希望發表在有助於他們取得終身職的刊物，若審查委員未抱持開放的心態，認可更多開放取用的刊物，則對於推展開放取用的相關議題將是一大阻礙。

I think the second big obstacle is the **whole tenure process of faculty**. Until that changes that's what I found doing open-access was something that people liked in theory, but the bottom line was **if they were not a tenured professor, they wanted to get things on their CV, help them to get tenure. So until tenure committees open up their minds about what's acceptable**, that's another big obstacle. (RDM3)

(3) 研究資料典藏庫與資料再用服務

哈佛大學為收集、典藏、管理與再用研究原始資料之目的設置Harvard Dataverse (<https://dataverse.harvard.edu/>)，以利全球學者可自由與免費上傳研究原始資料至該系統典藏，以利分享、典藏、引用、探索任何學科領域的研究原始資料。Dataverse計畫是由哈佛大學計量社會科學研究所最早發展，計畫主持人是Gary King教授，計畫創設之初是為社會科學研究學者提出一項利於資料分享的網站架構(G. King, 2007)，後來擴大為全球所有學科服務。鼓勵學者自行上傳研究資料，但若有需求，圖書館亦提供付費型的資料皮用管理服務：

We offer free of charge Harvard dataverse, your dataverse repository, let you deposit your own data there. **You can self-curate it if you'd like. Or we are just spinning up a data curation services that will let you pay for them. So you could pay us and we will deposit and curate the data on your behalf in the Harvard Dataverse** (RDM2)

不同學科對於研究資料分享的風氣不同，而各學科慣於上傳研究資料分享的網站也不盡然相同。RDM1館員提及該校學者較常使用外部典藏系統，如Github為開放軟體發展與版本控制的資料貯存站，而由歐洲核子研究組織(European Organization for Nuclear Research，簡稱CERN是由其前身Conseil

Européen pour la Recherche Nucléaire 縮寫而來) 建置之 Zenodo (<https://zenodo.org/>) 是該校研究學者最常利用的外部典藏系統，舉凡研究論文、研究原始資料、軟體、教學資源等等皆可上傳與分享。此外，密西根大學建置的 ICPSR (<https://www.icpsr.umich.edu/>) 則是社會與行為研究學者上傳與分享研究資料的典藏系統，基因銀行 GenBank (<https://www.ncbi.nlm.nih.gov/genbank/>) 則重點在於 DNA 序列資料貯存與分享利用。

社會科學領域提供研究資料服務的內涵與科學領域不同，法學院圖書館 RDM3 館員提供研究資料的類型包含法庭資料、法學資訊資料、公司資料、證券交易資料等多元類型的資料。

... then the data part of my job, **my job is primarily data reference**, most of these questions I get from law people, actually most more from **actually even that aren't laws is court data**. Sometimes people also want other kinds of **legal information data**, things about agencies, things like that, and then sometimes I have a colleague that **focuses on corporate data**, for example like up in the US we have **SEC (the Social Securities and Exchange Commission)**, public traded companies have to do a filings, and sometimes people want that as data. A lot of times people want **company data**, data about companies. (SC5/RDM5)

研究資料收錄於各類型典藏庫後，有效提供資料再用服務是很重要的一環，讀者關於研究資料的需求是多元的，有時讀者欲查找的「資料」是指統整後的統計資料，有時他們指研究的原始資料，所以需藉由相互溝通與釐清問題後，才能協助讀者查找到他們所需的研究資料。

Sometimes **they say data**, sometimes they **really just want summary statistics**. Sometimes **when they say data, they actually want like raw data**, the econ student, they don't even usually care what data it is, so it's sort of like they come in wanting this data but it really isn't they just wanted to be computational data, I have to **work with them to figure out, what maybe there's another kind of data you can get that'll let you do the exercise you want to do**. It's more accessible. (SC5/RDM5)

3. 數位學術研究計畫共建與建置內容管理系統

數位學術館員需協助大學之不同系所建置數位典藏系統，不僅僅詮釋資料之實體位置等，也要提供關於語意相關的敘述，往往需深入瞭解每個案的內容細節，與相關人員以腦力激盪方式來共同規劃建置的模式，協助提供建置工具平台的諮詢與建議，必要時也要轉介校內外專家來協助計畫的推動。DS2 館員表示如下：

... we have 33 live projects, not all of them are coming to me all the time but enough that **I have this constant stream of advising people on what their**

next steps might be, to the brainstorming with them, pointing them to information from my fields that they might not have found, otherwise and that might be useful to them, I'm pointing them towards collaborators. Both internal and external to BU. (DS2)

數位典藏專案計畫來自各系所，來自學生的問題包含如何為特定資源建置網站？相關工具為何？來自教師面的諮詢則包含如何運用相關資源以做為未來教學使用。由於案件不少，但圖書館於數位學術相關之人力資源有限，因此圖書館提供計畫申請表，各系所師生填寫專案計畫目的、經費、是否需要採購特殊軟體、長期／短期計畫等資訊，以利圖書館篩選合作計畫案件。

I also **meet with faculty**, you know **to talk about potential project ideas that they have**, or to talk about, you know, **opportunities for instruction in the classroom**, if they want to bring in a particular tool, you know, for their students to use as part of an assignment, (DS1)

We have **had requests from researchers at other university, it's unfortunately just not something that we really have the staff to support**, but it typically when somebody wants to work with us, we have a project intake form, if they want to do the project with us, though we asked them to do a little bit of thinking beforehand about, **what their project will actually need, is there going to be a cost associated with it, you know, does it require special software that they need to buy, how long do they want it to be online, does it need to be online forever** (DS1)

推展數位學術工作時，與資訊人員溝通有其挑戰，即使DS2館員具備人文計算(humanities computing)博士學位，亦提及資訊人員的思維模式與人文學者不同，往往難以對話，有時是相同的語彙卻指不同的事務：

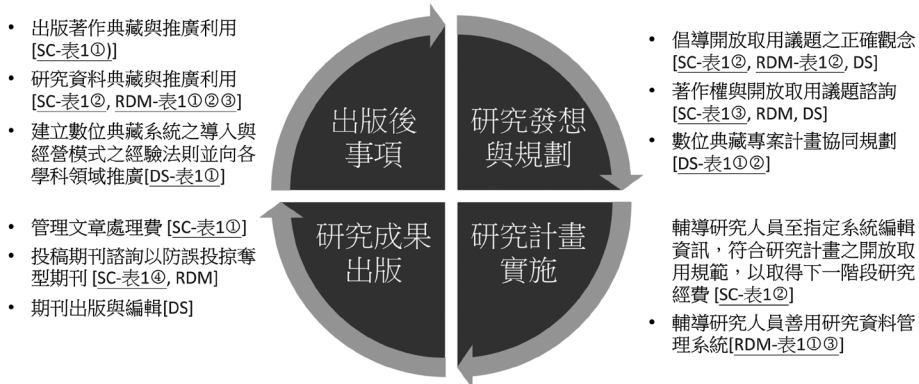
... it was **very difficult conversation to have, because it's not even that we speak different languages**, is that we use the same words to mean **different things, like website and support and project**, like all of that, right, and **because IT needs to be involved, but the way that they were is very different from the way the digital humanities were,** (DS2)

圖書館提供導入內容管理系統的建議，其中關於日文俳句詩集及其翻譯作品的系統建置計畫，DS2館員推薦導入自由開源的內容管理系統WordPress，以利推展該案工作。依據Mackenzie(2016)所區分的數位學術研究服務之四種層次而言，可將DS2館員提供之服務內容列入第四層次一專家級的服務。

將此小節訪談內容整合三種類型館員在研究週期中提供之服務與諮詢於圖2，研究週期區分為研究發想與規劃、研究計畫實施、研究成果出版、出版後事項等四階段，各階段列入本研究訪談之三種類型館員的相關工作事項。本研究彙整Calarco等(2016)、Schmidt與Shearer(2016)與M. King(2018)研究呈現較

完整的角色任務與知識技能於表1，圖2則由研究週期的視野來呈現受訪者提及的工作事項，學術傳播館員工作範疇較廣，遍布整個研究週期，而研究資料管理館員與數位學術研究館員雖有其重點工作項目，但三種類型館員提供之服務項目亦有其相互重疊之處。由於圖2僅列入本研究受訪者所提及的內容，較完整的工作項目以表1為主。表1呈現三種類型館員的工作任務，由於篇幅有限，僅節錄角色任務要項，並未加以陳述各要項下的內容細節，然而圖2呈現較具體的工作事項，試圖比對表1後，加註於方括弧中，小結如下：學術傳播館員於表1所列之四項角色任務，分布於圖2之各階段。研究資料管理館員於表1所列之三項角色任務亦分布於圖2之各階段，本研究受訪者有提及著作權與投稿期刊諮詢等工作項目，但並未列入表1之研究資料管理館員的角色任務。數位學術研究館員於表1說明其角色任務很廣泛，包含研究資料生命週期管理與數位圖書館之協調溝通等，本研究受訪者提及期刊出版與編輯，並未列入表1所列數位學術研究館員的角色任務。

圖2 三種類型館員在研究週期中提供之服務與諮詢



註：[SC] = 學術傳播館員、
[RDM] = 研究資料管理館員、
[DS] = 數位學術研究館員；
館員代碼下加底線者，
表示該工作項目亦列入表1角色任務，如[RDM-表1③]，
表示該工作可對應於表1研究資料管理館員之第一與第三項角色任務。

總結三種類型館員於表1總整的角色任務與本研究的實證資料，不論圖書館規模大小，學術傳播館員的工作項目如同表1所列項目，各校工作範疇差異不大。研究資料管理館員工作焦點於研究資料生命週期的管理業務，通常是規模較大的圖書館，其業務分化較細後，才會設置專屬館員，其業務內容亦如表1所列。然而，數位學術研究館員之業務，各校賦予的業務範圍相當具多元性，有時重點偏向學術傳播館員業務，有些則是開創型業務，如為教師教學研究需要，而協助創建其客製化的數位教學或研究資源系統，其業務內容範疇各校差異大。

(二) 協調溝通等多元技能與挑戰

1. 頻繁的校內外協調與合作

大學的重要任務即為推展學術研究，美國幾乎所有學術圖書館都設有學術傳播館員，協助各學科領域研究人員推展學術相關研究活動，向研究人員轉介最適切研究資源與工具，相較於採編館員或參考館員，融入學術研究活動較深。

研究資料管理業務往往是由館內同仁組團隊提供服務，以RDM1館員所屬圖書館為例，團隊成員有二人的業務直接相關於研究資料管理，但也納入參考館員、系統館員、特藏與數位檔案館員、學術傳播館員、館藏服務館員等，以及分別由化學、人文等學科館員，分別占用他們日常業務工作量的三分之一至10%，共同投入研究資料管理的業務。

RDM2館員所屬機構規模大，她的服務對象是各學院分館及其館員，主要任務是協調各學院圖書館建立其個別的研究資料皮用之服務模式，因此重點在於跨學院圖書館的協調與溝通，為各分館館員辦理相關教育訓練、最佳實務工作分享等活動，協助解決跨學院圖書館的共同問題，促進組織知識分享。

數位學術館員除了與各學科領域研究人員合作建構各種類型的數位典藏與學術平台計畫之外，校內密切合作的對象主要是學術傳播館員、校內出版中心人員。

波士頓與新英格蘭地區之學術圖書館合作密切，不同機構相互觀摩數位人文推展工作，也會共同辦理推廣活動，但目前是以非正式合作關係，若未來有正式的數位人文聯盟(DH Consortium)，則將會更有效率。DS1館員與DS2館員隸屬不同大學，但他們共同發起群眾外包(crowdsourcing)計畫，名為「Crowd Café」的活動(<https://libcal.bc.edu/event/5182216?hs=a>)，每月第三個星期五下午分別在二館提供場地，若無法實地參與，也可參與線上會議Zoom Meeting，號召群眾每月投入兩小時協助整理各類型數位資料，如Smithsonian博物館收藏之中國紙鈔的文字建檔與校對、地圖圈選建築物、爵士音樂家口述歷史訪談稿校對等多元類型的專案計畫，希望能眾志成城，協力完成各種數位典藏計畫。

2. 多元的諮詢與教學內容

除了辦理推廣教學活動之外，學術傳播館員需協助新進教師判定適合投稿的期刊，以避免誤投掠奪型期刊，當教師提出研究計畫時，也協助教師撰寫研究資料管理計畫。也需提供研究生關於著作權法相關事宜的諮詢服務，研究助理若有為符合研究過程之要求而上傳論文以利開放取用之系統操作問題，館員可提供一對一指導，協助解決操作問題。數位學術館員與教師討論關於未來的研究計畫或者教學上需使用的特定工具。

I also meet with faculty, you know to talk about potential project ideas that they have, or to talk about, you know, opportunities for instruction in the classroom, if they want to bring in a particular tool, (DS1)

Many new faculty are coming in and it's their first job. **They're unsure of where to publish and it's also the case that there's a lot of predatory publishing going on, it's also trying to confirm whether they should be publishing in a particular journal.** So I help them do the research in and **determine whether it's a valid journal in the field,** ... I work with faculty on **research data management. I help them to write the data management plan for the grant.** I also work with the faculty. (SC1)

具法學博士學位RDM3館員，她曾擔任研究指導館員，2009年之後轉為學術傳播館員，目前是研究資料管理館員，提供相當深入而務實的諮詢服務，在論文寫作小組中，指導老師也只是參與對話的成員之一，館員通常會提供關於研究方法的諮詢，並依據不同法的屬性不同，如民法重法典、普通法重案例等狀況來教授研究方法。此外，亦需教育讀者並非所有層次的法庭資料都開放存取，因此，法律圖書館館員需具備相當精熟的法學知識。

We work with them pretty in-depth hands-on detailed consultation, and then we also they have for the ones doing a longer paper they have these writing groups, ... people are doing such different topics, they just kind of have to fit them together, **JD kind of helps them with the writing part of the paper, I help them with the research part of the paper.** I teaches part of that, but I usually do one kind of formal teaching class, but the rest of the time, I just go to the meetings, and kind of like, you know, **advisor, just be part of the conversation ... civil laws is very like code oriented and then common law is like case oriented,** so how you teach that research, it's a little bit different. (RDM3)

Because lot of them now want to do practice cases, so they **always looking for court data.** But they want this really granular data, and you have to explain to them sometimes that's the way they want the data isn't necessarily, **everybody thinks every court case is like openly available and accessible at every level of court, and then you have to kind of educate them.** (SC5/RDM5)

由此可見，具備學科知識背景往往是提供良好的學術傳播、研究資料管理業務的基礎，多位館員(SC1、SC2、RDM3)在現職工作之前都曾經提供參考服務，即學科館員的工作。而在成為研究資料管理館員之前，RDM1與RDM3先前是學術傳播館員，累積學科館員、學術傳播館員的工作經驗後，可基於先前的經驗知識，提供全方位的服務。

3. 工作挑戰

綜整受訪館員所提到的挑戰包含如何提升推廣活動參與度、如何導正研究人員對於開放取用學術資源正確認知、如何提高研究人員分享研究資料的誘因、如何建立有效而永續經營的營運模式等。

美國的學術圖書館員提供之服務內容相當融入學術研究，但來自不同校的不同館員（包含DS1、DS2、SC1、SC3、RDM1館員）共同提及的挑戰是提升推廣活動的參與率，推廣活動的主題與學術研究過程息息相關，但不見得每場活動參與度高，研究人員專注於自身研究，往往是需求發生時才會想到圖書館尋求協助。透過學科聯絡館員較能向各系所有效地傳達相關活動訊息，也無法百分百保證有需求者收到相關活動訊息。無法掌握校園每位研究人員的進程，如何在適當時機使他們得知圖書館可提供協助。此外，經常很多活動都在相同熱門時段舉辦，館員覺得很難同時提供良好的服務。

... we often don't have direct access to students in the same way that other parts of campus do, so you know, **our Subject Liaisons are probably our most direct line**, but you know, even they are removed from the department's, I mean they're not faculty in the department, you know, they don't ... they can forward messages and promote things, **but there's no real guarantee that it will get to the right people, and so I think that this is a problem.** (DS1)

Now the biggest challenge, I actually facing my scholarly communications is faculty involvement, is getting the faculty to actually act upon, ... **because they're here to research into teach, they're not here to ensure that I am doing my job, or to provide me the information that I need.** So it's sometimes hard to get them at the point, for example, **how do you get in front of a faculty member to help them write their research, their data management plan for grants, if you don't know who on the campus is involved in grant writing, and if they don't know that I exist, to help them with the process.** So it's the challenge is getting those points of contact **So it's making those contact to set the point of need, and making sure that you're there when they need you, is a challenge.** (SC1)

Big challenge is that **when you want to do an event, you are competing with a lot of different things**, and then **when you're helping people, a lot of people want your help at the same time**, so you feel like you can't really fully do a good job, because you're too busy trying to go between all these people ... so I would say that's kind of **the biggest challenge is that just too many things going on at the same time.** (RDM3)

校園中仍有不少師生缺乏開放取用學術資源與著作權相關的正確認知，以及不清楚圖書館可提供協助的範疇。因此SC2與SC4館員皆表示這是最大的挑戰。S3館員亦提到該校已推行開放取用政策10年，即使她的新聞專業背景有利於她的推展工作，但仍有不少人不清楚其內容，在經費與人力資源缺乏的困難處境下，有效倡導開放取用學術資源的正確認知是一大挑戰。

除了宣導正確的資訊之外，RDM1 館員則提及提高研究人員分享研究資料的誘因亦是一大挑戰，她強調研究資料管理能有效加速研究影響力，所以是必備的流程。

... raise the incentive, to create the awareness that this is not just a “nice to have” it’s a “have to have” ... finding that triggered, that lever, that gets the attention of a researcher that this is an important topic, ... this is how it has an impact and influence on their work on their career, this is how data management can make them more efficient, more effective, ... so people come and they can hear about why it matters to have a documented naming convention for your files at the most basic level, right, why it matters to have a versioning system, why it matters to document your script when you’re doing an analysis, why it matters to create a statement in your article about whether or not your data is available, where it might be, why it matters to cite someone else’s data that you use in your study, why it matters to cite your own data that you use in your study. (RDM1)

此外，由於RDM2館員的主要任務是與各分館協調與溝通，建置顧及多面向之研究資料管理政策，因為每分館館員都要特別抽出時間探索此工作的未來發展方向，所以她認為最大的挑戰是如何建立優先次序，形成有效率且永續經營的營運模式，

... how do we operationalize right and how do we just make it a part of a routine business. That can also be a challenge. Everybody is busy. So if you’re going to sustain the work, then that means in some cases, you have to stop doing some else. There’s the prioritization. Those are the type of things I would say that are the big challenges. It also be their big opportunity and it can be a lot of fun. (RDM2)

4. 多樣化的工作內容與吸收新知方法

數位學術館員工作內容多元，有些亦需管理各式研究資料，有時也身兼學科聯絡館員 (Liaison Librarian)，做地理資訊測繪工作 (GIS mapping work)。DS1 館員也辦理期刊出版工作，有些是大學生與研究生的刊物，館員提供期刊出版的諮詢，另外有些是天主教相關的刊物。此外，推展開放取用的基金管理工作，如提供教師發表論文於開放取用期刊之文章處理費等經費的管理，也屬數位學術館員的工作內容之一，在DS1館員所屬學校，推廣教師將研究資料開放的相關工作，亦是數位學術館員工作。

We have just hired our first data services librarian and one of her goals is to encourage the use of open data and encourage researchers to deposit their data openly, you know, when possible. (DS1)

DS2館員則提及中介角色的重要性，由於數位典藏工作所需技能多元複雜，學科範疇也很廣，DS2館員曾與日本文學、義大利文學、音樂學等不同學科領域學者合作，因此掌握許多專家知識庫，轉介給有需求的師生，有助於建置與推展不同學科領域的數位典藏工作。

... one of the elements of my job as I see it, is to know **who is an expert at what, and who's doing what**, and we **set up conversations and people are very generous with their time, and people refer people to me also, right, so we share.** (DS2)

為了深入瞭解各學科領域的研究資料特性以做好研究資料管理的工作，館員往往學習範疇超過以往圖書館經營所需知識，RDM1館員舉例如機器學習、貝式統計、人工智慧、生成對抗網路(Generative Adversarial Network)等知識，似乎是研究的黑盒子，完全無法理解，圖書館員應要幫助人們瞭解周遭的環境，要使資訊可發現、可存取，以及研究資料可再利用。因此，基於館員所奠基的資訊素養，來考量當這些資訊被演算法預先消化(predigested)時意味著什麼，並理解該資訊是什麼，如何系統性的管理與評估研究資料集的良莠，以及協助研究人員瞭解其演算機制，並有效提高其再用性，需思考不同的角度與考量不同的環節，也要避免因演算機制的偏誤或對於機器運作不夠瞭解而將該放入的資料排除在外。

... what are the data site, to train your machine to learn, **is there a way that we can rank what's good about the data set**, ... how can we **describe this in a systematic way** so there is a common understanding about this data set ... let's **look at algorithms out there, how do they work, how were they different from each other, how early development, how do we classify them, how do we organize**, so people can understand what they're using them, and then **how do we help people to understanding algorithms, how do we do that in a way that is beneficial to society**, so that we can **reinforce those idea of equitable access to information, and not seeing the results of algorithmic bias where people are shut out of society by the decisions of machine that aren't understood well.** (RDM1)

因應館員多元化的工作內容，對於持續變動的環境，綜整受訪館員提及的吸收新知的的方法與方向如下：

(1)自我教育訓練與做中學、參加工作坊或再進修：SC1館員提及需自修關於開放取用與著作權相關知識以利工作之推展，環境變動是促進學習的激勵因素，經常預先研讀相關知識，以因應不時之需。RDM2也提及將自我持續學習成為生活的習慣，不論學習新語言、新軟體應用、新程式語言，學習新知已融入於生活習慣。DS2館員認為在推展數位人文計畫時，在每個案的實務工作學習新知。SC1館員則表示自己是實作型館員，樂於學習新技能、嘗試新試驗並加以應用它。

I'm pretty much a **hands-on person**, so if there's a new skill I need to learn. I wanted in front of me, and I want to **be able to experiment with it**, and **I want to use it ... and I try to keep my self-educated** from that perspective, and that if **I'm going to implement something, then again research online**, and then trying to **find other people who perhaps have been involved with it** as well. (SC1)

DS1 館員是參加特定主題的研討會與工作坊來吸收新知，如數位圖書館聯盟 (Digital Library Federation, 簡稱DLF, <https://www.diglib.org/>) 舉辦的研討會，或文字分析與主題模型 (topic modeling) 等主題之工作坊。SC4 館員則時常參與網路研討會 (webinar) 與嘗試應用新軟體以跟上時代潮流。SC2 館員則覺得需再進修第二碩士學位，提升法學知識，以備工作所需知識。

(2) 社群軟體與跨機構合作學習：RDM1 提及在 twitter 看到研究資料管理相關對話，她也提及新英格蘭區或不同區域範圍之聯盟成員的合作，參與研究資料聯盟 (Research Data Alliance, <https://rd-alliance.org/>)，有助於研究資料管理實務工作的分享與學習。DS1 館員密切與跨機構成員合作辦理活動，相互學習。RDM2 與 RDM3 館員隨時吸收新知，亦包含來自 twitter 訊息，關注各方來源的訊息，即使目前業務不見得與推展開放取用有關，但仍持續關注相關新訊。

I'll be **looking at Twitter** and I try to follow ... I **don't do open anymore**, but I still follow, **quite a few open-access things, but I think it's important as part of my research job**. Aware of that, so we just say it's kind of monitoring things and then thinking about like **how useful they would be for what you're doing and then following it more, mostly monitoring things**, I'd say that's how I keep learning knowledge. (RDM3)

(三) 良好館員之個人特徵與工作熱誠來源

1. 綜整受訪者認為良好館員之個人特徵，包含如下要素：

(1) 好奇心、樂於吸收新知：研究資料與數位學術研究管理業務變化大，每天都會面臨新事物，因此，DS2、RDM1 與 RDM3 館員都提及必須時時保持好奇心，喜歡學習，思考跳脫舊式框架，以及能夠正確的提問。DS1 館員亦提到需具備喜歡學習新事物的本能，因她個性很喜歡嘗試新事物，而數位學術服務工作往往需結合於發展快速的新科技，所以她認為抱持開放心胸，樂於嘗試，從失敗中成長等心態很重要。

(2) 善與人溝通協調合作：由於常面臨全新的業務，因此經常與相關利害關係人協調與溝通，多位館員 (SC2、SC3、RDM2、DS2、RDM3) 提及人際溝通的重要，DS2 館員提及數位人文領域很新，常需與不同領域人交談，以促成更多的協同合作研究，所以好的溝通能力很重要。由於 SC3 館員具備新聞學專業，特別提及好的書寫溝通技能可將複雜事物簡單化，達成有效率的溝通。

RDM2館員表示要與不同學科背景者溝通該領域研究資料的特性，亦提及人際溝通技巧的重要。

(3)隨機應變：探索全新業務時，常產生許多未知而不可控制的情境，SC3館員提及彈性應對的重要。DS1館員表示必須因時因地制宜，彈性調整應對狀況，可談論較廣層面的策略規劃議題，同時也能掌握各專案的細節資訊，充分配合需求。

A willingness to adapt to other people's needs, fairly significant attention to detail, I can talk about something strategically, ... for example, managing your research data, and I could say what is important for all these reasons, but when you get down to actually manipulating and help, I might the research data management plan, it's much more detail oriented, and so you have to have that attention to detail, and willingness to work at both the strategic level and down in the detail level. (DS1)

(4)系統性思維：由於研究資料類型多元，不同資料之特徵與管理機制皆不同，目前正處於廣泛探索各項變動的事物與嘗試創建營運模式的階段，RDM1與RDM2館員都表示具備有系統性思維來分析事務很重要，RDM2館員更提及運算思維（computational thinking）⁹的重要性，因為研究資料管理的面向很廣，能以巨觀視野來察看各項相關因素的能力、系統化的思考方式，以及考量使用者社群需求與未來的擴充力等，也很重要。

I would say that you want to have the subject knowledge, you have to understand data as a scholarly object. You have to understand data as a format and that it is different from digital information. Its characteristics is so different. How it comes to be, is different, the kinds of tools that are needed to engage with it manipulated it, make sense of it, are different than traditional information sources, even electronic resources. So you have to understand the community in which data as a scholarly object arise, and are transformed and used and reused. So that is a body of knowledge, and a set of computational skills, and type of computational thinking, that you just have to have. I actually find that people really should know how to do that, but computational thinking, being able to think in the structured systematic way, being able to think about scalability is incredibly important. Being able to think about the user communities, and the types of practices that this data served, it's essential, and so that's what I consider like computational thinking, systems thinking, and then knowledge about data as a scholarly object. Those are all key things. (RDM2)

⁹ 運算思維是一個思考的程序，包含四大步驟：將問題拆解為小問題、辨識小問題是否有其規律或趨勢、找出產生規律之通則的抽象化過程、設計逐步執行的指令來解決問題。前述定義與說明來自<https://tw.alphacamp.co/blog/algorithm-and-computational-thinking>。

(5)專案管理技能：RDM2館員的角色任務是協調各學院圖書館，規劃與辦理各項館員訓練活動，以利各館建立其研究資料度用之服務模式，因此特別提及專案管理技能的重要，往往每次的工作任務都是一項新專案，需知曉各種主題知識，及其研究資料管理實踐的知識，以及與各層級組織的利害關係中協同工作，掌握時程以達成專案目標。

2. 館員工作熱誠來源，依受訪者的回覆，統整為三大面向：

(1)研究共好之目標與使命：本研究探索的服務內容，緊密環扣於學術研究的各階段，三種類型的館員(DS1、DS2、SC3、SC4、RDM1、RDM2)均提及由於他們的努力，可使研究社群更好，促進更有效率的研究場域，提升學術研究對於社會影響力，館員積極融入學術社群，其業務為促進更完善學術環境之重要因素，這是對於他們認真投入工作的最大動力。

... the part that's really exciting is talking to somebody about an idea that they have, and thinking about where it could go from there, and you know **working with them to actually make that into something, or even just to teach them about what's possible, that to me is really rewarding part,** (DS1)

... the work itself is **it feels good to be trying to do something that is hopefully for the public good**, opening up research that is publicly funded. (SC3)

How we organize information, how we make information accessible, discoverable, **has such a large impact on what society itself**, what individuals can understand about themselves, about the world around them, and understanding the mechanics behind that, was something I found, **continue to find interesting and also very motivating which reason to the position that I have had in data management,** (RDM1)

But I think that ultimately in the library space that we're trying to do is we do want to help further science, we do want to **help our research Community make use of these resources and to carry the resources for them on their behalf in order to be a scholarship**. And so that's also nice to see. (RDM2)

(2)幫助人而獲得正向的回饋：館員業務多元複雜且經常接到全新的任務，付出許多心血為讀者克服難關，往往來自讀者正面肯定的回饋即能使館員繼續保有工作熱誠。如SC1提及著作權相關指導課程課後，來自讀者送的咖啡，SC3館員則表示大約一至二周就會收到來自全世界讀者的感謝，他們就覺得有動力繼續投入工作。

(3)學習新知：多位館員(SC2、SC3、DS1、RDM2、RDM3)都提及可持續學習新知識是他們的工作熱誠來源，發現新方法與新觀念、向研究人員展現新方法來達成工作目標時，是成就感的來源。面對全新業務的挑戰時，往往是以學習新機會之正面想法來使問題迎刃而解。

... sometimes they think this isn't something I could ever do, and being able to show them, "actually you can do this", you know, it might look a little bit different from what you envisioned, that's really rewarding, so for me that's one of the parts of the job that I like the most, and also just learning new things, I find that really rewarding, finding out about a new tool that does something that I've been wanting to do for years, or a new concept that I can see will completely change the way that we're doing things. (DS1)

(四) 數位時代之館員角色與任務

綜整受訪者關於數位時代之館員角色與任務的意見，分成如下四大面向：

1. 讀者溝通，滿足需求：SC1 館員提及館員的核心要務即是為讀者篩選正確適合的資訊，滿足其需求。DS1 與 DS2 館員皆提及與研究人員的持續對話與溝通，營造圖書館為活絡研究的場域，促進持續學習與協同合作的氛圍。RDM3 館員亦強調圖書館宜建構親和力高的資訊架構，以協助讀者易於探索所需資訊。

2. 教育與牧羊人的角色：RDM3 館員提及教育的角色將會更重要，要使讀者瞭解資訊背後隱藏的意涵，以及如何控管資訊等細節，亦如同牧羊人的角色，帶領讀者朝向目標資訊。

... huge educational role, we have to making people understand like what the underlying information is that they're looking at and what is between them and the information, and how that's manipulating, maybe what they're getting from the underlying information, cause you do have that interfacing between it ... I think they'll be some sort of **shepherding role**, like a shepherd with sheep in a field, the shepherd that you helped the sheep get to the next place, and you help the animals get from one part of the field to the other. (RDM3)

3. 善用科技工具，提升知識融合：數位時代勢必將引進更多科技工具，DS2 館員強調科技工具與人文學科知識融合運用的重要，DS1 與 SC4 皆提及要學習更多資訊科技相關應用與工具，如資料視覺化與文字探勘等分析運用。RDM3 館員亦強調圖書館應建構利於讀者親近資訊的基礎建設，如善用人工智慧相關應用，以利讀者探索他們所需資訊。RDM2 則提醒要以人們使用的角度來思考科技的運用，而不被工具所奴役。

We are talking in library space, we are talking about data, and scholarly resources. That's what the library does for you. We will get this **for the lens of scholarly resources.** Yes, we are thinking about the storage cost, what kind of storage to use it, Amazon services, or in the cloud, whatever.

What we are thinking about **how will this data be used in the context of human use, not computer use.** The IT folks with computer use, **we are thinking about it from the perspective of human use.** (RDM2)

4. 系統思維與協助學術出版模式轉型：RDM2 館員提及未來會更多專案管理的機會，應抱持開放心態，以系統性思維觀點來處理事務。SC2 提及圖書館應協助學術出版轉型為朝向開放存取的學術傳播模式。

五、結論與建議

本研究綜整學術傳播、研究資料管理與數位學術研究等三種類型館員工作之理論與實務內容，將實務工作訪談結果區分為重點工作內容與項目、協調溝通等多元技能與挑戰、良好館員之個人特徵與工作熱誠來源、數位時代之館員角色與任務等四項。前述四項涵蓋專業工作知能與軟技能等兩大面向，專業工作知能內容符合先前文獻提及的重點工作項目，研究結果呈現學術傳播館員的工作範疇廣，涵蓋學術研究的完整流程，部分館亦包含研究資料管理的業務；研究資料管理業務於美國學術圖書館尚未全面普及，並非每館設專職於研究資訊管理服務的館員，因圖書館規模大小，其相關人力資源及其業務範疇亦有所不同；數位學術研究館員深度融入於大學教師之數位人文研究與教學。經由本研究訪談實務工作者所說明的案例，若干任務可以較具體的實例來增進經驗知識，未來台灣的學術圖書館若有機會實踐相關服務，可參照其經驗，事先為挑戰性高的事務來規劃因應措施。

第二面向關於軟技能的描述，包含協調溝通等多元技能、良好館員之個人特徵與工作熱誠來源、數位時代之館員角色與任務等項。本研究受訪者熱愛圖書館員工作，無私地分享許多個人對於擔任館員的期許與精進工作的方式，好奇心是多人提及的館員特質，也是此項特質促使館員不斷地學習新知以提供更好的服務；善於溝通亦是經常被提及的要素，不僅是與讀者的溝通，與其他專業館員的合作協調也相當重要。此外，多人提及個人工作熱誠來源來自於促進研究共好的使命感，以及幫助人而獲得正向的回饋。儘管工作並非事事順利，但激勵館員繼續努力投入工作的動力主要來自於前述項目，並非是實質的物質報酬，是找到滿足工作成就感的來源。

台灣學術研究的環境與氛圍與歐美現況不同，大學研究人員將圖書館員視為研究夥伴的風氣仍不普及，為提升研究人員對於圖書館提供學術研究服務的需求，若干研究著重於探索台灣不同學科領域學者之研究資料需求，本研究則探索美國學術圖書館學術傳播、研究資料管理與數位學術研究等三種類型館員的實務工作，試圖彙總美國實務經驗來學習其經驗知識，以擬定未來圖書館推展相關服務的措施，建議如下：

(一)參考美國學術圖書館之實務工作內容，建議可排定優先序為未來推展相關業務，如先挑選觀念較為開放的學科領域來推展相關服務，並為文中所提之挑戰性高的事務，規劃因應措施。

(二)初期推展相關工作時，建議以矩陣式組織編組任務，由各組遴選適合成員來組專案團隊，未來若業務擴增時，再考量聘用專職館員。

(三)持續營造館員繼續教育的環境，除了鼓勵館員參與自辦或機構外部正式的課程與工作坊之外，亦鼓勵館員參與各式專業或非專業之社群媒體，以擴大大學學習場域與知識的範疇。

(四)探索提升工作場域工作士氣的機制，藉由表揚年度好館員事蹟，如協助研究人員完成研究專案之案例，以建立最佳實務個案與建立口碑行銷的素材。

(五)本研究數位學術研究館員之兩位受訪者都具備博士學位，台灣除國家圖書館之外，學術圖書館之博士級館員並不多見，建議未來台灣的大學圖書館可招募博士人才，以提升學術研究服務的質量。

(六)若有機會遴選新進館員，建議將好奇心與求取新知程度、溝通能力、教學技巧等相關知能列入人才評選的相關因素。

期許台灣的大學圖書館可逐步落實深入的學術傳播、研究資料管理、數位學術研究等服務，館員成為研究人員的研究好夥伴，並進一步成為建構資訊／資料／資源有效傳播之系統建置與經營模式之資訊專家，協助台灣研究人員之研究成果與國際趨勢接軌，並促進台灣研究能量於世界的能見度。

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附錄：訪談大綱原文版

1. Can you talk about your routine jobs and some other special cases as a librarian?
2. What are your comments about open access and open data issues? You may share anything you want to tell me.
3. How do you adapt to changes?
4. How do you keep learning new knowledge?
5. Do you encounter any difficulties when you promote some activities or execute daily time jobs? What is the biggest challenge?
6. What are the important personal traits (characteristics) to be a good librarian?
7. How do you keep your passion to be a librarian?
8. What are the roles of librarian in the digital age? What are your expectations to librarians in next generation?





An Overview of Scholarly Communication, Research Data Management and Digital Scholarship Services in American Academic Libraries: An Empirical Study from Five University Libraries in the States of Massachusetts and Missouri^ψ

Yuan-Ho Huang

Abstract

The core task of academic librarians are to support academic research. The recruitment for the following librarians' positions including scholarly communication librarians, research data management librarians, and digital scholarship librarians is popular in American academic libraries. Few university libraries provide in-depth digital scholarship services in Taiwan. In order to learn experiential knowledge about digital scholarship services of American academic libraries, qualitative interviews were applied in this research. The interviewees include four scholarly communication librarians, three research data management librarians, two digital scholarship librarians. The research results were stated as the following items: core job descriptions, multiple skills including communication and challenges, the personal traits of good librarians and their passion, the roles and tasks in digital age. Several suggestions were provided in this study, including prioritizing tasks for future work, proposing plans for most challenging works, flexible organizational structure, and developing librarians' competencies and skills. The research results are helpful to propose a plan for the practical work required of digital scholarship professionals and services in university libraries in Taiwan.

Keywords: *Academic libraries, University libraries, Scholarly communication librarians, Research data management librarian, Digital scholarship librarian, Core competence*

^ψThe preliminary research paper were presented in an online conference of "Open and Sharing on Digital Scholarship: 50th Anniversary of *Journal of Educational Media & Library Sciences*. New Taipei: Tamkang University" as the title of "The practices of American academic librarians' work: Case studies of the scholarly communication, research data management and digital scholarship librarians".

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SUMMARY

Introduction

The main roles of academic librarians are to support academic research. Recruiting scholarly communication librarians, research data management librarians, and digital scholarship librarians is popular in American academic libraries. However, few university libraries provide in-depth digital scholarship services and no job titles of the three types of librarians can be found in academic libraries in Taiwan. Therefore, it is helpful to examine the roles involved, competencies and skills of the aforementioned librarians from the related literatures as well as to investigate their practical work, to gain empirical knowledge from them.

The patterns of scholarly communication have changed a lot in the digital age. The open science movement facilitates more freely available research and librarians need to provide services related to the openness of scholarly work in each stage of research life cycle. Librarians manage not only the research output, i.e., publications, but also the raw research data. Therefore, Calarco et al. (2016) provide a comprehensive information about roles involved, competencies and skills, representative job titles for scholarly communication librarians. North American Serials Interest Group (2017) describe five potential areas of emphasis for scholarly communication librarians, including institutional repository management, publishing services, copyright services, data management services, assessment and impact metrics. Schmidt and Shearer (2016) also provide thorough guide for librarians' competencies for research data management. M. King (2018) examined the skills and competences for digital scholarship librarians and showed that collaborative skills, knowledge of digital scholarship and approaches are important capabilities. Pontika (2019) analyzed the information of job advertisements relating to open access, repositories and research data management and concluded that the open research services is complex and librarians need to obtain a variety of general and subject specific skill sets and more than one area of expertise. In addition to reviewing the above literature to acquire a clearer picture of librarians' work for providing open research services, an empirical study is necessary to help us further understand their practical work experience.

In this study, research questions are as follows: (1) what are these librarians' roles involved? (2) What are the core competences and skills? (3) Are there any difficulties or challenges when providing services? (4) What kind of soft skills that good librarians should have? (5) What are the future development of academic libraries and expectations to librarians in the next generation?

Research Method

In order to learn experiential knowledge about digital scholarship services of American academic libraries, qualitative interviews were applied in this research. The interviews were conducted from August to October, 2019. The interviewees include four scholarly communication librarians, three research data management librarians, two digital scholarship librarians. These librarians work in different university libraries, including one university in Rolla, Missouri and four universities in Boston, Massachusetts. The scale of libraries range from 15 to 800 librarians, seven interviewees have master's degree in library science or information studies, and two digital scholarship librarians own Ph.D. degree in history and humanities computing.

Research Results and Suggestions

The research results could be categorized as two parts, one looks at the roles and competences in professional work, while the other category looks at soft skills. From the first category, several findings are as follows. (1) Librarians help researchers to deposit researchers' publications into the repository in order to comply with the public access policy from the funding agency. They provide the copyright, fair use and open access advice, as well as help researchers to find proper the journal to publish in, while being cautious not to submit papers to predatory journals.

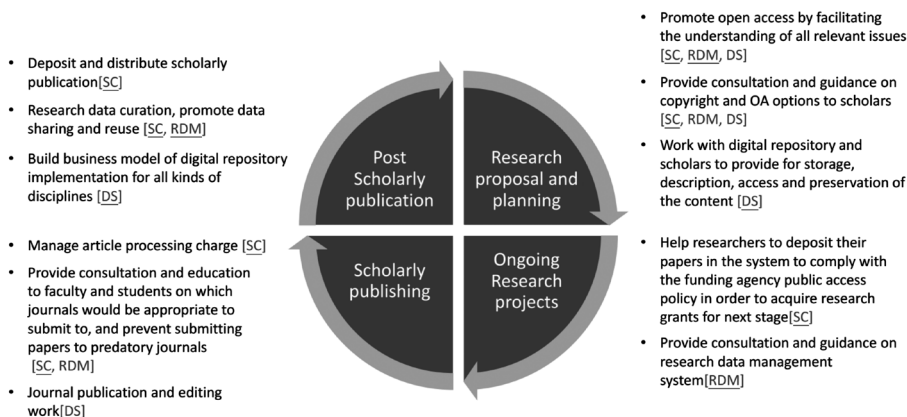
(2) Librarians advocate and support for managing data collections and provide data reuse services. The willingness of scholars to share data in different discipline are not the same. If the research data management plan is necessary for a research proposal required by the funding agency, then it will raise the awareness of researchers to share data. Librarians should understand this diversity and provide consultations according to patrons' need. (3) Librarians collaborate and brainstorm with researchers and this introduces both internal and external opportunities to develop digital scholarship projects. These collaborations also provide advice to build up customized content management systems.

To sum up, the professional work involved in scholarly communication, research data management, and digital scholarship librarians as shown in Figure 1, indicating that their services are included in different stages of the research life cycle.

From the second category, regarding to the soft skills, research findings are as follows. (1) Librarians often collaborate with both internal and external stakeholders. Communication skills are very important. (2) Librarians often offer different topics of consultations and teach in a variety of workshops. Teaching is a very vital skill. (3) Librarians encounter with several kinds of challenges, including how to promote the number of participants in every activity, how to educate researchers of open access issues, how to raise awareness of sharing data

among the research community, how to build up an effective and sustainable business model for research data management. (4) Librarians face new tasks quite often, they need to acquire new knowledge all the time. They continue to educate themselves by attending workshops or seminars, learning by doing, or pursue a second master's degree. In addition, they also join professional forum or alliance, i.e. Research Data Alliance, to learn from professional members from other institutions.

Figure 1 Services and Consultations of Three Types of Librarians during Research Cycles



Note: [SC] = scholarly communication librarian;
[RDM] = research data management librarian;
[DS] = digital scholarship librarian.

In terms of the personal traits of good librarians and their passion, many librarians mentioned having curiosity and willing to acquire new knowledge, possessing good communication skills and a nature capability to collaborate well with people. Because librarians often encounter new sets of responsibilities and uncontrollable situations, they need to adapt to change all the time, and think systematically and exercise strong project management skills. In addition, librarians' passions come from the followings, satisfaction in serving for the public good and having the greater impact on society. Librarians express feeling great reward after acquiring positive feedback from patrons who begin to discover new knowledge through the tours and services provided by the library.

The important issues of the expectations to librarians in the future were raised as the followings. (1) Always communicate with patrons and meet their needs. (2) Education and playing the role of shepherd to lead patrons toward their data/information needs. (3) Make use of modern technology and combine with information services. Think about how data/information will be used in the context of human use, instead of computer use. (4) Consider ways to help scholarly publishing transition to open access scholarly communication models.

Several suggestions were provided in this study as the follows. (1) Prioritize scholarly communication, research data management, and digital scholarship services for future work, and propose plans for most challenging works. (2) Apply matrix organization, to develop flexible organizational structure for new work design, assign tasks for new project team when initiating new services. (3) Develop librarians' competencies and skills. Encourage librarians to attend different topics of workshops and social community to broaden their mind. (4) Explore the mechanism to promote the morale of librarians, such as positive stories about "librarian of the year" and celebrate other good success stories. (5) Recruit more librarians with PhD degrees to provide high-quality information services. (6) Consider curiosity, passion of acquiring new knowledge, and good communication and teaching skills as the criteria when recruiting future librarians.

The research results are helpful to propose a plan for the practical work required of digital scholarship professionals and services in university libraries in Taiwan.

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